

SOCIETY FOR CONSERVATION BIOLOGY OCEANIA FIJI 2014



DISCLAIMER

Contained in this document you will find details of the various sessions presented during the conference. While every care has been taken to present accurate times and venues please be aware that these are subject to change and we advise you to refer to the printed schedule of events in your welcome pack for more up to date information.

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WELCOME

Ni sa bula vinaka,

Welcome to the Society for Conservation Biology Oceania (SCBO) section conference in Fiji! This conference was several years in the making. After successful SCBO conferences in Sydney (2007) and Darwin (2012), and the International Congress for Conservation Biology in Auckland (2011), we wanted to find a venue in the Pacific Islands of Oceania to broaden the reach of the society and engage, in particular, our young Pacific Islander scientists and conservationists. We are very happy that the University of the South Pacific in Fiji agreed to co-host the event with us.

We hope you have a productive and enjoyable time networking with fellow conservation biologists, talking about your work and learning from the work of others as well as enjoying the famous Pacific Island hospitality. As we all know, Pacific Islanders and their environment have some of the most pressing conservation challenges on the globe, given long-term effects of habitat loss and invasive species and current impacts of global climate change, particularly sea level rise. The focus of our conference is on building resilience not only in the environment but also the people who depend on ecosystem services. We hope you have an invigorating time and have renewed enthusiasm for the ongoing challenge of conservation in our changing part of the planet – Oceania.

Coupled with this conference, the SCBO has organised a special issue (Volume 20, Issue 2) of Pacific Conservation Biology focused on “Conservation of biodiversity in the Pacific Islands of Oceania” (to be published in August, there will be a brochure in your conference packs). We encourage you to have a look at these papers for a well-rounded assessment of the state of threats in the region, as well as emerging conservation opportunities.


Richard Kingsford
President, Society for Conservation Biology
Oceania




Stacy Jupiter
Chair, Local Organising Committee



SCBO FIJI CONFERENCE HOSTS

The SCB Fiji 2014 Conference is co-hosted by the Society for Conservation Biology Oceania section and the Office of the Pro Vice Chancellor for Research & International at the University of the South Pacific.

About the Society for Conservation Biology Oceania (SCBO) Section



The Society for Conservation Biology (SCB) is an international professional organization dedicated to promoting the scientific study of the phenomena that affect the maintenance, loss, and restoration of biological diversity. The Society's membership comprises a wide range of people interested in the conservation and study of biological diversity: resource managers, educators, government and private conservation workers, and students make up the more than 5,000 members world-wide. SCB is a global community of professional conservation scientists and practitioners and has grown tremendously since it was founded in 1985. A major strategic initiative identified in 1999 led to the establishment of regional sections, and the evolution of SCB into an international society.

The SCB Oceania (SCBO) section was created as part of this strategic initiative and has been functioning with an elected independent board since 2005. The SCB Oceania region has five sub-regions, reflecting human cultures and colonisation: Australia, Melanesia, Micronesia, New Zealand and Polynesia. We have more than 250 members in the region. In the past five years, we have held successful conferences in Darwin, Australia, in 2012; hosted the global International Congress for Conservation Biology in Auckland, New Zealand, in 2011; continued to support and grow the regional journal *Pacific Conservation Biology*. We are keen to continue to improve our effectiveness in the science and practice of conserving the Earth's biological diversity.

Conferences are a key way that we think we can continue to build our capacity and it is great to hold this one in the Pacific. SCBO is co-hosting the Fiji 2014 Conference with the University of the South Pacific.

About The University of the South Pacific



The University of the South Pacific (USP) is the premier provider of tertiary education in the Pacific region and an international centre of excellence for teaching, research consulting and training on all aspects of Pacific culture, environment and human resource development needs. It is jointly owned by the governments of 12 member countries: Cook Islands, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu and Samoa. The University has campuses in all member countries. The main campus, Laucala, is in Suva, Fiji. Since its inception in 1968, USP has been committed to fulfilling the challenge of providing the highest possible quality education and research while addressing the changing circumstances and needs of the Pacific region. Over the years, more than 35,000 graduates have successfully completed their studies.



SPONSORS

The Society for Conservation Biology gratefully acknowledges the following organizations for their contributions to the success of Fiji 2014:



Silent Auction Contributors:



Environment
Consultants
Fiji



LOCAL ORGANISING COMMITTEE & VOLUNTEERS

Local Organising Committee:

Stacy Jupiter (Chair)
Gilianne Brodie
John Bythell
Margaret Fox
Richard Kingsford
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Ravitesh Kumar
Niumai Nabukelevu
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Natasha Verma

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Mosese Naleba
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Varea Romanu
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Iliveleti Gadai
Robert Kaia
Alena Mataitoga
Jale Naivalurua
Yokohama Potifara
Arishma Ram
Karameli Schuster
Samanunu Simpson
Shaunalee Tagaloa
Sarah Teetu
Meresiana Tikoisuva
Luke Uluiburotu
Natasha Woods



PRACTICAL DETAILS

Registration

Registration times are shown in the schedule, and will be available Monday to Thursday in front of AUSAID2 Lecture Theatre.

Schedule for Uploading Presentations

All presentations should be provided to IT volunteers at least 24 hours before you are due to speak. IT volunteers will be available during registration times. We request that you arrive 10 minutes early to the session you are speaking to check that your presentation is loaded correctly onto the computer. Please bring your presentation on a USB stick as extra backup!

Conference Book

Each registrant will receive a copy of the conference book on a USB stick when they collect their conference pack. Inside you will find all relevant information about the conference, including a short and more detailed schedule, as well as the abstracts for plenaries, symposia and individual presentations. USP Health and Safety Information is provided as a separate PDF file.

Reimbursements

Participants seeking reimbursements for cancelled workshops or field trips should go to the registration desk.

Oral Presentations

Presentations should be in Powerpoint or equivalent software (e.g. Keynote), and should be around 10-12 minutes in length to allow 3-5 minutes for questions.

Mobile Phones

As a courtesy to your fellow attendees, please turn off all mobile phones prior to entering a session room. If you must leave a session room early please leave quietly.

Opening Cocktails & Closing Banquet

All full registrants will receive complimentary admission to the opening and closing banquet. Please check behind your name tag that you have the two tickets, and any extras you ordered for guests.

Student Event

If you are a student, there are limited tickets to a Student Event hosted by postgraduate students at the University of the South Pacific Gymnasium, on Thursday night, 6-9 pm. There are limited tickets available on request during registration. Please bring identification showing which university you are currently enrolled in if you wish to join the event.

Food and Drinks

Morning and afternoon teas and lunch will be served in the open space between the AUSAID theatres and AUSAID tutorial rooms. Please wear your name tags at all times. Water bottles have been provided and you will be able to fill these up at water filter stations.



Name Badges

Participants are required to wear your SCBO name tag at all times. In addition to being a means of identification, the name badge is required for admission to all sessions, lunch, and social functions.

Notice Board

A message board is located at the registration desk. Messages may be left for participants.

Lost and Found

Please go to the registration desk for all lost and found items.

No Smoking Policy

Smoking is not permitted anywhere within the convention centre or where food and drinks are being served.

Social Media and Communications

The official Twitter hashtag for the event is **#SCBO2014**. We encourage participants to tweet about interesting talks and follow us on our Twitter **@SCBOceania**.

Search for SCB – Oceania on Facebook and “like” our organisation page to receive more news throughout the week through your feed.

Wireless internet will be provided throughout the venue. Please look for announcements about the host site and password.



GENERAL INFORMATION ON FIJI

Land & Population

Covering nearly 1.3 million km² of the South Pacific, Fiji is made up of over 330 islands, of which about 100 islands are populated by approximately 900,000 people.

Languages

The official language in Fiji is English and is spoken throughout. However, Fijian and Hindi are also taught in schools as part of the school curriculum. Indigenous Fijians also have their own dialects spoken in their respective provinces.

Currency

The currency in Fiji is the Fijian Dollar or FJD. Foreign currencies can be converted into Fijian Dollars at International Airports entering into Fiji and can also be converted at all banks and currency converters located within the central business districts within Suva and or Nadi. Fiji's paper currency has denominations of \$100, \$50, \$20, \$10 and \$5 notes with \$2, \$1, 50 cents, 20 cents, 10 cents and 5 cents coins.

Banking

Different banks have different opening hours but generally open Monday to Friday from 9 am to 4 pm. ATM access is ubiquitous, but some ATMs will charge a service fee above and beyond any fee charged by your own bank for use of an out-of-network ATM. Most major credit cards are also accepted at local businesses. ANZ, Bank of Baroda, BSP (Bank of the South Pacific), Bred Bank and Westpac operate in Fiji.

Electricity

Fijian electrical supply and wall sockets are the same as those found in Australia and New Zealand (220-200 Volts), so if you have a gadget or appliance that has a 110-120V, you will require converters and/or plug adapters.

Telecommunications

Fiji has three major telecommunications providers being Digicel, Vodafone and Telecom Fiji Limited. These carriers provide excellent local and international calling rates and pre-pay/pay as you go mobile SIM cards can be purchased at the airport upon arrival or in Suva. Alternatively you may opt to switch your mobile phone to international roaming.

Climate

Fiji is blessed with a tropical South Sea maritime climate without great extremes of heat or cold. The average temperature for July is 22°Celsius (72°F).

Travelling within Suva

Public buses and taxis can generally be used for travelling within Suva. Taxis wait at taxi stands or can be flagged down. Taxis can also be hired. It takes about 10 minutes with a fare of approximately FJ\$3.50 to go from central Suva City to the University of the South Pacific by taxi. A bus ride from the Suva Bus Station to the University of the South Pacific will take about 15 minutes with a fare of approximately FJ\$0.70. Bus and taxi fares increase with the distance travelled.



About Suva City

The city of Suva sits on a hilly peninsula between Laucala Bay and Suva Harbour on the south-eastern side of Viti Levu. Suva is Fiji's capital city. It is the major commercial and political centre of Fiji, and the largest urban area in the South Pacific outside of Australia and New Zealand. Suva is mostly surrounded by sea. As the capital, Suva has a Parliament House and many overseas embassies. Suva is home to a variety of South Pacific educational institutions including The University of the South Pacific, the Fiji School of Medicine, the Fiji National University and the Institute of Technology Australia. This vibrant multi-cultural capital has a population of about 200,000 and a large selection of shops and restaurants. The main tourist attractions in Suva include:

- o Colo-i-Suva Forest Park
- o Golf Course at Rifle Range
- o Bowling Club
- o Fiji Museum
- o Suva City Tour
- o Queen Elizabeth Drive/Foreshore
- o Takashi Suzuki Garden
- o Sukuna Park
- o Heritage buildings
- o Thurston Gardens
- o National Aquatic Centre
- o Suva Market
- o Handicraft Centre
- o Government House
- o Albert Park

Food

Fiji is well known for Fijian traditional food and its delicacy. There are many restaurants including Indian and Chinese restaurants to choose from in the Suva City. Restaurants cater for all tastes and budgets. Some selected locations for restaurants and cafes include:

Damodar City (Walking Distance from USP)

Located across the road from the University conference venue, this shopping and retail space offers a cinema and a collection of restaurants featuring International, Mexican, Japanese, Indian and Asian cuisines.

Prices: from FJ\$5 upward

Dans Fish & Chips (Walking Distance from USP)

This is a popular fish and chips shop that is less than 5 minutes walk from the University conference venue and boasts its staple fish and chips alongside fish burgers and roasted chickens.

Prices: FJ\$5 upward

Nando's Restaurant (Walking Distance from USP)

Nando's specializes in chicken dishes with either lemon or herb, medium, hot, extra hot or extra extra hot Peri-Peri marinades. Located less than 5 minutes from the University conference venue, it is situated next to Dan's Fish and Chips.

Price: FJ\$7 upward



Mango Cafe

This groovy little cafe is the place to stop during a walk or drive along the Suva waterfront. With a Pacific fusion menu, this joint transforms into a happening night spot after 5pm daily with live performances by Pacific dance groups and musicians and guaranteed icy cold beers. Cuisine: Café style

Address: 52 Ratu Sukuna Rd, Nasese
Telephone: +679 331 9523
Prices: mains from FJ\$10

Tiko's Floating Restaurant

The only way you could be any more harbour side would be if you were standing in the water. This permanently moored former Blue Lagoon cruise ship is best enjoyed when there's little motion in the ocean (though people who are prone to sea sickness be warned!) The excellent surf-and-turf fare includes New Zealand steak, fresh local fish (walu and pakapaka) and an extensive wine list. Everything is served on white linen and in fine china and glassware. Cuisine: International

Address: Street off Stinson Parade
Telephone: +679 331 3626
Prices: mains FJ\$25 – FJ\$60

Daikoku Restaurant

Upstairs past the closet-sized bar, the acrobatic culinary skills of Daikoku's teppanyaki chefs are reason enough to spend an evening here. The seafood, chicken and beef seared on the sizzling teppanyaki plates would hold up in any Tokyo restaurant. Partner restaurant to Daikoku in Nadi, the \$15 lunch specials are popular here too. Arrive promptly at midday or be prepared to wait. Bookings essential for dinner. Cuisine: Japanese

Address: Dolphins Plaza, Victoria Parade
Telephone: +679 330 8968
Prices: mains FJ\$25 – FJ\$90

Sea Salt Restaurant/Bar & Grill

This modern restaurant located in the heart of Suva offers a varied menu and is an ideal location for sit down dinners. As it is also a favourite for business meetings and gatherings, Sea Salt also has a bar and offers live music entertainment on occasion. Cuisine: Seafood, Australian, Bistro

Address: 1 Central St, Suva, Viti Levu 5214, Fiji
Telephone: +679 3305005
Price range: FJ\$17 – FJ\$52



Old Mill Cottage Cafe

Officials and government aides from the nearby embassies cram the front verandah of this affordable and cheerful Suva institution to dabble in authentic Fijian fare. Dishes including palusami (meat, onion and lolo – coconut cream – wrapped in dalo leaves) are displayed under the front counter alongside Indian curries and vegetarian dishes. Cuisine: Pacific, Indian, Vegetarian

Address: 49 Carnarvon St
Telephone: +679 331 2134
Prices: FJ\$5 – FJ\$12

Highland Naturals, Juice & Salad Bar

This joint is an all-natural food store and juice bar that sells plant-based produce, dried herbs and essential oils including wholesome cereals, sauces, herbal teas, and packaged goods. They also make natural butters, sauces and dressings which are mostly raw and fresh and which are used in the food sold in the juice bar. Cuisine: Vegetarian.

Address: Parade Arcade off Victoria Parade
Telephone: +679 354 0222
Prices: FJ\$5 – FJ\$10

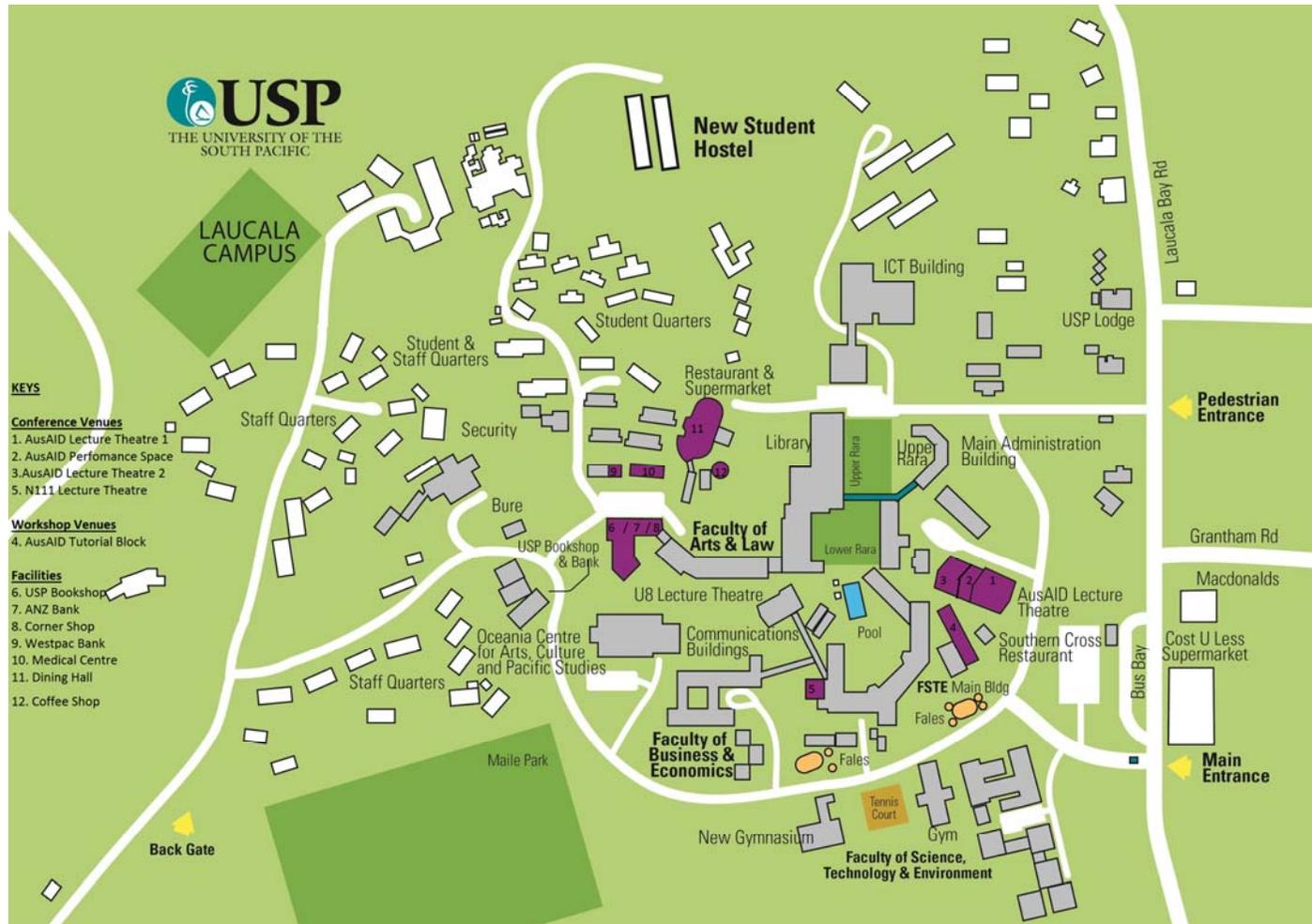
Maya Dhaba

Maya Dhaba is an authentic Indian restaurant that screens hip-gyrating Bollywood musicals on flat-screen TVs in Suva's most urbane restaurant. The meals are excellent: wrap your naan (Indian bread) around any number of familiar and not so familiar Indian curries. It also boasts an excellent Indian dessert selection. Cuisine: South Indian

Address: 281 Victoria Pde
Telephone: +679 331 0045
Prices: mains FJ\$13 – FJ\$22



MAP OF UNIVERSITY OF THE SOUTH PACIFIC



PRE-CONFERENCE WORKSHOPS

Monday, 7 July 2014

Workshop 1: A hands-on introduction to applied social network analysis for community-based conservation

Contacts: Ken Vance-Borland, Conservation Planning Institute
Judy Soule, CPI; Ged Acton, Wildlife Conservation Society

Days: 1 full day (7 July 2014)

Number of participants: 10-25

Location: AUSAID Tutorial Block (#4 on USP map)

The theory and methods of social network analysis have been under development since the 1930s, and in the past decade have begun to be applied to socio-ecological systems. Using relational data and diagrams (maps), SNA can identify properties of social networks such as which actors are in the center of 'the action' and which are peripheral; groups of actors who interact more with one another than with those outside their group; and which actor groups interact and which ones don't (i.e., social boundaries or divides). Network 'weaving' processes to bridge divides and increase innovation and success have also been developed. Interest in the potential for SNA to contribute to conservation has emerged in recent years, as evidenced by increasing numbers of SNA papers in conservation journals and conferences, including ICCB 2013. Yet few conservation scientists, practitioners, or students are familiar with SNA and how it might be applied in conservation. This course will provide both an overview of and hands-on learning in applied SNA for conservation. Participants will learn about the history, theory, and methods of SNA, and will practice: (1) Social network questionnaire development, (2) Network data collection, (3) Network mapping with the free visone software, (4) Social network analysis with visone and R, (5) Applied conservation SNA: methods for network weaving, (6) How to plan and execute an applied conservation social network project.

Workshop 8: Scientific Writers and Presenters Workshop: Two Essential Skills to becoming a Good Scientist

Contact: Sangeeta Mangubhai, Wildlife Conservation Society; Stacy Jupiter, Wildlife Conservation Society; Rebecca Weeks, James Cook University

Days: 1 full day (7th July 2014)

Number of participants: 20

Location: AUSAID Tutorial Block (#4 on USP map)

The workshop will provide a 2-day introduction to scientific writing and presentation skills to young aspiring Pacific Island scientists. The workshop is aimed at postgraduate students at the University of the South Pacific (USP), or recent graduates who have not had the opportunity to share or disseminate the results of their thesis work with their peers. This workshop is appropriate for theme of the conference, given its focus on science and conservation in the Oceania, and will inspire and help build the capacity of the next generation of scientists in the region. Day 1 will focus on teaching participants the key steps to preparing, writing and submitting a scientific paper for publication in an international journal. It is expected that the workshop will improve skills and strengthen the confidence of young Pacific Island scientists to both write up their work for journal publication, and present their work to their peers in both national and international fora. Day 2 will focus on presentation skills and will give participants the chance to practice their presentations in front of their peers and to the trainers, so that they learn to both give and receive constructive feedback. It is anticipated that this will help improve presentations, and increase their confidence at presenting at international conferences.



Tuesday, 8 July 2014

Workshop 7: Working forward to implement more effective sea cucumber fisheries management in Pacific Islands

Contacts: Rocky Kaku and Jayven Ham, Vanuatu Fisheries Department; Stacy Jupiter, Wildlife Conservation Society

Days: half day (afternoon, 8 July 2014)

Number of participants: 20

Location: AUSAID Tutorial Block (#4 on USP map)

In Vanuatu, the Fisheries Department has been implementing a new total allowable catch (TAC) management system for sea cucumbers based on stock assessments. The objectives of the workshop are to share the experience from Vanuatu of managing cucumber stocks among interested Pacific Islanders and to initiate a technical working group on sea cucumber management in Pacific Islands. The workshop will include presentations by Pacific Islanders involved in sea cucumber fisheries management and assessment, as well as practical data analysis using the established online BDMER database (bdmer-test.ird.nc) with practical examples of data collected from Vanuatu.

Workshop 5: Bridging the research implementation gap

Contacts: Rebecca Jarvis; AUT University; Steph Borrelle, AUT University

Days: half day (morning, 8 July 2014)

Number of participants: 36

Location: AUSAID Tutorial Block (#4 on USP map)

One of the main challenges in conservation lies in our inability to translate management objectives into effective action on the ground. This is often due to the inadequate consideration of the social, cultural and institutional dynamics that influence ecological systems and the likelihood of successful conservation outcomes. Successful conservation outcomes are often limited by (1) the research implementation gap, and (2) scale mismatch. The workshop is designed to explore conservation issues concerning multiple priorities, the research implementation gap, and scale mismatch in Oceania through two workshop activities adapted from Frog Design's Collective Action Toolkit (2013). The workshop will provide the opportunity for conservation researchers and practitioners to identify where they may sit within the research implementation gap, how their own motivations and priorities align or diverge from others, and how their own work relates to the scale of conservation issues.



SOCIAL EVENTS



OPENING COCKTAIL AND POSTER SESSION

July 9, 18:00 – 21:00

Location: Inside and adjacent to AUSAID2

Catch up with old colleagues and meet new ones at our opening cocktail event, featuring the VOU performers. VOU is an explosive and vibrant Pacific experience that transports you to our island paradise rich in ancient stories, tradition and culture. Through the medium of live music and dance, VOU (meaning new in Fijian), is the blending of old and new, traditional and contemporary. Learn more about VOU on their website:

<http://www.voufiji.com/>

STUDENT NETWORKING EVENING

July 10, 18:00 – 21:00

Location: USP Gymnasium

The social evening is an occasion geared towards bringing together graduate students from the Oceania region and chosen specialists in conservation biology. It is an opportunity made available to students participating in the SCBO conference to meet, share and network with fellow graduates and conservation specialists. The evening provides an opportunity to learn of the different opportunities for intern-ships, scholarships and research available in the Oceania region, it is also a chance to be inspired by some of the most respected contributors to conservation biology.

CLOSING BANQUET

July 11, 18:00 – 21:30

Location: Fiji Museum, Thurston Gardens

Located in the heart of Suva's botanical gardens, the Fiji Museum holds a remarkable collection which includes archaeological material dating back 3,700 years and cultural objects representing both Fiji's indigenous inhabitants and other communities that have settled in the island group over the past 100 years. Join us in the verdant gardens around the museum veranda to listen to the cool jazz sounds of the Tom Mawi and his band. In the late 1960s, the US jazz chronicle Down Beat rated Tom Mawi as one of the top 10 jazz guitarists in the world. He has played on continuously ever since, entertaining locals and visitors from around the world.





Are you a member of an SCB chapter? Interested in becoming one? Wondering what SCB Chapters are all about? Check out one of our chapter events!

Symposium hosted by Victoria University in Wellington (VUW) Chapter

Wednesday, July 9th; CCO-05: Integrating Science with Participatory Conservation

Pairing participatory projects with science-based methodology and practices offers measurability for project outcomes. This symposium will explore successful participatory conservation projects where science was incorporated and discuss ways to improve community conservation schemes. We will specifically draw from the experience of SCB Oceania chapters.

Special Lunchtime Chapter Workshop: How and why to start an SCB Chapter

Thursday, July 10th; Begins 15min after official lunch break starts (Go grab your lunch first!)

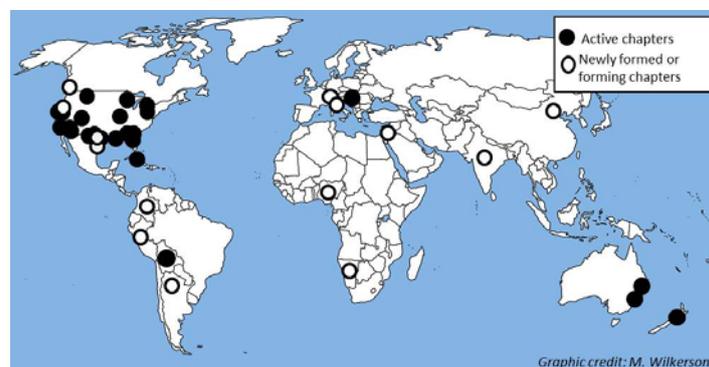
Starting a local chapter is an excellent way to join forces with other like-minded individuals in your area to tackle local issue. Whether you would like to start a restoration project, discuss changes you would like to see in local policy, start a seminar series, or any other conservation related topic, establishing a local SCB Chapter is a great way to reach those goals.

Chapter Evening Social

Thursday, July 10th; Start time TBA and group will leave from the University Campus

We'll mix business and pleasure as we head out to eat out in Suva. This is your chance to network with and discuss Chapter business issues directly relevant to Oceania Chapters. If you are interested in attending, contact Marit Wilkerson, member of SCB Chapters Committee, via email (mlwilkerson@ucdavis.edu) or in person at the conference.

Don't forget to stop by our Chapter Booth on Thursday! Look for us near registration.



FIELD TRIPS

Bird Watching – Savura Forest Reserve

Organized by Miliana Ravuso (Birdlife International)



The Savura Forest Reserve is designated an Important Bird Area (FJ10) in Fiji and is located on the other side of the Colo-i-Suva Forest Park, about 10km out of the centre of Suva. The Forest Reserve hosts one of the best forest areas in south east Viti Levu and has watersheds (Savura & Vago Creeks) which are protected water catchment areas. The Savura Forest Reserve is bordered by settlements on the edge of Suva and the mahogany plantations of the Colo-i-Suva Forest Park and has been protected from logging since

1963. The walk follows a 4wheel drive track that can be wet underfoot following rain. There is no need, however, to venture off the track and into the forest. July is the start of the breeding season for most forest bird species in Fiji, so we should expect to hear a lot of singing and calling from approximately 32 bird species which are either endemic or have been introduced.

Pick-up: 6am, USP

Drop-off: 9am, USP

Cost per head: FJD 35

What to Bring: Good walking shoes, hat, binoculars. Bird Pocket Guides will be provided.

Dolphin Watching – Moon Reef

Organized by Cara Miller (Whales & Dolphins Conservation Society)



Dolphin Watch Fiji is a locally owned company which offers a truly unique opportunity to spend a day with our dolphins on Moon Reef – just 15 minutes by boat from Takalana Bay. The day includes a locally prepared delicious lunch and refreshments leaving you to enjoy the wonderful marine scenery. As part of the day trip to Takalana bay, you will be treated to dolphin watching, sea kayaking and a bush walk.

Pick-up: 6am from USP

Drop-off: 6pm at USP

Cost per head: FJD 130

What to bring: Walking shoes, dry bag for camera and other items, towel, bug spray and sun screen.



Nabalesere Waterfall and Wailotua Bat Caves

Organized by Stacy Jupiter (Wildlife Conservation Society) and Matt Capper (Talanoa Treks)



Discover Nabalesere's magnificent waterfall and swim in the cool, refreshing waters. Warm-up and relax in the village over a cup of draanimoli and lunch, and then head on and explore the historic caves at Wailotua.

Although it bears the name of the snake, the cave is more popularly known amongst Fiji's field biologists for its bat fauna. This is one of the remaining roosting and nesting cave of the Vulnerable Fiji Blossom bat.

Pick-up: 7:30am from USP

Drop-off: 6pm at USP

Cost per head: FJD 120

What to bring: Walking shoes (trainers recommended), 'sulu' (sarong) for village, insect repellent, sun cream, camera, dry bag/plastic bag, and rain gear (just in case)

Nature Hike – Colo-i-Suva Rain Forest

Organized by Dwain Qalovaki (Wildlife Conservation Society)



Colo-i-Suva Forest National Park was established in 1872, boasting a lush rain-forest renowned for tropical flora and bird life. There are approximately four and a half kilometers of natural trails through the forest and natural water pools to swim in. The Waisila Creek flows through the Colo-i-Suva Forest National Park in Fiji making its way to Waimanu River and is the water catchment for Nausori and Nasinu creek. African mahogany, planted in the 1940s and 1950s, stands apart from the

older native vegetation. This is a guided tour by the Colo-i-Suva Park Rangers which will begin with a brief about the national park before the hike begins, at the mid-way participants will get to take photos and have a swim in the water pools.

Pick-up: 9am, USP

Drop-off: 1pm, USP

Cost per head: FJD 35

What to bring: Hiking shoes, water bottle, light lunch, bug spray and a towel. Maps will be provided.



SCBO FIJI 2014 SCHEDULE AT A GLANCE

Time	Monday - 7 July 2014			
7:30 - 9:30	Registration - Booth in front of AUSAID2 Lecture Theatre			
	Tuesday - 8 July 2014			
12:00 - 16:00	Registration - Booth in front of AUSAID2 Lecture Theatre			
	Wednesday - 9 July 2014			
0730 - 0830	Registration - Booth in front of AUSAID2 Lecture Theatre			
0830 - 0845	Welcome, Opening prayer and Fijian traditional opening ceremony (<i>sevusevu</i>) (Chair: S. Jupiter)			
0845 - 0915	Opening Address - James Watson (President-Elect, SCB Board of Governors), AUSAID1			
0915 - 1000	Plenary 1 - Taholo Kami (IUCN Oceania Regional Office), AUSAID1			
1015 - 1045	MORNING TEA			
LOCATION	AUSAID1	AUSAID2	AUSAID3	N111
Symposium Theme	Vulnerable Ecosystems, Communities & Species	Adaptive & Community-Based Management of Socio-Ecological Systems	Conservation in Changing Oceania	Vulnerable Ecosystems, Communities & Species
Symposium Name	VE-01: Using biogeography to set the scale of conservation in Melanesia	CBM-01: Advancing the integration of connectivity processes into marine conservation planning.	CCO-05: Integrating science with participatory conservation	VE-08: Freshwater, forest ecosystems and climate change



Chair	Joshua Drew, Erin Eastwood, Molly McCargar, Elora López	Rebecca Weeks	Rosalynn Anderson-Lederer	James Watson
10:45	Rico, Ciro	Harrison, Hugo	Awasthy, Monica	Taylor, Jennifer
11:00	Burley, Hugh	Green, Alison	Whitburn, Julie-Anne	Laitame, Tiffany
11:15	Eastwood, Erin	Olds, Andrew	Jarvis, Rebecca	Fulton, Graham
11:30	McCargar, Molly	Alvarez-Romero, Jorge	Borrelle, Steph	Vardeh, David
11:45	Lavery, Tyrone	McGowan, Jennifer	Wendt, Hans	Birrer, Simone
12:00	Rico, Ciro	Weeks, Rebecca	Cox, Bart	Bino, Gilad
12:15	López, Elora H.		Kingsford, Richard	
12:30	Waqairatu, Salote			
1245 - 1345	LUNCH			
1245 - 1345	LUNCH EVENT: SCB Oceania Section - Annual General Meeting and learn about the Society (Location: AUSAID 2)			
1345 - 1430	Plenary 2 - David Keith (University of New South Wales) (Chair: C. Lundquist), AUSAID1			
	AUSAID1	AUSAID2	AUSAID3	N111
Symposium Theme	Vulnerable Ecosystems, Communities & Species	Adaptive & Community-Based Management of Socio-Ecological Systems	Conservation in Changing Oceania	Vulnerable Ecosystems, Communities & Species
Symposium Name	VE-02: Exploring the resilience of Pacific Island species, habitats, ecosystems and communities.	CBM-03: Traditional Ecological Knowledge & Conservation	CCO-03: Spatial management of coastal seascapes for ecological functioning, ecosystem services and food security.	VE-09: Species in Oceania



Chair	Sangeeta Mangubhai, Randi Rotjan		Andrew Olds, Marcus Sheaves, Jean Davis	Kelera Macedru
14:45	Osborne, Laurel	Drew, Joshua	Davis, Jean	Shumway, Nicole
15:00	Teroroko, Tukabu	McMillen, Heather	Baker, Ronald	Tikoca, Siteri
15:15	Rotjan, Randi	Morishige, Kim	Gilby, Ben	Anderson-Lederer, Rosalynn
15:30	Dacks, Rachel	Pascua, Pua'ala	Huijbers, Chantal	Davidson, Anthony
1545 - 1615	AFTERNOON TEA			
16:15	Boschetti, Simona	Kurashima, Natalie	Sheaves, Marcus	Macedru, Kelera
16:30	Nand, Yashika	Mane, Akshaya	Olds, Andrew	Karst, Tanya
16:45	Couch, Courtney	Lamaris, John	Albert, Joelle	
17:00	Taylor, Subhashni	McDavid, Brooke	Lundquist, Carolyn	
18:00 - 21:00	Poster session and Opening Cocktail (Location: Infront of AUSAID 2 Lecture Theatre)			



Thursday - 10 July 2014			
0800 - 0900	Registration - Booth in front of AUSAID2 Lecture Theatre		
0900 - 0945	Plenary 3 - Randy & Konai Helu Thaman (University of the South Pacific) (Chair: R. Kingsford), AUSAID1		
1000 - 1030	MORNING TEA		
	AUSAID1	AUSAID2	AUSAID3
Symposium Theme	Vulnerable Ecosystems, Communities & Species	Adaptive & Community-Based Management of Socio-Ecological Systems	Conservation in Changing Oceania
Symposium Name	VE-03: Species Conservation (Part 1)	CBM-05: Integrated land-sea planning. (Part 1)	CCO-01: Fisheries By-catch in Oceania: assessment & solutions
Chair	Gillianne Brodie, Marika Tuiwawa, Cara Miller, Helen Pippard	Jutta Beher, Carissa Klein, Hugh Possingham	Yonat Swimmer, Susanna Piovano
10:30	Brown, Kelly	Possingham, Hugh	Itano, David
10:45	Simpson, Samanunu	Jupiter, Stacy	Ledua, Esaroma
11:00	Aisea, Latu	Ticktin, Tamara	Donoghue, Michael
11:15	Copeland, Lekima	Brodie, Jon	Swimmer, Yonat
11:30	Boseto, David	Waterhouse, Jane	Siota, Catherine
11:45	Chandra, Visheshni	Beher, Jutta	Hutchinson, Melanie
12:00	Waqa-Sakiti, Hilda	Saunders, Megan	Campbell, Ian
12:15	Brodie, Gillianne	Shaw, Sylvie	Piovano, Susanna



12:15			Osmond, Michael
1230 - 1330	LUNCH		
1230 - 1330	LUNCH EVENT: Learn how to set up an SCBO chapter (Location: AUSAID 2)		
1330 - 1415	Plenary 4 - Eve McDonald-Madden (University of Queensland) (Chair: R. Weeks), AUSAID1		
	AUSAID1	AUSAID2	AUSAID3
Symposium Theme	Vulnerable Ecosystems, Communities & Species	Adaptive & Community-Based Management of Socio-Ecological Systems	Conservation in Changing Oceania
Symposium Name	VE-03: Species Conservation (Part 2)	CBM-05: Integrated land-sea planning. (Part 2)	CCO-04: Prioritising conservation actions on tropical islands.
Chair	Gillianne Brodie, Marika Tuiwawa, Cara Miller, Helen Pippard	Jutta Beher, Carissa Klein	Amelia Wenger, Ian Craigie, Bob Pressey
14:30	Barker, Gary	Tulloch, Vivitskaia,	Pressey, Bob
14:45	Anisi, Ramokasa	Albert, Simon	Wenger, Amelia
15:00	Pene, Sarah	Closs, Gerry	Craigie, Ian
15:15	Yabaki-Goundar, Mere	Brown, Christopher	Baker, Christopher
1530 - 1600	AFTERNOON TEA		
16:00	Filardi, Chris	Frost, Alexander	Tagicakibau, Luisa
16:15	Posala, Corzzierrah	Auerbach, Nancy	Steven, Rochelle
16:30	Fisher, Diana	Esbach, Michael	Hall, Jane
16:45	Pikacha, Patrick	Maxwell, Sean	Saunders, Alan



17:00	Pollard, Edgar	Watson, James	Thaman, Randy
17:15	Tuiwawa, Marika		
17:30	Pippard, Helen		
18:00 - 21:00	Student Evening (Location: Gymnasium)		

	Friday - 11 July 2014		
0900 - 0945	Plenary 5 - Chris Filardi (American Museum of Natural History) (Chair: R. Spindler), AUSAID1		
1000 - 1030	MORNING TEA		
	AUSAID1	AUSAID2	AUSAID3
Symposium Theme	Vulnerable Ecosystems, Communities & Species	Adaptive & Community-Based Management of Socio-Ecological Systems	Conservation in Changing Oceania
Symposium Name	VE-05: Pacific reptiles: declines, extinctions and new species.	CBM-04: Socioeconomic considerations in conservation planning: past, present, future	CCO-06: Protected areas and their management
Chair	Peter Harlow, Robert Fisher	Melanie Hamel, Vanessa Adams, Sangeeta Mangubhai	Ciro Rico
10:30	Fisher, Robert	Mangubhai, Sangeeta	Boaden, April
10:45	Harlow, Peter	Hamel, Melanie	Henderson, Christopher



11:00	Lovich, Kim	Adams, Vanessa	Lawless, Peter
11:15	Osborne-Naikatini, Tamara	Andrefouet, Serge	Sokimi, Arthur
11:30	Morley, Craig	Salcone, Jacob	Hobbs, Rebecca
11:45	Manasi, Eric	Klein, Carissa	Miller, Mark
12:00	Amepou, Yolarnie	Gurney, Georgina G.	Barnes, Megan
12:15	Richmond, Jonathan	Geslani, Cheryl	Bos, Melissa
1230 - 1330	LUNCH		
1330 - 1415	Plenary 6 - Bob Pressey (James Cook University) (C hair: R. Anderson-Lederer), AUSAID1		
	AUSAID1	AUSAID2	AUSAID3
Symposium Theme	Vulnerable Ecosystems, Communities & Species	Vulnerable Ecosystems, Communities & Species	Conservation in Changing Oceania
Symposium Name	VE-06: Systematic conservation planning for marine mega-fauna	VE-07: Avifauna of Oceania	CCO-07 Fisheries in Oceania
Chair	Mariana Fuentes	Kelera Macedru	Margaret Fox
14:30	Fuentes, Mariana	Buxton, Rachel	Ham, Jayven
14:45	Hamann, Mark	Dhanjal-Adams, Kiran	Kaku, Rocky
15:00	Tamata, Laitia	Vogel, Sandra	Thomas, Alyssa



15:15	Kwan, Donna	Dussex, Nicolas	Fox, Margaret
1530 - 1600	AFTERNOON TEA		
16:00	Cleguer, Christophe	Weston, Kerry	Thaman, Randy
16:15	Solomona, Penina		
16:30	Manlik, Oliver		
16:45	Miller, Cara		
17:00-17:30	Closing - Richard Kingsford (University of New South Wales) (Chair: J. Watson), AUSAID1		
1800 - 2130	Closing Banquet (Fiji Museum, Thurston Gardens)		



DETAILED SCBO FIJI 2014 SCHEDULE

Time	Monday - 7 July 2014			
7:30 - 9:30	Registration - Booth in front of AUSAID2 Lecture Theatre			
Time	Tuesday - 8 July 2014			
12:00-16:00	Registration - Booth in front of AUSAID2 Lecture Theatre			
	Wednesday - 9 July 2014			
0730 - 0830	Registration - Booth in front of AUSAID2 Lecture Theatre			
0830 - 0845	Welcome, Opening prayer and Fijian traditional opening ceremony (sevusevu) (Chair: Stacy Jupiter), AUSAID1			
0845 - 0915	Opening Address - James Watson (President-Elect, SCB Board of Governors), AUSAID1			
0915 - 1000	Plenary 1 - Taholo Kami (IUCN Oceania Regional Office), AUSAID1			
1015 - 1045	MORNING TEA			
LOCATION	AUSAID1	AUSAID2	AUSAID3	N111
Symposium Theme	Vulnerable Ecosystems, Communities & Species	Adaptive & Community-Based Management of Socio-Ecological Systems	Conservation in Changing Oceania	Vulnerable Ecosystems, Communities & Species
Symposium Name	VE-01: Using biogeography to set the scale of conservation in Melanesia	CBM-01: Advancing the integration of connectivity processes into marine conservation planning.	CCO-05: Integrating science with participatory conservation	VE-08: Freshwater, forest ecosystems and climate change
Chair	Joshua Drew	Rebecca Weeks	Rosalynn Anderson-Lederer, Amanda Taylor	James Watson



10:45	Rico: High genetic diversity and absence of founder effects in a worldwide aquatic invader	Harrison: Identifying patterns of network connectivity in marine metapopulations	Awasthy - A participatory framework for chapter-led community conservation programs: lessons from Oceania	Taylor: Forecasting the availability of old-growth habitat features in relict Eucalypt woodlands
11:00	Burley: Can beta-diversity increase continental-scale resilience? A macroecological analysis of relationships between productivity and beta-diversity	Green: Movement patterns of tropical marine fishes and implications for conservation and management	Whitburn : Vegetation Cover and Participation in Voluntary Planting Help Explain Residents' Wellbeing in Wellington City, New Zealand	Laitame: Restoration in highly degraded habitats: plant regeneration following ungulate exclusion and invasive plant control in a remnant semi-dry forest on Rapa Iti (South Pacific)
11:15	Eastwood: Community assembly of coral reef fishes along the Melanesian Biodiversity Gradient	Olds: Recognising the value of seascape connectivity in marine conservation	Jarvis: Public participation for marine spatial planning	Fulton: An island of woodland in an ocean of wheat: endangered marsupials as egg-predators of endangered birds
11:30	McCargar: Microbial connectivity between an herbivore and its environment	Alvarez-Romero: A practical approach to design a network of marine reserves in the Midriff Islands (Gulf of California) considering connectivity and climate change	Borrelle: Enhancing community led restoration of seabird driven ecosystems	Vardeh: Community Profiling and bioactive secondary metabolite potential of unexplored microbialites across Australia and implications for their conservation
11:45	Lavery: Zoogeography of the mammals of northern Melanesia	McGowan: Conservation gaps in the Coral Triangle: Towards a representative, connected and climate proof MPA system	Wendt: Conservation planning in Fiji – The participatory process and lessons learned from engaging local communities.	Birrer: Next-generation sequencing as a tool to elucidate structural and functional responses of a sediment community to field manipulated stressors



12:00	Rico: The influence of oceanographic fronts and early-life history traits on connectivity among fish populations: a multi-species approach	Weeks: Towards explicit objectives for connectivity in conservation planning	Cox: Kumutoto Forest Restoration Project; restoring native flora and fauna and cultural revitalisation in an urban New Zealand context	Bino: Prioritisation of wetlands for waterbird conservation in a boom and bust system: a case study of the Murray-Darling Basin
12:15	López: Comparative phylogeography of Indo-Pacific marine taxa presents idiosyncratic genetic connectivity patterns		Kingsford: Agency research for conservation – necessity or luxury?	
12:30	Waqairatu: Genetic analysis of Black Tiger shrimp (<i>Penaeus monodon</i>) across its natural distribution range reveals more recent colonization of Fiji and other South Pacific islands			
1245 - 1345	LUNCH			
1245 - 1345	LUNCH EVENT: SCB Oceania Section - Annual General Meeting and learn about the Society (Location: AUSAID 2)			
1345 - 1430	Plenary 2 - David Keith (University of New South Wales) (Chair: Carolyn Lundquist), AUSAID1			
	AUSAID1	AUSAID2	AUSAID3	N111
Symposium Theme	Vulnerable Ecosystems, Communities & Species	Adaptive & Community-Based Management of Socio-Ecological Systems	Conservation in Changing Oceania	Vulnerable Ecosystems, Communities & Species
Symposium Name	VE-02: Exploring the resilience of Pacific Island species, habitats, ecosystems and communities.	CBM-03: Traditional Ecological Knowledge & Conservation	CCO-03: Spatial management of coastal seascapes for ecological functioning, ecosystem services and food security.	VE-09: Species of Oceania
Chair	Sangeeta Mangubhai & Randi Rotjan	Randy Thaman	Andrew Olds, Marcus Sheaves, Jean Davis	Kelera Macedru
14:45	Osborne: Life history strategies predict the long term responses of coral community assemblages to anthropogenic disturbance events	Drew: Combining Traditional Ecological Knowledge and Collections Based Research to Aid in Community Based Fisheries Management.	Davis: Habitat corridors and fish movement in inshore coral reef seascapes	Shumway: A miss-match of community attitudes and actions: a case study of koala's



15:00	Teroroko: An account of invasive species eradication in the Phoenix Islands Protected Area	McMillen: Tools and products for integrating traditional and place-based knowledge, experience, and wisdom to inform adaptation planning and resource management: an example from Hawai'i Island	Baker: Insights into the life-history of the New Guinea Black Bass <i>Lutjanus goldiei</i>	Tikoca: Comparison of macro-moth diversity and community structure in a native and mixed forest on Viti Levu, Fiji.
15:15	Rotjan: Resilience of near pristine coral reefs to climate change disturbances	Morishige: Philinakai: Integrating Traditional Knowledge and modern science to support holistic approaches to sustainable fisheries management in West Hawaii	Gilby: Fish community structure and macroalgal browsing processes show significant temporal and spatial variation in the subtropical Moreton Bay Marine Park	Anderson-Lederer: Can a Brazilian control your wandering willie? The use of beetles (<i>Neolema ogloblini</i> , <i>Neolema abbreviata</i> and <i>Lema basicostata</i>) from Brazil as a biological control for an invasive plant (<i>Tradescantia fluminensis</i>) in New Zealand.
15:30	Dacks: Characterizing market influences on fishing and implications for resilience in coral reef social-ecological systems in Fiji	Pascua: Assessing the Opportunities for Collaborative Marine Management in Hawai'i	Huijbers: Conservation benefits of marine reserves are undiminished near coastal rivers and cities	Davidson: First matrix model for the vulnerable population of southern right whales (<i>Eubalaena australis</i>) in New Zealand waters.
1545 - 1615	AFTERNOON TEA			
16:15	Boschetti: Temporal variation in coral recruitment in Indonesia as result of reef degradation	Kurashima: Restoration of agroforestry in Hawai'i: A tool for cultural preservation, ecological conservation, and resilience to climate change	Sheaves: Coastal ecosystem repair: joint livelihood and public health benefits of informed design	Macedru: Fiji's bats: understudied, undervalued, and in dire need of conservation measures
16:30	Nand: Distribution and prevalence of coral disease in Fiji	Mane: Participatory approach towards species conservation and livelihood generation in Andaman Islands, India: A Case-study	Olds: Managing the resilience of seagrass ecosystems to severe events: the role of phenotype and acclimation in determining ecosystem dynamics	Karst: Potential predation of the Maud Island frog, <i>Leiopelma pakeka</i> , translocated into the Zealandia eco-sanctuary in Wellington, New Zealand



16:45	Couch: Promoting Indo-Pacific coral health and reducing disease risk through the Action Network for Coral Health and Resilience (ANCH&R).	Lamaris: Tambu: a Melanesian model for the sustainability of the Admiralty cuscus (<i>Spilococcus kraemeri</i>)?	Albert: Reaping the reef: conflicting ecosystem services from coral reefs in Solomon Islands	
17:00	Taylor: Vulnerability of small island endemic species to climate change	McDavid: Using Social Network Analysis and Network Weaving to Increase Effectiveness of Integrated Coastal Management in Bua Province, Fiji	Lundquist: How well do fish serve as surrogates for invertebrate marine diversity in conservation planning?	
18:00-21:00	Poster session and Opening Cocktail (Location: In front of AUSAID 2 Lecture Theatre)			

Thursday - 10 July 2014

Registration - Booth in front of AUSAID2 Lecture Theatre

Plenary 3 - Randy and Konai Helu Thaman (University of the South Pacific) (Chair: Richard Kingsford), AUSAID1

MORNING TEA

AUSAID1	AUSAID2	AUSAID3
Vulnerable Ecosystems, Communities & Species	Adaptive & Community-Based Management of Socio-Ecological Systems	Conservation in Changing Oceania
VE-03: Species Conservation (Part 1)	CBM-05: Integrated land-sea planning. (Part 1)	CCO-01: Fisheries By-catch in Oceania: assessment & solutions
Gilianne Brodie, Marika Tuiwawa, Cara Miller, Helen Pippard	Jutta Beher, Carissa Klein, Hugh Possingham	Yonat Swimmer, Susanna Piovano
Brown: Preliminary assessment of a nursery ground for the Scalloped Hammerhead Shark <i>Sphyrna leweni</i> in the Rewa River Estuary, Fiji Islands.	Possingham: Forest conservation delivers highly variable coral reef conservation outcomes	Itano: Tuna purse seine fisheries and FADs: an ecological perspective
Simpson: Acoustic communication patterns of spinner dolphins (<i>Stenella longirostris</i>) within a critical resting site in Fiji	Jupiter: Politics and practice of integrated land-sea planning in Fiji	Ledua: Evaluation of Fiji's tuna fishery by-catch management system in Fiji



Aisea: Temporal characterization of humpback whale song in Tongan waters	Ticktin: A ridge-to-reef approach to assessing the role of local ecological knowledge and management in enhancing adaptive capacity and resilience to climate change in Fiji	Donoghue: Marine mammal by-catch in fisheries in Oceania
Copeland: The importance of maintaining connectivity for the conservation of Fiji's freshwater fishes: a case study from Nakorotubu, Ra, Viti Levu.	Brodie: Prioritizing catchment agricultural management practice change through marine risk	Swimmer: Update on Effective Fisheries Bycatch Research in Longline and Gillnet Fisheries
Boseto: Amphidromous goby complex and island species conservation.	Waterhouse: Hazard assessment for water quality threats to Torres Strait marine waters and ecosystems	Siota: SPREP's Turtle Research and Monitoring Database System - a platform for sustainable management and conservation of marine turtles; including a case study of by-catch in Palau
Chandra: Population structure and movements of the endemic Fijian Swallowtail Butterfly, <i>Papilio schmeltzi</i> and habitat suitability for conservation.	Behr: Prioritizing cost-effective management projects to improve water quality in the Great Barrier Reef	Hutchinson: Silky shark (<i>Carcharhinus falciformis</i>) bycatch in a tropical tuna purse seine fishery
Waqa-Sakiti: Patterns of tree species usage by Long Horned Beetles in Fiji	Saunders: Quantifying benefits of catchment management for coastal marine ecosystem	Campbell: Sharks: More than just bycatch
Brodie: Conservation of Fiji's unique Partulid tree snail fauna	Shaw: Moreton Bay and Catchments as a Socio-Ecological System: The Human Dimensions of Marine and Terrestrial Waterways in South East Queensland	Piovano: Bycatch in longline fisheries: effective mitigation tools
		Osmond: Smart Gear: Inspiring Innovation by Capitalizing Creativity

LUNCH

LUNCH EVENT: Learn how to set up an SCBO chapter (Location: AUSAID 2)

Plenary 4 - Eve McDonald-Madden (University of Queensland) (Chair: Rebecca Weeks), AUSAID1



AUSAID1	AUSAID2	AUSAID3
Vulnerable Ecosystems, Communities & Species	Adaptive & Community-Based Management of Socio-Ecological Systems	Conservation in Changing Oceania
VE-03: Species Conservation (Part 2)	CBM-05: Integrated land-sea planning. (Part 2)	CCO-04: Prioritising conservation actions on tropical islands.
Gilianne Brodie, Marika Tuiwawa, Cara Miller, Helen Pippard	Jutta Beher, Carissa Klein, Hugh Possingham	Amelia Wenger, Ian Craigie, Bob Pressey
Barker: Diversity and conservation status of Placostylus land snails, with emphasis on species endemic to Fiji	Tulloch: Setting spatial priorities for coral reef fisheries: managing interacting land-sea systems and stressors	Pressey: Conservation in paradise: prioritizing management actions on islands in the Great Barrier Reef and Pilbara regions of Australia
Anisi: Conservation status of Ebony heartwood producing Diospyros species (rihe) on Vangunu, Western Solomon Islands	Albert: Sediment loads to coral reefs in Solomon Islands - what is natural?	Wenger: The use of expert elicitation in prioritising conservation management actions
Pene: Molecular systematics and phylogeography of Fiji's endemic Peperomia (Piperaceae)	Closs: Understanding why migratory diadromous Indo-Pacific fishes migrate can aid conservation	Craigie: The costs of conservation management on islands – developing a framework to understand and optimise spending
Yabaki-Goundar: The genetic divergence of Fijian Honeyeaters	Brown: Interactive impacts of run-off and climate change determine the effectiveness of management for marine ecosystems	Baker: Optimal spatial and temporal management of invasive species: general principles for eradication and suppression
AFTERNOON TEA		
Filardi: Recent Advances in Understanding the systematics, speciation, and evolution of Southwest Pacific birds	Frost: Climate Change Vulnerability and Adaptive Capacity Assessment of Three Watershed Sites in Kauai, Hawaii, and Fiji	Tagicakibau: The Critical Ecosystem Partnership Fund's investment niche and strategy for the East Melanesian Islands' Hotspot



Posala: Diet and feeding ecology of two endemic Solomon Islands flying foxes: Pteropus rayneri (Solomon's flying fox) and Dobsonia inermis (Solomon's bare-backed flying fox)	Auerbach: Evaluating dependencies in threat action prioritization	Steven: Endemism and diversity: key avitourism attractions of island destinations and opportunities for conservation and development.
Fisher: Effects of logging on an endangered Pteralopex and other Solomon Islands flying foxes: a 22 year experiment	Esbach: Partnership as a Tool for Reef-to-Ridgeline Conservation: Case Studies from the western Solomon Islands	Hall: Assessment of reptile and mammal disease prevalence on Christmas Island
Pikacha: Density and species richness of frogs of Solomon Islands implications for conservation	Maxwell: Impacts of extreme climatic events on natural resource management	Saunders: Setting priorities to manage invasive species on tropical islands; whose priorities?
Pollard: Threatened Biodiversity and Traditional Ecological Knowledge: Status of herpetofauna and associated knowledge among the `Are` Are, Malaita, Solomon Islands	Watson: How well are scientists helping the conservation community tackle climate change?	Thaman - Alien invasion of our islands and seas: a call for Pacific Alien Species Action Plans (ASAP)
Tuiwawa: Island in the sky - an unexplored and little known biodiversity hotspot in east Melanesia		
Pippard: The current status of species conservation in the Pacific Islands		

Student Evening (Location: University of the South Pacific Gymnasium)



Friday - 11 July 2014

Plenary 5 - Chris Filardi (American Museum of Natural History) (Chair: Rebecca Spindler), AUSAID1

MORNING TEA

AUSAID1	AUSAID2	AUSAID3
Vulnerable Ecosystems, Communities & Species	Adaptive & Community-Based Management of Socio-Ecological Systems	Conservation in Changing Oceania
VE-05: Pacific reptiles: declines, extinctions and new species.	CBM04: Socioeconomic considerations in conservation planning: past, present, future	CCO-06: Protected areas and their management
Peter Harlow, Robert Fisher	Melanie Hamel, Vanessa Adams, Sangeeta Mangubhai	Ciro Rico
Fisher: Biogeography and Conservation Systematics of Pacific Iguanas (<i>Brachylophus</i> sp.)	Mangubhai: Incorporating socioeconomic criteria and data into conservation planning: examples from Melanesia	Boaden: Predator/Prey Interactions and the effectiveness of marine reserves in conserving ecosystem processes
Harlow: Priority islands for Pacific Iguana (<i>Brachylophus</i> sp.) conservation in Fiji	Hamel: Incorporating socioeconomic information into coral reef conservation planning in the Pacific: it's not all about fisheries.	Henderson: The effects of water quality and marine protection on top-down control in the seagrass communities of Moreton Bay, Queensland.
Lovich: A species survival plan program for Fijian Banded Iguana (<i>Brachylophus bulabula</i>), and the development of a conservation fund for Fijian iguanas	Adams: Understanding the socio-economic context: research trends, gaps, and future directions	Lawless: Kaikoura community-led integrated marine management
Osborne-Naikatini: A synthesis of genetics and geo-spatial analyses to direct conservation of Fiji's frogs	Andrefouet: Modulation of habitat-based conservation plans by fishery opportunity costs	Sokimi: Operating MPAs as a business in Fiji – A case study of the Namena Marine Reserve
Morley: Can we ensure the long-term survival of skinks on Fijian Islands?	Salcone: An economic valuation of ecosystem services in the Vava'u island group, Kingdom of Tonga	Hobbs: Breaking Barriers - Reef Conservation



Manasi: Community-led conservation of the Pig-nosed turtle of the Kikori River, PNG	Klein: Achieving the triple bottom of social equity, economic return, and conservation	Miller: Uncharted waters: identifying priority areas for tropical seabird conservation in the Timor Sea
Amepou: Nesting Biology of the pig-nosed turtle in Kikori and conservation initiatives	Gurney: Poverty and protected areas: an evaluation of a marine integrated conservation and development project in Indonesia	Barnes: Using volunteer collected data to evaluate the impact of protected areas for endemic birds of the Australian Wet Tropics
Richmond: Explosive speciation without the help of continents: a case study on insular radiations of Pacific and Indo-Pacific scincid lizards of the genus Emoia	Geslani: The influence of management and tenure on ecosystem services in the Pacific	Bos: Impact Investing for Coral Reef Management in the Pacific Islands
LUNCH		
Plenary 6 - Bob Pressey (James Cook University) (Chair: Rosalynn Anderson-Lederer), AUSAID1		
AUSAID1	AUSAID2	AUSAID3
Vulnerable Ecosystems, Communities & Species	Vulnerable Ecosystems, Communities & Species	Conservation in Changing Oceania
VE-06: Systematic conservation planning for marine mega-fauna	VE-07: Avifauna of Oceania	CCO-07: Fisheries in Oceania
Mariana Fuentes, Mark Hammann, Christophe Cleguer	Dick Watling	Colin Shelley
Fuentes: Prioritising multiple management actions for marine mega-fauna conservation	Buxton: Applying community assembly rules to seabird restoration: patterns of burrow-nesting seabird species co-occurrence after rat eradication	Ham: Implementing more effective sea cucumber fisheries management in Vanuatu
Hamann: Challenges and opportunities for marine turtle conservation	Dhanjal-Adams: Optimizing disturbance management of migratory shorebirds in Moreton bay, Australia	Kaku: Estimating sea cucumber stocks to inform fisheries management in Vanuatu



Tamata: Critical habitats of sea turtles in Fiji	Vogel: Australia wide conservation genetics of Little Penguins	Thomas: Why do fishers break the rules? An investigation into the reasons behind regulation non-compliance
Kwan: Implementing conservation planning approaches for dugongs and their seagrass habitats in the Pacific Islands: Lessons learnt from a global perspective	Dussex: Postglacial expansion and not human persecution best explains the population structure in endangered kea (<i>Nestor notabilis</i>)	Fox: Implications of export trade for Pacific inshore coastal resources: the case of Fiji
AFTERNOON TEA		
Cleguer: Using aerial surveys as one of the key decision supporting tools to improve dugong conservation in New Caledonia.	Weston: The New Zealand rock wren (<i>Xenicus gilviventris</i>): impacts of past climate change on connectivity within an alpine archipelago	Thaman: Voices from the Lagoon: A Retrospective Taxonomic Assessment of the Recovery of a Managed Fishery – A Case Study of the Vanua Navakavu, Fiji Islands
Solomona: SPREP's Marine Species Action Plans – a regional blueprint for the conservation of charismatic marine mega-fauna		
Manlik: Population viability and major histocompatibility complex (MHC) genetic diversity of two dolphin populations in Western Australia		
Miller: Moving from National Cetacean Sanctuaries to Joined up MPA Networks and Spatial Planning for Pacific Whales & Dolphins		
Closing - Richard Kingsford (University of New South Wales) (Chair: James Watson), AUSAID1		
Closing Banquet (Location: Fiji Museum)		



PLENARY SPEAKERS AND ABSTRACTS

Opening Remarks: July 9, 08:45, AUSAID1

James Watson, President-Elect, SCB Board of Governors; Climate Change Program Lead, Wildlife Conservation Society; Honorary Associate Professor, University of Queensland



Bio: James Watson is the past president of the Society for Conservation Biology Oceania section and President-Elect of the SCB Board of Governors. James is an Honorary Associate Professor at the University of Queensland (UQ) and leads the Climate Change Program for the Wildlife Conservation Society (WCS). James works closely with different government agencies and environmental NGOs to prioritize conservation investment in different countries. As the Climate Change Program Leader for WCS, he leads two different climate teams: the climate adaptation team and the climate mitigation and forestry team. James completed his doctorate at the Oxford University in 2004, where funded by a Rhodes Scholarship he explored the

effects of habitat fragmentation on birds in Madagascar and Australia. Since then, he has worked as a postdoctoral fellow at the University of California (San Diego) and as a senior campaigner for The Wilderness Society in Australia.

Plenary #1: July 9, 09:15, AUSAID1

Taholo Kami, Regional Director, International Union for the Conservation of Nature (IUCN) - Oceania Regional Office, Suva, Fiji



Bio: Taholo Kami is the Regional Director for the Oceania program of the International Union for the Conservation of Nature (IUCN) based out of Suva, Fiji. A Tongan native, Kami grew up in Papua New Guinea and graduated with an accounting degree from the University of Technology of PNG. He completed an MBA in marketing/eCommerce as a Fulbright scholar at Vanderbilt University. Kami has worked with the United Nations in New York on networking small islands nations by setting up the Small Islands Developing States Network (SIDSNET). He has been involved in various initiatives such as working on development projects at a local level and national

development strategies on information and communication technologies and the environment. He currently chairs the Pacific Islands Roundtable for Nature Conservation.

Biodiversity conservation in the Pacific - significant shift required

Threats to biodiversity in the Pacific region continue and will become greater and more difficult to address. The Pacific is faced with challenges of rapidly declining fisheries and forestry resources, degradation of habitats and ecosystems, climate change, growing human populations,



and an overall lack of alignment of biodiversity protection with Pacific countries' economic priorities. We in the conservation sector need to adapt and engage decision-makers at all levels to adopt a strategy that puts environment and social considerations back into the centre of economic development of our Pacific Island countries. This strategy demands a shift in perspective and should be based around the following: (i) understanding the special value of our large, healthy ocean space; (ii) regarding biodiversity and ecosystem services as strategic national assets; (iii) revisiting and engaging the values of our people, (iv) challenging the development approach and path we are on; and (v) growing the investment in biodiversity outcomes at all levels and significantly reducing negative impacts on the Pacific environment. The development of a 'green growth development' agenda is slowly taking roots in the Pacific, and offers an innovative way forward to merge environment, social and economic interests in a more balanced and sustainable manner.

Plenary #2: July 9, 13:45, AUSAID1

David A. Keith, Centre for Ecosystem Science, University of New South Wales, Sydney, and Ecosystem Processes Group, NSW Office of Environment & Heritage, Australia



Bio: David Keith is Professor of Botany in the Centre for Ecosystem Science at the University of New South Wales, and Senior Principal Research Scientist at the NSW Office of Environment and Heritage where he has worked as an ecologist since 1986. His research includes empirical and modelling studies of the dynamics of plant populations, communities and their habitats. Applications of these studies have helped to advance understanding of interactions between native vegetation and bushfire, climate change, grazing and diseases for management and conservation of biodiversity. David also contributed to the development, testing and application of conservation risk assessment methods, including Red List methods for both species and ecosystems.

He has authored more than 110 peer-reviewed scientific papers and an award-winning book, 'Ocean shores to desert dunes: the native vegetation of New South Wales and the ACT'.

Risk assessment of ecosystems: concepts, challenges, opportunities

It is almost a truism that ecosystems are in decline throughout the world. We think we know it when we see it, but how can we identify the ecosystems that are most at risk? A scientifically robust assessment of risks to ecosystems would allow us to: i) communicate clearer conservation messages to the wider community; ii) design effective management strategies that address underlying causes of risk; iii) allocate resources more efficiently to actions that produce most benefit; and iv) assess the performance of those conservation efforts. In this presentation I outline a conceptual model of risk assessment based on a synthesis of ecosystem diversity theories. The model proposes four main pathways of ecosystem decline, each associated with distinctive symptoms of risk. These pathways form the basis for criteria that may be used to assign ecosystems to ordinal categories of risk (such as 'Endangered', 'Vulnerable', 'Least Concern') in a similar fashion to Red List criteria for species. Some of the major challenges confronting the design and application of Red List criteria for ecosystems include defining the units of assessment, defining ecosystem collapse (as an analogue of species extinction) and estimating rates of functional decline in a common currency across ecosystems in which qualitatively different processes govern the risk of collapse. I illustrate the thinking behind pragmatic solutions



to these challenges using examples from Oceania. Applications of the protocol to a sample of contrasting terrestrial, freshwater and marine ecosystems suggest that it can produce workable outcomes with modest amounts of data.

Plenary #3: July 10, 09:00, AUSAID1

Randy Thaman, Professor of Pacific Islands Biogeography, The University of the South Pacific, Suva, Fiji and Asia Pacific member of the Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services (IPBES) Multidisciplinary Expert Panel (MEP)



Bio: Randy Thaman has, since 1992, held a Personal Chair of Professor of Pacific Islands Biogeography in the School of Geography, Earth Sciences and Environment at The University of the South Pacific and, along with his wife, Konai, are USP's two longest serving academic staff members. He is a Fiji citizen, but originally from California where he received his BA and MSc from Cal Berkeley and his PhD from UCLA. Over the past 40 years he has worked and conducted research with local and indigenous island students and communities in some 18 Pacific Island countries and territories and

has co-authored, with local and indigenous collaborators, books, articles, technical papers and consultancy reports on traditional agriculture and agroforestry, forestry, medicinal plants, Pacific floras, impacts of marine conservation, traditional fisheries knowledge, island biodiversity and invasive alien species. Many of his former students now hold important positions with government and non-government agencies in the areas of conservation and sustainable development throughout the region. In 2012 he received an Honorary Membership of IUCN and in 2013 was Awarded the Inaugural Pacific Islands Environment Leadership Award, Lifetime Achievement at the 9th Pacific Islands Conference on Nature Conservation and Protected Areas and is the only Pacific Island member of the recently formed Multidisciplinary Expert Panel (MEP) of the Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services (IPBES).

Konai Helu Thaman, Professor of Pacific Education and Culture and UNESCO Chair of Teacher Education and Culture, The University of the South Pacific, Suva, Fiji



Bio: Konai Thaman has held since 1998, a Personal Chair of Professor of Pacific Education and Culture at The University of the South Pacific. She is a Tongan national and has worked at USP since 1974. She also holds a prestigious UNESCO Chair in Teacher Education and Culture. She has a BA in Geography from the University of Auckland, N.Z., an M.A. in International Education from the University of California at Santa Barbara, and PhD in Education from the USP. She has conducted research, consultancies and published widely in the areas of teacher education, curriculum development, culture and education, education

for sustainable development and has held senior administrative positions in the USP including Director of the Institute of Education and Pro Vice Chancellor and Acting Deputy Vice Chancellor. She is also a widely published poet (five collections of her poetry have been published)



***Kakala Hingoa* – Sacred Plants and Conservation in the Pacific Islands**

A garland of fragrant flowers and leaves is among the greatest honors that can be bestowed upon a Pacific person. Garlands symbolise the fusion of biodiversity and the best biocultural traditions of our islands. We use the metaphor, *kakala hingoa* (Tongan for chiefly garland) to represent the best of traditional leadership and culturally important biodiversity — a garland that must be nurtured and passed on to future generations. We emphasize the need to go beyond the conservation of intact or ‘pristine ecosystems’ and threatened endemic and charismatic animals and plants to the protection of agricultural and cultural landscapes and their plants and animals, among the most charismatic and culturally cherished of which are *kakala hingoa*. Sadly, many *kakala hingoa* (which are found in all island ecosystems) and associated knowledge are seriously threatened, constituting a biocultural conservation crisis. We also present a *kakala* research framework based on the gathering of flowers, leaves, and so on (*toli*), weaving (*tui*) and the giving away (*luva*) of a *kakala* as a culturally appropriate methodology for conservation research and the preservation, dissemination and application of traditional knowledge. We emphasise the importance of vernacular and scientific taxonomy and traditional knowledge as the biocultural underpinnings of our links and obligate dependence on biodiversity. Without such knowledge, conservation of both Red-listed and non-Red-listed species will be problematic; and using sacred and fragrant plants as ‘flagship’ species for both *in situ* and *ex situ* conservation may be one of the best ways to gain wider appreciation of the ecosystem goods and services biodiversity provides. Their use should also engender greater intellectual and spiritual commitment to conservation. Examples are provided from Tonga, Fiji, Tuvalu, Kiribati and other Pacific Islands.

Plenary #4: July 10, 13:30, AUSAID1

Eve McDonald-Madden, Senior Lecturer and ARC Discovery Early Career Research Award Fellow, School of Geography, Planning and Environmental Management, the ARC Centre of Excellence for Environmental Decisions, University of Queensland, St Lucia, Queensland



Bio: Eve McDonald-Madden is a Chief Investigator on the ARC Centre of Excellence for Environmental Decisions and an Australian Research Council Early Career Research Fellow with the School of Geography, Planning and Environmental Management, at The University of Queensland, Australia. Her research on how we make decisions in conservation is at the cross-roads of statistical and mathematical analysis and ecology, and focusses on finding novel solutions to the complex problem of managing biodiversity. The foundation of her work is ‘Decision Theory’, a concept initially used to maximise the effectiveness of scarce military resources while dealing with the uncertainties always present in

war. To aid better conservation decision-making, she uses a suite of analysis techniques for seeking optimal strategies that are largely novel to ecology and conservation, such as Artificial Intelligence (AI). In particular she is interested in decisions about when to invest in monitoring and adaptive management, what is the value of information for improving decisions, and how such adaptive processes can aid decision-making in the face of uncertainty about climate change.



Searching for black swans among the shrinking ice

Public debate about the evidence for anthropogenic climate change has not stopped the use of climate prediction becoming *de rigueur* for a great many sectors, including agriculture, water security, insurance, infrastructure planning, and increasingly, conservation. These and other sectors routinely ask “how should our understanding of future climate change influence the decisions we make today and our assessment of the risk embodied in these decisions?” In a decision context, the central role of climate science is to provide predictions about outcomes of interest. These predictions are, of course, made with uncertainty. To address some of this uncertainty, most climate predictions are presented as a set of possible alternative futures. Sometimes, however, systems ‘do things’ outside even our extreme predictions; the extent of Arctic sea ice melt is a good example. Such *surprise outcomes* go beyond the conventional interpretation of *uncertainty* to encompass events that we could not have predicted given our current knowledge. These uncertainties have been popularised as ‘unknown unknowns’ or ‘black swans’. In this talk I give an overview of the current state of research on climate change adaptation for conservation from a decision-analytical perspective. I will propose that adaptive management requires our explicitly thinking about the value of information. And finally, I will argue that ‘black swans’ are vital diagnostic opportunities to learn and improve our predictions of climate change effects.

Plenary #5: July 11, 09:00, AUSAID1

Chris Filardi, Director of the Center for Biodiversity and Conservation’s Pacific Program at the American Museum of Natural History, Philadelphia, USA



Bio: Chris Filardi is the Director of the Center for Biodiversity and Conservation’s Pacific Program at the American Museum of Natural History. In his work, he combines over 20 years of field natural history, biodiversity research, and partnership with indigenous peoples to leverage science in fostering grassroots conservation. Research on island speciation has been a springboard for actions and social compacts that are inspiring globally recognized indigenous protected area initiatives in the

western Pacific. In and out of the Pacific region, scientific and leadership mentoring and youth advancement have been a priority. Chris received his Ph.D. in 2003 from the University of Washington, where he studied patterns of speciation and the biogeographic history of tropical Pacific flycatchers.

Throwing away the keys to paradise: unlocking conservation lessons among Pacific islands

The past several decades have seen numerous transformations within the fields of conservation practice. Analytical advances in spatial planning, priority setting, and systems modeling are now coupled with increasingly diverse sources of data drawn from multiple disciplines, new technologies, and varied forms of local knowledge. Alongside expanded empirical ability to understand complex systems, on-the-ground conservation approaches are more participatory, recognising the need for nuanced metrics of success and the importance of solutions that are not



just consultative, but co-created by people most affected by conservation actions. Undoubtedly, conservation biology is the better for incorporating these new approaches. However, all too often some of the deeper (and simpler) wisdom underlying our actions go unheeded, and the lines separating success versus failure are not as broadly shared as they could be. Because Pacific island societies deal with pressing issues in real time (and not in some possible future climate or extinction scenario), they provide narratives that can instruct and guide conservation efforts worldwide. Over the last 20 years, the actions, partnership, wisdom, and stories of Pacific Islanders have profoundly influenced my sense of how conservation biology can best achieve its goals. Scholarly and technological advances aside, here I focus on simple, sometimes under-appreciated lessons I believe are critical to conservation at any scale. I talk about communication, partnership, humility, and human resilience, and attempt to illuminate basic principles that have guided my best days as a conservation-minded biologist among the Pacific Islands.

Plenary #6: July 11, 13:30, AUSAID1

Bob Pressey, Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University, Townsville, Australia



Bio: Bob Pressey leads the conservation planning program within the Australian Research Council Centre of Excellence for Coral Reef Studies at James Cook University. He is widely credited as one of the founders of the field of systematic conservation planning and continues to lead cutting-edge, applied research in this area. Unusually, Bob combines scientific leadership with extensive experience in conservation practice and policy, and a strong commitment to engagement with practitioners. Bob's experience includes seven years as a private environmental consultant, working mainly on survey and conservation evaluation of freshwater wetlands, and nineteen years as a research scientist with the New South Wales National Parks and Wildlife Service, focused on semi-arid and forest ecosystems. Since his academic appointment in 2007, Bob has assembled a large group of PhD and postdoctoral researchers focused on all aspects of conservation planning in marine, terrestrial and freshwater ecosystems across Australia, through the Asia-Pacific region, and further afield.

Making protected areas make a difference: impact evaluation as a tractable scientific challenge and an essential policy tool

Protected areas are the cornerstones of the global conservation strategy but, on land and in the sea, they have a serious failing — because they are concentrated in areas that are remote and have little value for subsistence or commercial uses. Therefore, they tend to occur where threats to biodiversity are low while losses of biodiversity continue unabated elsewhere. This failing is hidden by common measures of conservation progress that emphasise characteristics of protected areas rather than how much loss of biodiversity their establishment has avoided. We measure our tools, but not what they are meant to achieve, or how effective they are in avoiding the loss of biodiversity. Putting protected-area science and policy on track requires scientists to lift their game in addressing impact evaluation of protected areas, both terrestrial and marine. Impact evaluation uses increasingly robust methods to estimate the difference that protected areas make



to outcomes relative to the counter-factual of no intervention or an alternative intervention. Another key requirement for progress in biodiversity conservation is for scientists to ‘step outside’ (or at least, ease) the political constraints that have hindered progress. In this respect, it can be easy to mistake pragmatism for naïveté. What passes as pragmatism can be an excuse for maintaining the *status quo*, which is demonstrably ineffective. Idealistic — even apparently naïve — approaches are needed to take conservation forward.

Closing Remarks: July 11, 17:00, AUSAID1

Richard Kingsford, Director of the Centre for Ecosystem Science, University of NSW, Australia



Bio: Richard Kingsford is is Director of the Centre for Ecosystem Science, School of Biological, Earth and Environmental Sciences of the University of NSW. He is President of the Society for Conservation Biology (Oceania). He has focussed his research over about the last 20 years on the waterbirds, wetlands and rivers of arid Australia, which cover about 70% of the continent. He is a member of the Australian Government’s Environmental Flows Scientific Advisory Panel and the Lake Eyre Basin Scientific Advisory Panel. His research has demonstrated the ecological values of many rivers and impacts of water resource in arid Australia. He is currently working on adaptive management of environmental flows.

Society for Conservation Biology (Oceania) – plans, opportunities and publishing

We are in one of the many challenging regions of our planet. There are often overwhelming problems and few solutions for dealing with the tide of conservation crises we face in our work as conservation biologists. Our society is potentially well-placed in providing direction and advice on those solutions across the broad spectrum of ecosystems within marine, terrestrial, freshwater and subterranean realms. Yet we aren’t always very effective. I talk briefly about our current initiatives on the Board and how I think we are approaching these challenges. I would like to see our society have a much stronger influence on policy and management across the region, arguing that our conservation decisions need to be underpinned by a good evidence base. This approach involves our going beyond our science and communicating more broadly the implications of our science to the public. The SCB Board (Oceania) is keen to involve members in charting the best way we can do this as well as outline our future initiatives on this front. Finally, a key function for us locally and globally is the pursuit of quality science through our publications: Pacific Conservation Biology (PCB) and Conservation Biology. I am the SCB representative on the Editorial Board of PCB and I talk briefly about the journal; but I also invite Professor Mark Burgman, the current editor of Conservation Biology, to talk about this global publication and its impact and direction.



SYMPOSIA ABSTRACTS

VE-01: Using biogeography to set the scale of conservation in Melanesia

Chair: Dr Joshua Drew (Department of Ecology, Evolution and Environmental Biology, Columbia University, New York; also Department of Vertebrate Zoology, American Museum of Natural History, New York, USA)

Date and Venue: Wednesday 9th July, AUSAID Lecture Theatre 1, 10:45 to 12:45

Understanding how populations, species, communities and ecosystems are linked together is essential in formulating effective conservation plans. However, in areas like Melanesia where obvious barriers to marine systems are absent and there are no obvious connections to terrestrial creatures, deciding the magnitude over which conservation management actions should be applied remains a challenge. In this symposium we will bring together researchers using a variety of tools and focusing on a variety of ecosystems to find out what biogeographic patterns in Melanesia are shared between marine and terrestrial systems as well as among different taxonomic groups. Our goal will be to present an overview of the major biogeographic patterns in the region and open a discussion about how to translate this scientific knowledge into conservation action.

VE-02: Exploring the resilience of Pacific Island species, habitats, ecosystems and communities

Co-chairs: Dr Sangeeta Mangubhai (Wildlife Conservation Society, Fiji Country Program, Suva, Fiji); **Dr Randi Rotjan** (New England Aquarium, Boston, Massachusetts, USA)

Date and Venue: Wednesday 9th July, AUSAID Lecture Theatre 1, 14:45 to 17:15

Pacific Island countries have experienced unprecedented and accelerated changes over the last century. Multiple and cumulative stressors are increasing the vulnerability of ecosystems and the communities and societies that depend on their goods and services. Island ecosystems are particularly vulnerable from natural disturbances as well as are anthropogenic stresses/threats, including climate change. For example, shifts in the timing or pattern of rainfall and temperature will negatively affect agricultural crops, coral and fish populations, coastal vegetation, pollinators, and so on, while increasing populations of disease vectors, pests, parasites, etc. The likelihood of individual species, habitats, ecosystems and communities being able to respond to disturbances will depend on their ability to repel or resist disturbances, as well as to their ability to recover from these disturbances. These two factors – resistance (to stress) and recovery (from stress) will determine how ‘resilient’ ecosystems and communities will be to environmental change. The environmental resilience of Pacific Island species, habitats, ecosystems and communities will be discussed in this symposium.



VE-03: Species conservation

Co-chairs: **Dr Gilianne Brodie** (Department of Biology, Faculty of Science, Technology & Environment, The University of the South Pacific, Suva, Fiji); **Mr Marika Tuiwawa** (Curator, The South Pacific Regional Herbarium, c/ Institute of Applied Sciences, The University of the South Pacific, Suva, Fiji); **Dr Cara Miller** (Whale and Dolphin Conservation Society, c/ Institute of Marine Resources, The University of the South Pacific, Suva, Fiji); **Ms Helen Pippard** (Species Officer, International Union for the Conservation of Nature (Oceania), Suva, Fiji)

Date and Venue: Thursday 10th July, AUSAID Lecture Theatre 1, 10:30 to 12:30; 14:30 to 17:30

Pacific species face heightened levels of threat due to the isolation of many Pacific Islands and rapid changes from development and species invasions. This geographic isolation is also a major barrier to the spread of knowledge and facilitation of support networks for species conservation. As such, consolidated approaches on species issues are lacking within the Pacific Island Countries and Territories (PICTs) and species conservation is often low on national governments' agendas. This symposium will be an opportunity for scientists, researchers, policy-makers, and conservation practitioners to come together and share scientific knowledge relating to species research and conservation in the Pacific.

VE-05: Pacific reptiles: declines, extinctions and new species

Co-chairs: **Dr Peter Harlow** (Taronga Conservation Society Australia, NSW, Australia); **Dr Robert Fisher** (U.S. Geological Survey, San Diego, USA)

Date and Venue: Friday 11th July, AUSAID Lecture Theatre 1, 10:30 to 12:30

This symposium will review the new findings regarding threats, speciation and conservation of Pacific reptiles, with particular focus on frog, turtle and iguana species of Fiji and Papua New Guinea.

VE-06: Systematic conservation planning for marine mega-fauna

Co-chairs: **Dr Mariana Fuentes** (Australian Research Council Centre of Excellence for Coral Reef Studies & School of Earth and Environmental Sciences, James Cook University, Townsville, Australia); **Dr Mark Hamann** (School of Earth and Environmental Sciences, James Cook University, Townsville, Australia); **Dr Chris Cleguer** (School of Earth and Environmental Sciences, James Cook University, Townsville, Australia)

Date and Venue: Friday 11th July, AUSAID Lecture Theatre 1, 14:30 to 17:00

Marine mega-fauna, which includes seabirds, marine turtles, marine mammals and elasmobranchs (sharks and rays), are key components of marine ecosystems and are socially and economically valued around the world. Many populations of marine mega-fauna, however, have declined in recent decades, largely due to human activities and are expected to be further impacted by climate change. Managers, therefore, face the challenge of addressing the multitude of ongoing and future threats that marine mega-fauna face throughout their geographic/distributional range. However, for logistical, financial and political reasons, natural resource agencies cannot address all of these threats simultaneously: priorities must be established. Systematic conservation planning can be



useful to identify conservation priorities, in particular the best locations to act and the best set of strategies to use to maximise the conservation of marine mega-fauna, especially when budgets are constrained. This symposium will showcase decision support tools (e.g. spatial risk assessments, cost benefit analysis, simulation models) and frameworks (e.g. vulnerability assessments) that can be used to systematically prioritize the management of marine mega-fauna to enhance their management. The symposium will also explore the existing gaps that enable/prevent the implementation of conservation planning in small island countries, with a focus in the South Pacific, where data availability and capacity/ acquisition/collection is a limitation. More importantly the symposium will emphasise the value of local traditional ecological knowledge and the relevance of collaborative work between western scientists and local indigenous/native communities to optimize conservation planning in such areas.

VE-07: Avifauna of Oceania

Chair: Dr Dick Watling (Environment Consulting Fiji)

Date and Venue: Friday 11th July, AUSAID Lecture Theatre 2, 14:30 to 17:00

VE-08: Freshwater, forest ecosystems and climate change

Chair: Dr James Watson (Wildlife Conservation Society and University of Queensland, Australia)

Date and Venue: Wednesday 9th July, Lecture Theatre N111, 10:45 to 12:45

CBM-01: Advancing the integration of connectivity processes into marine conservation planning

Chair: Dr Rebecca Weeks (Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University, Townsville, Australia)

Date and Venue: Wednesday 9th July, AUSAID Lecture Theatre 2, 10:45 to 12:15

Ecological connectivity processes, including larval dispersal, fish movement between habitats and to spawning aggregation sites, have important consequences for how coral reef populations persist, how they respond to and recover from disturbance, and how they should be managed. In the past decade, many papers and policy documents have put forth guidelines that have emphasised the need to incorporate connectivity in marine protected area network design. However in the context of planning, connectivity is poorly defined, and guidelines have focused on providing broad 'rules of thumb', as opposed to specific, quantitative recommendations. New empirical data, acquired through novel techniques such as genetic parentage and seascape analysis, have advanced our understanding of complex ecological connectivity processes, and the spatial scales across which they need to be managed. We are now in a position to advance conservation planning theory and develop new tools for conservation practitioners that move beyond ensuring representation of static biodiversity features (e.g., species and habitats), to also consider dynamic connectivity processes. The research to be presented in this symposium is



grounded in real management initiatives in PNG, Australia, Mexico and Solomon Islands, and has implications both for future research priorities, and immediate application by practitioners.

CBM-03: Traditional ecological knowledge and conservation

Chair: **Dr Randy Thaman** (Personal Chair of Professor of Pacific Islands Biogeography in the School of Geography, Earth Sciences and Environment at The University of the South Pacific, Suva, Fiji)

Date and Venue: Wednesday 9th July, AUSAID Lecture Theatre 2, 14:45 to 17:15

CBM-04: Socioeconomic considerations in conservation planning: past, present, future

Co-chairs: **Dr Melanie A. Hamel** (Australian Research Centre of Excellence for Coral Reef Studies, James Cook University, Townsville, Australia); **Dr Vanessa Adams** (Research Institute for the Environment and Livelihoods, Charles Darwin University, Darwin, Australia); **Dr. Sangeeta Mangubhai** (Wildlife Conservation Society, Fiji Country Program, Suva, Fiji)

Date and Venue: Friday 11th July, AUSAID Lecture Theatre 2, 10:30 to 12:30

In the past decade, scientists and conservation practitioners have recognized the importance of accounting for social and economic factors early in the conservation planning process to help bridge the planning-implementation gap and to achieve positive social outcomes. Furthermore, in many islands in Oceania, livelihoods are strongly connected to direct use of natural resources and acknowledging this link is critical to ensure compliance and minimize impacts on livelihoods. The main way of considering socioeconomic factors in conservation planning has been through the inclusion of opportunity costs (or their surrogates) in the protected area selection process. However, limitations of cost data and the ways they have been included to date have yet to be adequately addressed. For example, costs to fisheries are often included as a fixed data layer, failing to recognize the dynamic nature of fishing effort due to seasonality, changes in market demand, and increasing access to better transport. Furthermore, potential costs to stakeholders are only part of the equation and other socioeconomic aspects, such as governance, cultural values, and opportunities for conservation management should be incorporated as well. The symposium will bring together current approaches in incorporating social and economic factors into conservation planning. Case studies, mainly from Oceania, will address the advantages and limitations of current approaches and highlight advances in best-practice methods as well as stimulate discussion on what data is useful, what challenges are there in collecting, analysing or using the data.

CBM-05: Integrated land-sea planning

Co-Chairs: **Jutta Beher** (The Ecology Centre, The University of Queensland, St Lucia, Queensland, Australia); **Dr Carissa Klein** (The Ecology Centre, The University of Queensland, St Lucia, Queensland, Australia); **Dr Hugh Possingham** (Australian Research Council Centre of Excellence for Environmental Decisions, University of Queensland, St Lucia, Australia)

Date and Venue: Thursday 10th July, AUSAID Lecture Theatre 2, 10:30 to 12:30, and 14:30 to 17:00



Both land- and sea-based human activities are threatening marine ecosystems, thus conservation strategies should address both. Many marine ecosystems are threatened by local-scale human activities across the globe, with examples from developed nations like Australia where human activities have caused a 20-50% decline in coral cover on the Great Barrier Reef over the past two decades, to developing nations like India where over 40% of mangroves have been converted to agriculture or urban development. These issues are particularly acute when people's livelihoods depend upon the natural resources under threat, such as fisheries, which sustain some of the world's poorest people. Management and conservation of marine resources and human impact on marine systems is almost always focused on reducing overfishing without regard to the influence of terrestrial activities. Two possible reasons for this biased focus are: 1) asymmetry of information, where more data are available on the impacts of overfishing than on land-based activities; and 2) lack of integrated land-sea models and planning approaches to support management decisions. The proposed symposium will feature several integrated land-sea studies that address these gaps, covering both the science behind the concept of integrative land-sea conservation planning, and also perspectives from people who work with these approaches in Oceania.

CCO-01: Fisheries bycatch in Oceania: assessment & solutions

Co-chairs: **Dr Yonat Swimmer** (National Aeronautic and Atmospheric Associate, National Marine Fisheries service, Pacific Islands Fisheries Science Center, Honolulu, Hawaii, USA); **Dr Susanna Piovano** (The University of the South Pacific, Suva, Fiji)

Date and Venue: Thursday 10th July, AUSAID Lecture Theatre 3, 10:30 to 12:45

The issue of fisheries bycatch is particularly important to the large region of Oceania, which encompasses over 20 countries and territories and over 300 square km of the largest ocean in the world. Fisheries are expansive throughout the region and vary greatly with regard to gear type, species targeted, economics of fishery sector, as well as level of exploitation, from substantial subsistence to commercial fishing. Many questions remain in regards to understanding the level of fisheries bycatch or the unintended ecological consequences of fishing effort. In order to address these concerns and identify means to minimize these consequences, fisheries managers should be made aware of the areas and species of greatest concern. This symposium will provide an opportunity to share information on levels of catch of juvenile tunas in purse seine fisheries and rates of capture of sea turtles, marine mammals and sea birds in longline and gillnet fisheries. This symposium will also highlight successful efforts to reduce bycatch in a variety of fisheries.

CCO-03: Spatial management of coastal seascapes for ecological functioning, ecosystem services and food security

Co-chairs: **Dr Andrew Olds** (School of Science and Engineering, University of the Sunshine Coast, Sippy Downs and Australian Rivers Institute – Coast and estuaries and School of Environment, Griffith University, Gold Coast, Australia); **Dr Marcus Sheaves** (Centre for Tropical Water and Aquatic Ecosystem Research and School of Marine and Tropical Biology, James Cook University, Townsville, Australia); **Dr Jean Davis** (Australian Rivers Institute – Coast and estuaries and School of Environment, Griffith University, Gold Coast, Australia)

Date and Venue: Wednesday 9th July, AUSAID Lecture Theatre 3, 14:45 to 17:15



Coastal ecosystems in Oceania are under stress from multiple local, regional and global threats, including: fishing, loss of coastal habitat, catchment runoff and global climate change. These threats result from the pressures that burgeoning human populations place on the natural environment, but also actively undermine fisheries productivity and, therefore, impact directly on regional food security and human health. Consequently, it is important to develop sound programs for conservation, rehabilitation and ecosystem-based management across the region. It is also necessary to identify important species, ecological processes and landscape elements as targets for management. Many conservation and restoration projects, however, fail to achieve their objectives, and key spatial processes (like connectivity) and ecosystems (like mangroves, seagrasses and beaches) are often poorly represented in conservation actions. This symposium is focused on improving the spatial management of coastal seascapes to deliver better outcomes for ecosystems and people. It will incorporate presentations that are based on real conservation and restoration initiatives in Papua New Guinea, Fiji, Solomon Islands, Indonesia and Australia, as well as regional and global reviews of conservation actions.

CCO-04: Prioritising conservation actions on tropical islands

Co-chairs: **Dr Amelia Wenger** (Australian Research Centre of Excellence for Integrated Coral Reef Studies, James Cook University, Townsville, Australia); **Dr Ian Craigie** (Australian Research Centre of Excellence for Integrated Coral Reef Studies, James Cook University, Townsville, Australia); **Dr Bob Pressey** (Australian Research Centre of Excellence for Integrated Coral Reef Studies, James Cook University, Townsville, Australia)

Date and Venue: Thursday 10th July, AUSAID Lecture Theatre 3, 14:30 to 17:15

Tropical ecosystems of Oceania islands face many pressures, including climate change, invasive species, industrial development, and tourism. In the face of these threats, environmental managers need a framework with specific objectives to guide their conservation investments. Managers of islands face difficult decisions when it comes to investing in conservation management. With insufficient staff and funds to deal with all management problems, where should they invest limited resources to achieve the best outcomes? These conservation decisions must be made in the face of spatially heterogeneous and dynamic threats, including invasive plants and animals and inappropriate fire regimes, and within a constrained budget. A suite of actions can be applied to address conservation objectives, but they cost different amounts, and contribute differently to goals. Furthermore, most decisions must be made under considerable uncertainty. This problem – complex, dynamic and multifaceted – describes the reality of much conservation decision-making, and defines the problem faced by managers of islands in Oceania. This symposium will bring together diverse researchers attempting to overcome similar challenges from a wide geographical area and allow for valuable knowledge exchange between academic and applied scientists.

CCO-05: Integrating science with participatory conservation

Co-chairs: **Dr Rosalynn Anderson-Lederer** (Queen Elizabeth the Second National Trust, Wellington, New Zealand); **Dr Amanda Taylor** (Victoria University of Wellington, Wellington, New Zealand)

Date and Venue: Wednesday 9th July, AUSAID Lecture Theatre 3, 10:45 to 12:45

Participatory conservation projects contribute significantly to the preservation of natural and historical landscapes. Pairing participatory projects with science-based methodology and practices offers measurability to project outcomes. This symposium will explore successful



participatory conservation projects where science was incorporated and discuss ways to improve community conservation schemes.

CCO-06: Protected areas and their management

Chair: Professor Ciro Rico (Director, School of Marine Studies, Faculty of Science, Technology and Environment, The University of the South Pacific, Suva, Fiji)

Date and Venue: Friday 11th July, AUSAID Lecture Theatre 3, 1030 to 1230 hours

CCO-07: Fisheries in Oceania

Chair: Dr Colin Shelley (Director, Institute of Marine Resources, The University of the South Pacific, Suva, Fiji)

Date and Venue: Friday 11th July, AUSAID Lecture Theatre 3, 14:30 to 17:00



ABSTRACTS FOR ORAL & POSTER PRESENTATIONS

VE-01: Using biogeography to set the scale of conservation in Melanesia

VE-01.1, July 9, AUSAID1, 10:45

High genetic diversity and absence of founder effects in a worldwide aquatic invader
Ciro Rico (School of Marine Studies, The University of the South Pacific, Suva, Fiji)

The introduced oriental shrimp *Palaemon macrodactylus* has recently become widespread in temperate estuaries worldwide. However, this recent worldwide spread outside of its native range arises after a previous introduction to the US Pacific coast, where it was restricted for more than 30 years. Using a phylogeographic approach, the present work investigates the genetic history of the invasion of this decapod worldwide. Japan acted as the main native source area for worldwide introduced populations, but other native areas (likely South Korea and China) may act as source populations as well. The recently introduced European and NW Atlantic populations result from colonization from both Japan and an unknown area of the native range, although colonization from the NE Pacific could not be ruled out. Most introduced populations had higher haplotypic diversity than most native populations. *P. macrodactylus* has a strong potential to become one of the most widespread introduced species and may become the dominant estuarine shrimp in Europe. The ecological and economic consequences of this invasion remain to be thoroughly evaluated.

VE-01.2, July 9, AUSAID1, 11:00

Can beta-diversity increase continental-scale resilience? A macro-ecological analysis of relationships between productivity and beta-diversity

Hugh Burley (University of NSW, Sydney, Australia and CSIRO, Australia); Karel Mokany (CSIRO, Australia); Simon Ferrier (CSIRO, Australia); Kristen Williams (CSIRO, Australia); Shawn Laffan (University of NSW, Sydney, Australia); Tom Harwood (CSIRO, Australia)

Aim: The importance of conserving different spatial and temporal dimensions of biodiversity for enhancing the resilience of ecosystem processes in the face of global change is increasingly being recognised. However, most work in this field has ignored broad-scale, community-level spatiotemporal biological variations between locations (β -diversity), which should help explain ecosystem resilience under global change as species redistribute. Thus we test whether neighbourhood β -diversity influences the magnitude and variability of gross primary productivity (GPP), beyond environmental influences. Location: Continental Australia. Methods: Spatial modelling generated average taxonomic β -diversity values for vascular plants around all 1km cells at 10km radii. β -diversity, monthly remotely sensed GPP and environmental conditions (2001-2012) were randomly sampled at 10000 locations. Generalised additive models were used to explain GPP variance across, between and within years. Results: β does not significantly affect GPP across years, but may explain significant variation between and within years of strong environmental fluctuation. Conclusion: To demonstrate whether biogeographic factors can increase resilience, regional analyses are required to test for different responses to environmental fluctuations across multiple biological levels and ecosystem processes. This new research agenda promises to inform more spatiotemporally explicit conservation management of ecosystem processes.



VE-01.3, July 9, AUSAID1, 11:15

Community assembly of coral reef fishes along the Melanesian Biodiversity Gradient

Erin Eastwood (Columbia University)

The reefs of the Coral Triangle (the region of the Indo-Pacific ocean bounded by Indonesia, the Philippines, and Papua New Guinea) are the most biodiverse on the planet, with more species of fish, corals, and other marine invertebrates than anywhere else on earth. However, moving southeast from Papua New Guinea into Melanesia, there is a marked decline in biodiversity, with a steep gradient between the reefs of the Coral Triangle and those of peripheral islands from the Solomons out to Fiji. Looking along measures of endemism and of dietary preference, this study examines patterns of community similarity across the biodiversity gradient for four reef fish families (Chaetodontidae, Labridae, Pomacentridae, and Scaridae) in Melanesia. This study shows both how individual countries harbor unique assemblages of biodiversity, and how those individual communities can be grouped into larger, cohesive regional assemblages, which may be at the appropriate scale for regional conservation goals.

VE-01.4, July 9, AUSAID1, 11:30

Microbial connectivity between an herbivore and its environment

Molly McCargar (Columbia University)

Marine connectivity is rapidly becoming the focal point of marine protected area planning and design. This is important as protecting dispersal pathways means that we can essentially create a reef insurance policy, where if one reef suffers a bleaching or local extinction event, another reef in the same dispersal matrix can potentially re-seed a reef and maintain the integrity of its community structure. Currently, research looking at dispersal pathways focus on fish and coral larvae; the most visible features of the reef ecosystem. However, despite the fact that we know that much of coral reef health is predicated on having a healthy microbial community, the dispersal patterns and mechanisms of reef microbes are still largely unknown. Here we examine microbial connectivity across three trophic levels: sediment, sea grass and an herbivorous parrotfish, all taken from the same location to determine the strength of similarity between a reef herbivore and its environment. Since we know that herbivores are closely interacting with their environment, often ingesting both algal and sediment matter, we propose that herbivorous fish may serve as a vehicle for microbial dispersal in reef systems.

VE-01.5, July 9, AUSAID1, 11:45

Zoogeography of the mammals of northern Melanesia

Tyrone Lavery (School of Biological Sciences, The University of Queensland, Australia; Andrew Olds (School of Science and Engineering, University of the Sunshine Coast, Australia)

Analyses of the distributions of northern Melanesia's avifauna have helped formulate major theories of evolution, speciation and biogeography. In comparison, the region's mammalian fauna languishes for an empirical analysis of zoogeography. Such analyses may be useful to further advances in these theories, as well as developing strategies for the conservation of these mammals. Using published literature, museum databases and our own surveys, we compiled mammal inventories for 74 islands found within northern Melanesia (comprising the Admiralty, Bismarck, D'Entrecasteaux, Louisiade, Solomon and Trobriand Archipelagos). We used direct comparisons of family compositions and endemism indices, to compare mammal assemblages



between island groups and a defined New Guinea source pool. We also used Generalized Linear Models and a non-parametric multivariate regression tree to identify the influences of abiotic variables on mammalian species richness. Northern Melanesia's islands are depauperate in marsupials, have a moderate diversity of insectivorous bats and a diversity of pteropodid bats that exceeds that in the adjacent north-eastern area of New Guinea. The Solomon Islands support outstanding mammalian endemism. Island size best explained inter-island variation in total mammal richness and bats. The linear distance to New Guinea best explained the richness of non-volant mammals. Overall, our results demonstrate a clear hierarchical classification of islands according to their physical attributes and mammal assemblages. The mammalian fauna of northern Melanesia's islands is dictated primarily by island size and secondarily by isolation measured as the area of land present with 100km and 50 km island buffers.

VE-01.6, July 9, AUSAID1, 12:00

The influence of oceanographic fronts and early-life history traits on connectivity among fish populations: a multi-species approach

Ciro Rico (School of Marine Studies, The University of the South Pacific, Suva, Fiji)

The spatial distribution of neutral genetic diversity is mainly influenced by barriers to dispersal. The nature of such barriers varies according to the dispersal means and capabilities of the organisms concerned. While these barriers are often obvious on land, in the ocean they can be more difficult to identify. Determining the relative influence of physical and biotic factors on genetic connectivity remains a major challenge for marine ecologists. Here, we compare gene flow patterns of seven littoral fish species from six families with a range of early-life history traits sampled at the same geographic locations across common environmental discontinuities in the form of oceanic fronts in the Western Mediterranean. We show that these fronts represent major barriers to gene flow and have a strong influence on the population genetic structure of some fish species. We also found no significant relation between the early-life history traits most commonly investigated (egg type, pelagic larval duration, inshore-offshore spawning) and gene flow patterns, suggesting that other life history factors should deserve attention. The fronts analysed and the underlying physical mechanisms are not site-specific but common among the oceans, suggesting the generality of our findings.

VE-01.7, July 9, AUSAID1, 12:15

Comparative phylogeography of Indo-Pacific marine taxa presents idiosyncratic genetic connectivity patterns

Elora H. López (Department of Ecology, Evolution and Environmental Biology, Columbia University, New York, NY, USA); Joshua A. Drew (Department of Ecology, Evolution and Environmental Biology, Columbia University, New York, NY, USA)

Preservation of genetic connectivity across populations is crucial in maintaining genetic diversity and is therefore a priority for effective conservation management. Marine reserves designed to protect and link genetically connected populations improve species resilience and can benefit local fisheries. Species' life histories, habitat fragmentation, and other physical barriers to dispersal affect the extent of connectivity across geographically distinct populations. To provide an empirical basis for discussions of connectivity and marine reserve design we conducted a meta analysis of available genetic connectivity studies in South Pacific marine taxa. We found that few consistent patterns of connectivity or divergence can be generalized in the Pacific. Many closely related taxa have different patterns of connectivity even when measured across the same geographic expanse and with the same level of sampling effort. The lack of consistency in



connectivity patterns across similar physical barriers and life histories indicates the complexity of these systems, and that conservation policies should not be made based on general assumptions. This makes species and location-specific tests of connectivity necessary for proper management. Because patterns of genetic connectivity affect species' survival and evolutionary potential, scientists and policymakers should incorporate evidence of how explicit populations are genetically connected when designing marine reserves.

VE-01.8, July 9, AUSAID1, 12:45

Genetic analysis of Black Tiger shrimp (*Penaeus monodon*) across its natural distribution range reveals more recent colonisation of Fiji and other South Pacific islands

Salote S. Waqairatu (CSIRO Food Futures National Research Flagship, CSIRO Livestock Industries, Queensland Biosciences Precinct, St Lucia, Australia and School of Marine Studies, The University of the South Pacific, Suva, Fiji); Leanne Dierens (CSIRO Food Futures National Research Flagship, CSIRO Livestock Industries, Queensland Biosciences Precinct, St Lucia, Australia); Jeff A. Cowley (CSIRO Food Futures National Research Flagship, CSIRO Livestock Industries, Queensland Biosciences Precinct, St Lucia, Australia); Tom J. Dixon (CSIRO Food Futures National Research Flagship, CSIRO Livestock Industries, Queensland Biosciences Precinct, St Lucia, Australia); Karyn N. Johnson (School of Biological Sciences, University of Queensland, St Lucia, Qld, Australia); Andrew C. Barnes (School of Biological Sciences, University of Queensland, St Lucia, Qld, Australia); Yutao Li (CSIRO Food Futures National Research Flagship, CSIRO Livestock Industries, Queensland Biosciences Precinct, St Lucia, Australia)

The Black Tiger shrimp (*Penaeus monodon*) has a natural distribution range from East Africa to the South Pacific Islands. Although previous studies of Indo-Pacific *P. monodon* have found populations from the Indian Ocean and Australasia to differ genetically, their relatedness to South Pacific shrimp remains unknown. To address this, polymorphisms at eight shared microsatellite loci and haplotypes in a 418-bp mtDNACR (control region) sequence were examined across 682 *P. monodon* from locations spread widely across its natural range, including the South Pacific islands of Fiji, Palau, and Papua New Guinea (PNG). Observed microsatellite heterozygosities of 0.82–0.91, allele richness of 6.85–9.69, and significant mtDNA-CR haplotype variation indicated high levels of genetic diversity among the South Pacific shrimp. Analysis of microsatellite genotypes using a Bayesian STRUCTURE method segregated Indo-Pacific *P. monodon* into eight distinct clades, with Palau and PNG shrimp clustering among others from Southeast Asia and eastern Australia, respectively, and Fiji shrimp clustering as a distinct group. Phylogenetic analyses of mtDNA-CR haplotypes delineated shrimp into three groupings, with shrimp from Fiji again being distinct by sharing no haplotypes with other populations. Depending on regional location, the genetic structures and substructures identified from the genotyping and mtDNA-CR haplotype phylogeny could be explained by Metapopulation and/or Member-Vagrant type evolutionary processes. Neutrality tests of mutation-drift equilibrium and estimation of the time since population expansion supported a hypothesis that South Pacific *P. monodon* were colonized from Southeast Asia and eastern Australia during the Pleistocene period over 60,000 years ago when land bridges were more expansive and linked these regions more closely.



VE-02: Exploring the resilience of Pacific Island species, habitats, ecosystems and communities

VE-02.1, July 9, AUSAID1, 14:45

Life history strategies predict the long term responses of coral community assemblages to anthropogenic disturbance events

Laurel Osborne (Marine Ecology, University of Queensland, St Lucia, Australia); M. Beger (Australian Research Council Centre of Excellence for Environmental Decisions, School of Biological Sciences, The University of Queensland, Brisbane, Qld, Australia); J. Maina (Australian Research Council Centre of Excellence for Environmental Decisions, The University of Queensland, Australia and Global Conservation Program, Wildlife Conservation Society, Bronx NY, USA); A. Green (Indo-Pacific Division, The Nature Conservancy, West End, Qld, Australia); C. Birkeland (University of Hawaii); D. Fenner (Department of Marine & Wildlife Resources, American Samoa); H. Possingham (Environmental Decisions Group, School of Biological Sciences, University of Queensland, St Lucia, Australia)

Prioritising the best reefs for conservation is important to their persistence. Traditionally, coral reef conservation priorities have been assessed using measures of coral cover, and species richness – but it is unknown what functional responses are associated with long-term changes in coral communities. Using a long term dataset, we demonstrate that coral community structure and function change over time and in response to stress events but how their function changes still remains to be determined. Our study uses metrics of functional diversity (FD package, R) to show that shifts in life history traits better explains community responses to stress events than metrics of coral cover or species richness alone. Our results showed that coral communities tended to shift from competitive to stress-tolerant life histories over time when exposed to changes in temperature, light and nutrient levels. By altering their dominant life history characteristics, coral communities appear to facilitate functional diversity regardless of whether or not they are maintaining species richness or diversity. As climate change continues to restructure coral reef communities, understanding how reefs' community composition and functional traits are being maintained may provide managers with better criteria to prioritise reefs for conservation than more traditional metrics.

VE-02.2, July 9, AUSAID1, 15:00

An account of invasive species eradication in the Phoenix Islands Protected Area

Tuverea Teroroko (Director, Phoenix Islands Protected Area); R. Pierce (Eco Oceania Pty Ltd)

The Phoenix Islands Protected Area (PIPA) is a recently declared World Heritage Area spanning 408,250 sq. km of marine and terrestrial habitats in the central Pacific Ocean. The diverse fauna includes c.50 bird species, including 19 breeding seabird species. Six of the islands have recently been included as Important Bird Areas (IBAs), but impacts from invasive species, particularly invasive mammals, has been the main threat to these values. In recent times 1-3 invasive mammal species have occurred on each of the PIPA islands, but eradication efforts since 2008 have been successful on three islands and more are planned along with enhanced biosecurity. All except one of the islands are uninhabited by people and most are difficult to land on from boats which promotes natural biosecurity. Recovery of birds and vegetation is already occurring at the three restored islands and this should occur at higher rates than on those at inhabited islands in Kiribati and the Pacific generally, but some reintroductions are also being proposed. Collectively these eradications will reduce the chances of pest reinvasion between islands within PIPA, bolstering resilience for the archipelago as a whole. Eradication and restoration efforts in PIPA



should also subsequently lead to a productive natural or artificial source of seabirds to repopulate other restored islands at higher latitudes, thereby improving resilience for the central Pacific region, overall.

VE-02.3, July 9, AUSAID1, 15:15

Resilience of near pristine coral reefs to climate change disturbances

Randi Rotjan (New England Aquarium, Boston, Massachusetts, USA); Sangeeta Mangubhai (Wildlife Conservation Society, Fiji Country Program, Suva, Fiji), and D. Obura (CORDIO East Africa)

The Kiribati Phoenix Islands are located in the central Pacific, where annual temperature fluctuations are typically narrow except during intense El Niño events. In 2002-03, a severe high thermal event occurred. Across all islands, coral cover declined by ~60% due to bleaching. Remarkable but patchy recovery was observed, with coral cover ranging from 18-95%, exemplary of reefs at various stages of recovery and succession despite another (but less severe) thermal event in 2010. Monitoring these reefs pre-bleaching (2000, 2002), post-bleaching (2005, 2009) and post re-bleaching (2012) has provided insight into coral successional trajectories and resilience. Overall, abundance of coral genera across 5 islands appeared similar in 2009 and 2012 (same order of magnitude). Despite the presumed 2010 re-bleaching, there was an increase in intermediate coral size classes (21-80 cm) in 2012. Adult coral community structure resembles that of new recruits, and is dominated by fast-growing coral genera. Differences in resilience and recovery across each of the 8 islands reflect natural environmental differences in size and positioning. Phoenix Islands reefs are remote, largely uninhabited, and fully protected, thus making them a good case study in natural ecosystem responses to climate. In the context of Kiribati' and other Pacific states' vulnerability to climate change, PIPA research will help generate knowledge on adaptation options in climate-vulnerable reefs.

VE-02.4, July 9, AUSAID1, 15:30

Characterising market influences on fishing and implications for resilience in coral reef social-ecological systems in Fiji

Rachel Dacks (Department of Biology, University of Hawai'i at Mānoa); Tamara Ticktin (Department of Botany, University of Hawai'i at Mānoa); Stacy Jupiter (Wildlife Conservation Society Fiji Country Program, Fiji); Alan Friedlander (Fisheries Ecology Research Lab, University of Hawai'i at Mānoa)

Recent research in coral reef social-ecological systems suggests that market access may be a driver of overfishing in small scale fisheries. It is important to further characterize the nature of this overfishing due to its implications for social-ecological resilience. In addition, market access is traditionally defined as a road or sea distance to actual fish markets, but in a place like Fiji where there is widespread presence of middlemen, the relationships found to date may not hold. Given the significance of social networks in adaptive capacity, it is also important to document how the distribution of catch may be affected by market pressures, as this may alter the size and composition of the social network. This research addresses the following questions: 1) Are fishing methods and target species influenced by market pressures? and 2) Is the distribution of catch affected by market pressures? Data will be gathered using a combination of household and fisher interviews and creel surveys in 20 villages across Fiji. Results of this study will be valuable for managers interested in managing for resilience in the face of climate change and increasing integration of artisanal fisheries into cash economies.



VE-02.5, July 9, AUSAID1, 16:15

Temporal variation in coral recruitment in Indonesia as result of reef degradation

Simona T. Boschetti (Victoria University of Wellington, School of Biological Science, Marine Conservation Research Group, Wellington, New Zealand); David J. Smith (University of Essex, Department of Biological Science, Coral Reef Research Unit, Colchester, UK); James J. Bell (Victoria University of Wellington, School of Biological Science, Marine Conservation Research Group, Wellington, New Zealand)

Coral recruitment is considered the fundamental process that drives the maintenance and recovery of coral reefs. Habitat degradation and the increasing impacts of biological and abiotic factors such as sedimentation and overfishing, threaten the survival of corals. Therefore, it is crucial to understand the processes that affect coral recruitment. Our goal was to assess the health of the coral reef analysing the variations in coral recruitment rate and juvenile population abundance across six years. Surveys were conducted at four sites of low and medium quality reefs in the Wakatobi Marine Park (Indonesia) and results were compared to a previous research conducted at the same sites. Settlement panels and quadrats along transects were used to measure recruits, juvenile and adult corals abundance. We found a decrease in the recruitment values (PERMANOVA, $df=3$, $p<0.05$) and in the juveniles population (PERMANOVA, $df=3$, $p<0.05$). These findings suggest that recruitment success is strictly correlated to the local adult population. In addition our results show variability in recruits and juveniles abundance among different quality sites (PERMANOVA, $df=3$, $p<0.05$). The introduction of scheduled monitoring of coral recruitment is proposed to allow the assessment of the reef condition and consequently to plan appropriate management strategies. These interventions are crucial to control the disturbances and improve the conservation of the coral reef.

VE-02.6, July 9, AUSAID 1, 16:30

Distribution and prevalence of coral disease in Fiji

Yashika Nand (Wildlife Conservation Society - Fiji Country Program, Suva Fiji, and The University of the South Pacific, Suva Fiji); John Bythell (The University of the South Pacific, Suva Fiji)

Fiji's highly diverse reef ecosystems that support a high percentage of coastal livelihoods is continuously threaten by cyclone damage, coral bleaching and outbreak of crown-of-thorns starfish. More recently, coral disease has emerged as a likely growing threat to reef ecosystems. Despite extensive applied research and monitoring by various academic, government and non-government organizations, the knowledge on distribution and prevalence of coral disease is limited. In 2013, "snapshot" surveys were conducted at six locations across the Vatu-i-Ra seascape and Yasawa Island group, to collect data on coral disease. Three (50 m x 0.5 m) belt video transects were conducted at each site. Video data was processed to extract information on two categories: (1) coral abundance and diversity; and (2) coral disease based on lesion. Lesion types were further categorised into potential disease and non-disease symptoms. We calculated coral disease distribution by percentage per site, as well as a coral disease susceptibility index for different families to gauge individual site vulnerability and tolerance level. Coral disease site susceptibility index is likely to improve our understanding on the relationship between coral communities and disease occurrence. Our research is vitally important as a baseline allowing reef managers to incorporate newly available information on coral disease, the overall resilience of the reef system, and to improve adaptive management of Fiji's coral reefs.



VE-02.7, July 9, AUSAID1, 16:45

Promoting Indo-Pacific Coral Health and Reducing Disease Risk through the Action Network for Coral Health and Resilience (ANCH&R)

Courtney S. Couch (University of Hawai'i at Mānoa, Hawai'i Institute of Marine Biology, Kāne'ohe, Hawai'i 96744, USA); E. Conklin (The Nature Conservancy, Honolulu, Hawaii, USA 96825, USA); R. Kosaki (NOAA, Papahānaumokuākea Marine National Monument, Honolulu, Hawai'i 96825, USA); J. Wilson (Sea Solutions, Pottsville NSW 2489, Australia)

Coral disease has steadily increased both spatially and temporally during the last four decades, altering coral health from the physiological to ecosystem-level. Originally restricted to the Caribbean, the ecosystem-wide effects of disease, acting synergistically with other environmental stressors are now threatening the Indo-Pacific and Indian Oceans, which contain the world's most biologically diverse reefs. To understand the extent to which coral disease affects these reefs and address the underlying causes of rising disease, coral reef managers are tasked with assessing disease risk and prioritizing threat-reduction strategies. Our ability to understand the importance of disease in reef resilience and respond to disease outbreaks are hampered by inconsistent methodology and limited spatial coverage across a range of impacted and "near pristine" regions. Large marine protected areas (MPAs), such as the those within the Big Ocean Network, as well as many community-based MPAs provide a valuable tool for enhancing coral reef resilience by minimizing stress and boosting recovery following disturbance events. Through the Action Network for Coral Health and Resilience (ANCH&R), we are building capacity within reef monitoring programs and MPAs across the Indo-Pacific and Indian Oceans to standardize disease monitoring, develop coral disease monitoring programs and implement comprehensive training workshops. During this project, ANCH&R aims to not only raise awareness about coral disease, but also facilitate partnerships between scientists, conservation practitioners and resource managers to integrate disease into existing resilience programs.

VE-02.8, July 9, AUSAID1, 17:00

Vulnerability of small island endemic species to climate change

Subhashni Taylor (Ecosystem Management, School of Environmental & Rural Science, University of New England, Armidale, Australia); Lalit Kumar (Ecosystem Management, School of Environmental and Rural Science, University of New England, Armidale, Australia)

The Pacific Islands are home to a large variety of rare and endangered species and the geographic complexity and isolated nature of the islands have resulted in high levels of endemism. These islands and the biodiversity found on them may be highly vulnerable to changes in climate due to the unique nature of their climates. As such, adaptation opportunities may be limited particularly for species that have a very limited range. The aim of this project is to identify and model the distribution of species that are the most vulnerable to the impacts of climate change based on risk of coastal erosion from sea level rise, biology of the species and changing environmental conditions, such as temperature and precipitation. A recent major project conducted by the authors for Australian Aid and the Department of the Environment in Australia mapped the vulnerability of 1800 islands in the Pacific to climate change. Initial vulnerability was calculated using four variables: lithology, maximum elevation, area and circularity. Indicative vulnerability was assessed using a comparative scale of very low, low, medium, high and very high. The results showed a greater diversity of vulnerability in the Pacific than previously realised. The current project will relate what these vulnerabilities mean for biodiversity and endemic species. The results of this research will be useful for conservation prioritisation initiatives.



VE-03: Species Conservation

VE-03.1, July 10, AUSAID1, 10:30

Preliminary assessment of a nursery ground for the Scalloped Hammerhead Shark *Sphyrna leweni* in the Rewa River Estuary, Fiji Islands

Kelly T. Brown (School of Marine Studies, Faculty of Science, Technology and Environment, The University of the South Pacific, Suva, Fiji); Johnson Seeto (School of Marine Studies, Faculty of Science, Technology and Environment, the University of the South Pacific, Suva, Fiji); Cara E. Miller (Pacific Islands Programme, Whale and Dolphin Conservation, P O Box 228, Suva, Fiji)

The Scalloped Hammerhead Shark *Sphyrna leweni* is a prime target for the global shark fin trade. Due to the high fishing pressures this species experiences in Fiji and the greater Pacific region, an understanding of its population dynamics is critical for the appropriate management of the fishery and the imposition of successful conservation measures. The identification and characterisation of the nursing grounds used by *S. leweni* is an important first step towards achieving this. Very little is known about the habitat areas used as nurseries by *S. leweni* in the Fiji Islands, and the current study is the first of its kind carried out. A gill net was deployed at night in the Rewa River estuary, over a period of 5 months, during which a total of 82 juvenile *S. leweni* were captured, weighed and measured. Analyses of the data gathered showed that approximately even numbers of male and female juveniles were captured throughout the study, whose lengths and weights were not significantly different between the sexes. Lengths and weights were also found to increase over time, and these data combined with examinations of umbilical scar healing state may indicate that all individuals captured were likely to be from the same cohort. While there remains room for further research into the characterisation of the Rewa River estuary as an established nursing ground for *S. leweni*, the current study provides some preliminary data and confirmation that this is indeed the case.

VE-03.2, July 10, AUSAID1, 10:45

Acoustic communication patterns of spinner dolphins (*Stenella longirostris*) within a critical resting site in Fiji

Samanunu Simpson (Faculty of Science, Technology and Environment, The University of the South Pacific, Suva, Fiji); Cara E. Miller (Institute of Marine Resources, The University of the South Pacific, Suva, Fiji and Pacific Islands Programme, Whale and Dolphin Conservation Society International, Suva, Fiji); Johnson Seeto (School of Marine Studies, Faculty of Science, Technology and Environment, The University of the South Pacific, Suva, Fiji); Josefa Bau (Dawasamu Environmental Movement, Dawasamu, Tailevu, Fiji); Isoa Koroiwaqa (Dawasamu Environmental Movement, Dawasamu, Tailevu, Fiji)

Makalati (also known as Moon Reef) in Viti Levu, Fiji, serves as a critical daytime resting habitat for a pod of semi-resident spinner dolphins (*Stenella longirostris*). Acoustic communication patterns (i.e., whistles and echolocation clicks) at both daily and seasonal scales were investigated for this population over a two-year period. An on-board hydrophone collected 7,960 whistles during 3 discrete sampling periods. Multivariate techniques were used to categorize 6 different whistle types (upsweep, down sweep, convex, concave, sine, and constant) from 12 whistle measurements related to frequency, duration, and inflection points. Chi-squared tests revealed significant differences in proportion of occurrence of the different whistle types between sampling periods – as well as in comparison to studies on spinner dolphin repertoire in the



published literature. Furthermore, regression analyses' of the 6 different whistle types revealed significant trends against time of day. In addition, a moored passive acoustic monitoring device recorded more than 10,000 echolocation clicks during the study. Echolocation activity was investigated by regressing number of clicks per hour against the time of day, patterns in whistle communication, dolphin group size, and boat activity. This study presents important data about limiting disturbance to the Moon Reef spinner dolphin pod and provides principles for sustainable ecotourism management within Makalati.

VE-03.3, July 10, AUSAID1, 11:00

Temporal characterization of humpback whale song in Tongan waters

Latu 'Aisea (Faculty of Science, Technology and the Environment, The University of the South Pacific, Suva, Fiji); Cara E. Miller (Institute of Marine Resources, The University of the South Pacific, Suva, Fiji and Pacific Islands Programme, Whale and Dolphin Conservation Society International, Suva, Fiji)

Interest in humpback whale (*Megaptera novaeangliae*) song began when researchers first discovered both structure and repetition within songs; that only males sang; and that within a given breeding season different populations of humpback whales were singing different songs. In the Oceania region humpback whales migrate into tropical island waters during the austral winter to breed and calve. Between August and October 2013 small boat surveys and an onboard hydrophone were used to collect more than 30 humpback whale song samples within the Tongan EEZ. Measurements of sound frequency, duration and pattern on individual sounds (termed 'units') within each song were made using RavenPro acoustic analysis software. Songs were then compared to regional catalogs to validate classifications. Peak frequencies of 66 distinct units ranged from 21.5 - 4306.6Hz. Chi-square analyses showed that less than 25% of these units were used at significantly higher proportions than the remainder of the units. Following convention of humpback whale song description, units were used to progressively describe phrases and themes within a complete song. An overall description of humpback whale song in Tongan waters was given by quantifying within and between song variability across the 2013 migration period.

VE-03.4, July 10, AUSAID1, 11:15

The importance of maintaining connectivity for the conservation of Fiji's freshwater fishes: A case study from Nakorotubu, Ra, Viti Levu

Lekima K. F. Copeland (Institute of Applied Sciences, The University of the South Pacific, Suva, Fiji); James Comley (Institute of Applied Sciences, The University of the South Pacific, Suva, Fiji); Aaron P. Jenkins (School of Natural Sciences, Edith Cowan University, Lawley, Western Australia); and William Aalbersberg (Institute of Applied Sciences, The University of the South Pacific, Suva, Fiji)

The global paradigm of maintaining natural flow regimes for the conservation of aquatic fauna and flora has been well documented. However for Fiji, limited ecological studies have been undertaken on freshwater fish. This research analyzes several mechanisms affecting fish in wadeable streams of Nakorotubu. Three streams were sampled during the wet and dry seasons and divided into lower, mid and upper reach. Fish were surveyed using a combination of electrofishing and beach seine. Data were analyzed using both univariate and multivariate statistical methods to interpret factors affecting fish communities. A total of 677 fish were caught through electrofishing; 27 species of fish from nine families were collected representing 16% of the known freshwater and brackish water fish fauna of Fiji. The abundance and species diversity of fishes in streams were significantly affected by position in the catchment, with lower reaches having the highest diversity and abundance and decreasing moving upstream. Habitat and micro-habitat variables were tested and it was found that the altitude, canopy cover and volume of water



in a stream are highly significant factors regulating fish communities across the three streams. The results of this study suggest that the volumes of flow and connectivity are important for freshwater food fish.

VE-03.5, July 10, AUSAID1, 11:30

Amphidromous goby complex and island species conservation

David Boseto (Ecological Solutions Solomon Islands, Gizo, Solomon Islands)

Species of the gobioid subfamily Sicydiinae are common in tropical island streams because of their amphidromous life history. A number of independent studies will be presented to answer questions concerning whether protecting species or protecting their habitats is the key to island freshwater fish species conservation. Eight microsatellite loci were used to investigate the population genetic structure of the amphidromous goby species *Stiphodon rutilaureus* in the New Georgian Islands, Solomon Islands. The goby species of the genus *Stiphodon* have overlapping morphological character state distributions, making phylogenetic inference problematic when using only morphological characters. Therefore, the taxonomic studies must be complimented with molecular studies to verify and validate each species complex. Many species of *Stiphodon* are endemic to a single island like *S. julieni* or to a single river like *S. Larson* and are rare compared to the wide spread species like *Stiphodon rutilaureus*. Freshwater fishes and their habitats are exposed to similar threats as are many other native species. Some of the coastal streams are less than 3km in length on insular tropical volcanic islands where agricultural land use practices and development are poorly regulated. Habitat degradation, invasive species and over-harvesting of the fishes in the streams are of major concern. The study of amphidromous gobies will contribute to effective management and conservation of this and other island species. This can be achieved through collaborative efforts between communities, relevant government departments, NGOs, and higher educational institutions, resource managers and policy administrators.

VE-03.6, July 10, AUSAID1, 11:45

Population structure and movements of the endemic Fijian Swallowtail Butterfly, *Papilio schmeltzi* and habitat suitability for conservation

Visheshni Chandra (School of Biological and Chemical Sciences, Faculty of Science, Technology and Environment, The University of the South Pacific, Suva, Fiji)

Papilio schmeltzi is endemic to the Fiji Islands where it is widespread and generally low in density but with some areas of higher local density. The butterfly has an open population structure and occurs in secondary forests. The mark-release recapture method was used to study the population size and movements of *P. schmeltzi* and the use of resources in Vatukarasa, Sigatoka and Koro Island for two seasons. *Micromelum minutum* is the principal larval food plant, and its abundance is correlated with the number of marked and recaptured butterflies. The adult population size was bigger on Koro Island than in Vatukarasa, Sigatoka. The population was found to be very small, estimated at fewer than 15 flying individuals at both sites. At present, *P. schmeltzi* is not classified as an endangered species, under the IUCN guidelines. It is however vulnerable, because it has a restricted range and is very sensitive to land use changes and under threat from habitat destruction and climate change. This research shows that conservation of this species is needed and habitat management with joined breeding program to increase numbers of this extraordinary butterfly.



VE-03.7, July 10, AUSAID1, 12:00

Patterns of Tree Species Usage by Long-Horned Beetles (Coleoptera: Cerambycidae) in Fiji

Hilda Waqa-Sakiti (Institute of Applied Sciences, The University of the South Pacific, Suva, Fiji); Dr. Alan Stewart (University of Sussex, UK); Lukas Cizek (University of South Bohemia, Czech Republic); Simon Hodge (Lincoln University, New Zealand)

This study investigated cerambycid long-horned beetles in a lowland tropical forest in Fiji and produced 18 new records of beetle-tree associations along with data on beetle phenology and development times. Beetles were reared from timber baits exposed for 1 month to ovipositing females in the Savura Forest Park, Viti Levu. Twelve native, locally common tree species representing 10 families were examined. For each tree, two baits consisting of 16 kg of freshly cut branches were exposed in each of four time periods between June 2008 and May 2009. Eighteen cerambycid species and 557 individual beetles were reared from the 96 baits, with three of the beetle species probably being undescribed. *Ceresium* was the most abundant genus, representing almost 90% of all individuals reared, with most adults emerging between 4 and 6 months after the timber baits were exposed. Seventeen of the 18 beetle species each emerged from timber belonging to a single tree species, although more rearing records are required to support the high level of host-plant specificity reported here.

VE-03.8, July 10, AUSAID1, 12:15

Conservation of Fiji's unique partulid tree snail fauna

Gilianne Brodie (School of Biological and Chemical Sciences, The University of the South Pacific, Suva, Fiji); Gary M. Barker (Research Associate, Landcare Research, Private Bag 3127, Hamilton, New Zealand); Helen Pippard (Species Officer, International Union for the Conservation of Nature, Oceania Office, Suva, Fiji); Cindy Bick (Museum of Zoology, University of Michigan, Ann Arbor, USA); Diarmaid Ó Foighil (Museum of Zoology, University of Michigan, Ann Arbor, USA and School of Biological and Chemical Sciences, The University of the South Pacific, Suva, Fiji)

Despite non-marine molluscs being regionally and globally one of our most threatened faunal group's, information about their extraordinary diversity and endemism is to date missing from many Pacific Island national biodiversity action plans. Fiji for example has a very large and diverse native land snail fauna (> 200 species) with an endemism level ~80% but only recently has information about these species been added to national reporting mechanisms. One group in particular – the Partulidae tree snails with four species recorded as endemic to the Fiji Islands – stands out because (1) its Fijian members occur only on a few small, remote islands within the Fiji group and (2) despite the alarming extinction rate in other parts of the Pacific Island region, the status of local species is very poorly known. Two small, remote islands in the Fiji archipelago, known historically to support partulids, were surveyed to investigate if tree snails still persisted there. Living populations of *Partula nr lanceolata* and empty shells of *Partula lefeei* were found. DNA analyses are currently examining the relationship between these Fijian partulids and other family members in the region. Community awareness of the unique nature of these tree snails was absent prior to the survey visits. Further sampling of additional islands and residual native habitat in less accessible areas is needed to fully assess the conservation status of these threatened endemic species via the IUCN Red-listing process. Determination of the willingness of land owners to support development of community-led conservation action-plans including captive breeding programs is also required.



VE-03.9, July 10, AUSAID1, 14:30

Diversity and conservation status of *Placostylus* land snails, with emphasis on species endemic to Fiji

Gary M. Barker (Landcare Research, Hamilton, New Zealand); Gilianne Brodie (School of Biological and Chemical Sciences, Faculty of Science, Technology and Environment, the University of the South Pacific, Suva, Fiji); Lia Bogitini (School of Biological and Chemical Sciences, Faculty of Science, Technology and Environment, the University of the South Pacific, Suva, Fiji) ; Helen Pippard (International Union for the Conservation of Nature, Oceania Program, Suva, Fiji); Thomas Buckley (Landcare Research, Auckland, New Zealand)

We review the diversity and conservation status of *Placostylus*, land snails endemic to the western Pacific. Their narrow range endemism, large size and associated vulnerability to habitat loss and invasive predators, threaten their survival. There has already been considerable attention from conservation biologists focused on *Placostylus* in areas outside of Fiji. Several members of the genus in Australia and New Caledonia are already considered extinct, and a number of species in Australia, New Caledonia and New Zealand are presently under active conservation management. As part of an ongoing research program, in 2011 we collated existing and new information on fourteen Fijian *Placostylus* species and assessed the extinction threat of each species against the IUCN Red-list Red List criteria. Ten Fijian species were identified as extinction prone, including *P. koroensis* (Garrett, 1872) and *P. mbengensis* Cooke, 1942 that were assessed as ‘Critically Endangered’ and thus in need of immediate conservation action. The escalating rates of degradation of the forest habitat and the emergence of new threats from invasive species already suggests these Red-list assessments under-estimate the extinction risk to Fijian *Placostylus*. We will discuss biosecurity and conservation needs if loss of this unique component of Fiji’s endemic biodiversity is to be averted.

VE-03.10, July 10, AUSAID1, 14:45

Conservation status of ebony heartwood producing *Diospyros* species (rihe) on Vangunu, Western Solomon Islands

Ramokasa Anisi (The University of the South Pacific); Gunnar Keppel (School of Natural and Built Environments and Barbara Hardy Institute, University of South Australia); Gilianne Brodie (School of Biological and Chemical Sciences, The University of the South Pacific, Suva, Fiji)

Diospyros (Ebenaceae) is a tropical genus of trees with great economic importance because of the ebony heartwood, produced by at least 20 species. However, over harvesting and habitat destruction have reportedly threatened the persistence of some of these ebony heartwood producing *Diospyros* species. In the Solomon Islands ebony heartwood of *Diospyros* is profoundly important in the local woodcarving industry. Nevertheless, despite its economic importance, very little effort has been given to assess its’ conservation status in Solomon Islands. We used an interdisciplinary approach on Vangunu Island, to assess the conservation status of ebony heartwood *Diospyros* species (**rihe**). The ebony heartwood producing species was identified to be *D. samoensis*. Most traditional uses of *D. samoensis* are related to the ebony heartwood. *D. samoensis* occurred in relatively small dense stands with generally abundant regeneration. The number of felled trees had a vegetative correlation with the number of seedlings (<1.3m) indicating that continued felling of harvestable trees may reduce the regeneration ($r = -0.704$, $p = 0.008$). Of the 59 harvestable trees that were examined for the presence of ebony heartwood by local harvesters, only 2 displayed evidence of ebony heartwood being present. Thus, *D. samoensis* remains abundant on Vangunu. However, the number of trees producing ebony heartwood is low. Better methods of examination for the presence of ebonised heartwood (currently done by slashing the barks or felling trees) could improve the health and



lifespan of trees. Therefore, this study provides important information for the conservation and sustainable utilization of ebony heartwood producing *Diospyros* species

VE-03.11, July 10, AUSAID1, 15:00

Molecular systematics and phylogeography of Fiji's endemic *Peperomia* (Piperaceae)

Sarah Pene (Institute of Applied Science, The University of the South Pacific, Suva, Fiji); Peter Lockhart (Massey University, New Zealand)

Peperomia is a tropical genus of approximately 1600 species worldwide. Fiji currently has records of 25 species of *Peperomia*, 22 of which are endemic. The majority of the endemic species are recorded as occurring on only one or two islands within the group, and some are known only from a single type collection. The current study has begun work to expand and consolidate the collections of Fiji's *Peperomia*, and investigate the genetic diversity, distribution and habitats of species. These data will allow us to reevaluate taxonomic classification and the conservation status of species. *Peperomia*, like other species-rich genera, is of interest globally for what it can inform us about drivers of species diversification, the resilience and adaptive potential of floras on island archipelagos. This study will also provide a foundation for future work involving ecological niche modeling, computational and experimental ecophysiology. These approaches are currently being used to rapidly advance understanding of the nature of species, their biotic and abiotic interactions. Applied here in the Pacific, these approaches have the potential to help us better understand the adaptive potential of Pacific Island flora to anticipated environmental change.

VE-03.12, July 10, AUSAID1, 15:15

The genetic divergence of Fijian Honeyeaters

Mere Yabaki-Goundar (School of Biological & Chemical Sciences, Faculty of Science, Technology and Environment, The University of the South Pacific, Suva, Fiji)

This study investigates the origins, biogeographical history and taxonomy of Fijian Honeyeaters using molecular systematics. As previous work had suggested conflicting evolutionary histories for the Meliphagidae, an investigation was made of the evolutionary properties of sequence data used to construct Meliphagidae relationships. A recent publication appeared on the molecular systematics of Pacific Meliphagidae (Andersen, Naikatini, and Moyle 2014). The taxonomic sampling in this published work was more extensive than in the present study. Nevertheless, my findings provide novel insight important for evaluating and understanding Pacific honeyeater relationships and diversity. While my DNA sequencing results corroborate Anderson et al.'s findings of a close phylogenetic relationship between Fijian *Xanthotis* and *Foulehaio* with species from the Western Pacific and Pacific Rim (termed clade H by (Andersen, Naikatini, and Moyle 2014) my analyses also provide explanation for the discordance of phylogenetic inferences obtained by (Andersen, Naikatini, and Moyle 2014) and some of the findings by earlier researchers (Driskell & Christidis 2004; Gardner et al. 2010). Specifically, this discrepancy concerns the relationship of honeyeaters from Anderson's clade H to those of other clades (D and G) which comprise radiations of Australian, West Papua, Papua New Guinea and Indonesian species. I show that analyses of Fibrinogen and 12SrRNA genes are unlikely to be reliable for inferring the deeper phylogenetic relationships of honeyeaters, and that they potentially have misled the phylogenetic reconstruction of (Andersen, Naikatini, and Moyle 2014) which was based on concatenated Fibrinogen and ND2 genes. With consideration for the impact of this potential problem, a molecular clock reconstruction was made using only ND2 genes. This



provides a tentative temporal framework for the evolution of Fijian honeyeaters, and one that can be further investigated in analyses of independent nuclear gene loci and mitochondrial genomes. As such my work provides a strong foundation for further systematic and ecological investigations of Fijian Meliphagidae (honeyeaters). Such work will help us to better understand the nature of Fiji's avian biodiversity – its origins and diversity. This in turn will help us to develop appropriate conservation measures to better care for our endemic species and their habitats in the Fiji Islands.

VE-03.13, July 10, AUSAID1, 16:00

Recent Advances in Understanding the systematics, speciation, and evolution of South-west Pacific birds

Chris Filardi (Center for Biodiversity and Conservation, American Museum of Natural History, New York, NY, USA); Rob Moyle (Department of Ecology and Evolutionary Biology, Natural History Museum & Biodiversity Institute, University of Kansas, Lawrence, KS, USA); Al Uy (Department of Biology, University of Miami, Coral Gables, FL, USA)

The birds of southwest Pacific islands have provided an exceptional arena for inspiring and testing evolutionary theory for well over a century. For instance, historic morphological studies of isolation and geographic differentiation among southwest Pacific birds drove early speciation theory, community composition across islands framed the Theory of Island Biogeography and its impacts on biogeography, ecology, and conservation biology, and patterns of extinction among Pacific islands are a sobering reminder of ecological transformations that characterize the modern era. More recently, early morphological work has been revisited using powerful molecular tools in the first wave of molecular phylogenetic, phylogeographic, and demographic analyses. Results have redefined our understanding of the drivers of southwest Pacific bird diversity, rejecting some classic models of simple colonization and speciation dynamics, and revealing rapid, complex patterns of evolution on multiple scales. This work now includes genomics and more rigorous investigations of behavioral ecology, setting the stage for a new era of exploration and understanding. Here, we summarize key recent advances from our long-term molecular and field ecology studies of southwest Pacific birds. Over the past decade, results have revised geographic affinities and patterns of sympatry at regional scales, refined our sense of the mode and tempo of the accumulation and evolution of novel lineages, revealed plumage and song as powerful social drivers of speciation, and have discovered that parallel, single point mutations can result in near instantaneous changes in traits that comprise some of the most influential patterns of variation in the region.

VE-03.14, July 10, AUSAID1, 16:15

Diet and feeding ecology of two endemic Solomon Islands flying foxes: *Pteropus rayneri* (Solomon's flying fox) and *Dobsonia inermis* (Solomon's bare-backed flying fox)

Corzzierrah Posala (Biodiversity and Conservation Research Group, School of Biological and Chemical Sciences, Faculty of Science, Technology and Environment, The University of the South Pacific, Solomon Islands); Diana Fisher (University of Queensland, St Lucia, Australia); Tyrone Lavery (University of Queensland, St Lucia, Australia)

Fruit bats are major seed and pollen dispersers, as well as pollinators in the tropical Pacific region, and are key species to the regeneration and distribution of tropical fruiting vegetation. Northern Melanesia (including Solomon Islands) is a center of endemism for pteropodid bats. However, little is known about the ecology of any of the endemic species from the region. The



principal objectives of this study were to identify the diet and feeding preferences of *Pteropus rayneri* and *Dobsonia inermis*, and determine if these species eat plant materials in proportion to their availability in the environment. We used mist nets to capture bats and collect fecal samples on capture, and passively collected fecal samples from underneath roosting sites. Samples were examined under microscope to identify seeds, pollen and leaf material from different plant groups. In addition, we collected data on the traditional ecological knowledge of these fruit bats feeding ecology using community questionnaires. The results provide novel insights into the diet and feeding ecology of the two endemic Solomon Island fruit bats.

VE-03.15, July 10, AUSAID1, 16:30

Effects of logging on an endangered *Pteralopex* and other Solomon Islands flying foxes: a 22 year experiment

Diana Fisher (University of Queensland, St Lucia, Australia); Tyrone Lavery (University of Queensland, St Lucia, Australia); Corzzierah Posala (Biodiversity and Conservation Research Group, School of Biological and Chemical Sciences, Faculty of Science, Technology and Environment, The University of the South Pacific, Solomon Islands); Gilianne Brodie (School of Biological & Chemical Sciences, Faculty of Science, Technology and Environment, The University of the South Pacific, Suva, Fiji)

Forests of the Solomons archipelago support globally significant biodiversity, especially of flying-foxes, but there have been almost no ecological studies of Solomons mammals. Our work on the ecology of the endangered New Georgia monkey-faced bat ('tagi' or 'giravé') *Pteralopex taki* in Western Province in 1992 is the only published ecological study on this genus, all five species of which are endangered or critically endangered. Despite rapid loss of primary forest, no quantitative data existed on the impact of logging on Pacific Island forest bats. Published studies on island birds and forest primates elsewhere suggest that logging disproportionately affects specialist fruit-eating species. Globally, flying foxes with low reproductive rates are most threatened, reflecting the effect of over-hunting. We assessed the distribution and ecology of *P. taki*, species diversity, abundance, morphology, behaviour, and habitat structure and food availability of fruit and nectar eating bats (10 species) at eight sites on three islands in 1992. We re-visited and re-sampled these sites in 2014. Many, but not all of the formerly pristine sites have been logged since 1998. Our detailed pre-logging data and the existence of unlogged (but hunted increasingly over a period of intense human population growth) control sites over time gave us a rare opportunity to quantify the magnitude of bat population loss from logging and hunting, ecological traits of the most vulnerable species to logging, and loss of populations of a restricted-range endangered species (*P. taki*) due to extensive logging in the last 22 years.

VE-03.16, July 10, AUSAID1, 16:45

Density and species richness of frogs of Solomon Islands implications for conservation

Patrick Pikacha (Ecological Solutions, Solomon Islands, Gizo, Solomon Islands)

This paper aims to determine important factors affecting the density of frog species in the Solomon Islands. Distance sampling was used to estimate frog density in all major frog habitats across 13 islands. A total of 109 transects covering 5 forest types (coastal, freshwater marshes, lowland forest, hill or ridge, and montane forest) were used with 16 species being sampled. In these surveys densities ranged from 2 ha⁻¹ to 675 ha⁻¹. Akaike's information criterion (AIC) was used to identify the most parsimonious model. These models consist of island, landform, and forest type, for the density of *Batrachylodes elegans*, *B. vertebralis*, *C. guentheri*, *Discodeles bufoniformis*, *D. guppyi*, *D. malukuna*, *L. thesaurensis*, *Palmatorappia solomonis*, *Platymantis*



guppyi, *P. neckeri*, *P. solomonis*, *Platymantis* sp, *P. weberi*, and *R. krefftii*. Additional factors such as disturbance, leaf litter, shrub, and understory were also used in the model to predict the density of *B. vertebralis*, *C. guentheri*, *D. guppyi*, *D. malukuna*, *Pal. solomonis*, *P. guppyi*, and *R. krefftii*. These findings provide important management implications for the conservation of frogs in the Solomon Islands.

VE-03.17, July 10, AUSAID1, 17:00

Threatened Biodiversity and Traditional Ecological Knowledge: Status of herpetofauna and associated knowledge among the `Are`Are, Malaita, Solomon Islands

Edgar Pollard (Naturalist, Solomon Islands); Randy Thaman (Professor of Pacific Islands Biogeography, the University of the South Pacific, Suva); Gilianne Brodie (School of Biological and Chemical Sciences, The University of the South Pacific, Suva, Fiji); Clare Morrison (School of Environment, Griffith University)

Biodiversity and its associated traditional ecological knowledge (TEK) is in danger of being lost in many societies around the world and especially in the Pacific Islands. Herpetofauna are globally threatened along with their associated knowledge and beliefs. The aim of this study was to examine the richness of forest frogs and lizards and their associated TEK among the `Are`Are and to determine the status and health of these species and knowledge. Eighty nocturnal transects and 120 diurnal quadrats were sampled to determine herpetofaunal species richness. Questionnaire surveys were used to collect and gather TEK from local informants separated into equal sex and age cohorts. A total of 21 species of frogs and lizards were observed from field sampling and 18 species were described by local informants with 7 distinct uses identified. Key results include; Rarity in abundance for two lizards (*Corucia zebrata* and *Cryptodactylus salomonensis*) that are IUCN Red-Listed as near-threatened; High abundance of the invasive frog *Bufo marinus*, especially in disturbed areas; Age cohorts above the age of 60 exhibited greater knowledge with males also slightly more informed than females. Results imply that urgent action must be taken to document and preserve local TEK in the Solomon Islands.

VE-03.18, July 10, AUSAID1, 17:15

Island in the sky – an unexplored and little known biodiversity hotspot in east Melanesia

Marika Tuiwawa (South Pacific Regional Herbarium, Institute of Applied Sciences, The University of the South Pacific, Suva, Fiji); Chris Filardi (Center for Biodiversity and Conservation, American Museum of Natural History, New York, NY, USA); Sarah Pene (Institute of Applied Science, The University of the South Pacific, Suva, Fiji); P. Pikacha (Ecological Solutions, Solomon Islands); E. Pollard (Naturalist, Solomon Islands)

The Guadalcanal highlands are one of the last remaining unknown and untouched areas in the Pacific. This isolated and inaccessible place is believed to be a true biodiversity hotspot housing many species still unknown to science. Not only is this area of natural importance but it is also an area of high cultural value, a factor that has helped in its preservation. An international USP lead expedition in 2015 is being planned to help shed some light on this unique place. This rapid biodiversity expedition will include sampling across a wide variety of taxa from freshwater to terrestrial communities. Findings hoping to be accomplished include a greater understanding of biodiversity in this area and collaboration between various stakeholders that include academic institutions, government and local resource owners that continues to conserve this natural and cultural hotspot.



VE-03.19, July 10, AUSAID1, 17:30

The current status of species conservation in the Pacific Islands

Helen Pippard (Species Officer, International Union for the Conservation of Nature, Oceania Program, Suva, Fiji)

This final talk aims to present the current overall status of species conservation in the Pacific Islands, drawing data and conclusions from other presentations within Session VE 03. Our current knowledge of species will be examined, drawing on examples from and analysis of the IUCN Red List of Threatened Species, as well as country specific projects and documents such as NBSAPs. The relevant results from the recent SPREP report “Status of Conservation in Oceania” shall also be included. The session will then focus on acquiring from attendees actions required from conservation practitioners in the region, in order to contribute to conservation outcomes and Target 12 of the Aichi Targets (By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained). The talk will end with a discussion on funding opportunities and collaborative approaches to build on current efforts towards species conservation in the Pacific islands region. It is anticipated that the examination of current species research efforts and status of species conservation will enable participants to collectively identify opportunities for working towards collaborative species management and conservation in the Pacific Islands.

VE-03.20, July 9, AUSAID2, poster session, 18:00

Temporal Patterns of Drift in Amphidromous Fishes: Critical Windows for the Completion of a Life-History

Matthew Jarvis (Department of Zoology, University of Otago, Dunedin, New Zealand); Gerard P. Closs (Department of Zoology, University of Otago, Dunedin, New Zealand)

Diadromous fish migrate between freshwater and marine habitats, and are vulnerable to the disruption of their narrow migratory corridors. The freshwater fish faunas of the Indo-Pacific islands are dominated by diadromous species which spawn and hatch in freshwater, and then undertake a larval migration (‘drift’) to the sea for a short period of feeding and growth before returning to freshwater (an amphidromous life-history). During this period of drift, larvae may be vulnerable to multiple impacts such as water abstraction, weirs and dams, and pollution, which can delay or prevent migration and development, leading to population decline and loss. Little is known on the timing of downstream larval drift, but this knowledge is important as it can indicate critical times when larvae are most vulnerable to adverse impacts. In this study, I examined diel patterns of larval drift in the Waiānakarua River, South Island, New Zealand. Sampling took place from December 2013 to February 2014 over 24 hour cycles. Larval drift occurred at low levels throughout the day, but exhibited a marked spike just after sunset, which trailed off after only a few hours. This indicates that the majority of larval drift may occur over a relatively short period. Minimising factors that constrain larval drift and increase larval mortality during this short period of peak drift, such as water abstraction or the discharge of contaminants, may greatly benefit populations of these vulnerable migratory fish.



VE-05: Pacific reptiles: declines, extinctions and new species

VE-05.1, July 11, AUSAID1, 10:30

Biogeography and conservation systematics of Pacific Iguanas (*Brachylophus* sp.)

Robert Fisher (U.S. Geological Survey, San Diego, USA); Jone Niukula (The National Trust of Fiji, Suva, Fiji); Heidi Davis (San Diego Zoo Institute for Conservation Research, San Diego, USA); Peter Harlow (Taronga Conservation Society Australia, NSW, Australia)

Pacific iguanas (genus *Brachylophus*) are enigmatic element of Fijian and Tongan biodiversity and have a long history in the region. At least two species have become extinct, and now iguanas are rare or absent from many islands. There are three living species in the genus as currently described. Over the last decade we have surveyed iguana populations on many of the islands in Fiji and collected genetic and morphological samples from many of these relict populations. Analysis of these data indicates that there is a much greater diversity of iguanas still extant in Fiji. Many of these are apparently now single island endemics, probably due to extirpations of nearby populations, and most or all would be considered critically endangered. Overall these data support that there was a much greater distribution and species diversity in the genus in the recent past and continued investigation of unsampled islands is a critical priority. This information is vitally important to setting conservation goals and strategies, as the conservation focus from 1980 – 2005 was primarily on crested iguanas, whereas assumptions about “banded” iguanas was that their extinction risks were relatively low. Description of this new diversity is currently underway.

VE-05.2, July 11, AUSAID1, 10:45

Priority islands for Pacific Iguana (*Brachylophus* sp.) conservation in Fiji

Peter Harlow (Taronga Conservation Society Australia, NSW, Australia); Jone Niukula (The National Trust of Fiji, Suva, Fiji); Heidi Davis (San Diego Zoo Institute for Conservation Research, San Diego, USA); Robert Fisher (U.S. Geological Survey, San Diego, USA)

Recent genetic and morphological research on Pacific iguanas (genus *Brachylophus*) has shown that there are at least three living species in the genus. Over the last decade we have surveyed iguana populations on 76 of the 300 islands in Fiji for presence /absence and abundance. Only islands with native forest remnants have been surveyed; we did not survey islands without forest remnant as iguanas cannot exist on these. For some of these islands the most recent records of iguanas are over 90 years old, and many have never been surveyed or assessed. For the 28 uninhabited islands surveyed, 8 had extant iguanas, while for the 48 inhabited islands surveyed we recorded iguanas on 25. Our genetic and morphological data from these 33 island populations have identified at least five Evolutionary Significant Units within Fiji, with most island populations being genetically different from each other. As forest habitats continue to decline and exotic predators are transported to new islands, these arboreal iguana populations will continue to suffer local extirpations. Here we discuss how we have prioritised islands for the long term conservation of these five Evolutionary Significant Units in Fiji.

VE-05.3, July 11, AUSAID1, 11:00

A species survival plan program for Fijian Banded Iguana (*Brachylophus bulabula*), and the development of a Conservation Fund for Fijian Iguanas

Kim Lovich (San Diego Zoo Global, San Diego, USA); Jamie Ivy (San Diego Zoo Global, San Diego, USA)



The San Diego Zoo has maintained Fijian iguanas in captivity since 1976. The majority of the original animals came from Orchid Island, and their island origins were unknown. These animals are maintained in a program referred to as a Species Survival Program where breeding recommendations are made based on best available genetic information. Here we will discuss how new genetic data has impacted our Species Survival Plan for this species, and how *Brachylophus bulabula* are managed in the United States. We will also describe a case study of an illegally imported group of Fijian banded iguanas into the US. The SSP is now focusing on fund raising for *Brachylophus* species through the newly established Fijian Iguana Conservation Fund managed at the San Diego Zoo. Here we will discuss a few of the ways we have been fundraising and collaboratively working with other organizations such as the Dutch Iguanas Foundation, Los Angeles Zoo, and Kula Eco Park to help positively impact *Brachylophus* populations in the wild.

VE-05.4, July 11, AUSAID1, 11:15

A Synthesis of Genetics and Geo-Spatial Analyses to Direct Conservation of Fiji's Frogs

Tamara Osborne-Naikatini (School of Biological and Chemical Sciences, Faculty of Science, Technology and Environment, The University of the South Pacific, Suva, Fiji); Patricia McClenachan (Institute of Fundamental Sciences, Massey University, New Zealand); Peter Lockhart (Institute of Fundamental Sciences, Massey University, New Zealand)

Fiji's frogs are unique in many ways. Firstly, the two *Platymantis* species (*P. vitianus* and *P. vitiensis*) are the easternmost extent of any native amphibian species in the South Pacific islands. Secondly, these are the only frogs endemic to the Fijian archipelago. Thirdly, there is distinct genetic divergence between certain island populations, which would suggest insular evolution of sub-species. And lastly, they have a unique genomic rearrangement which sets them apart from other anuran species. These characteristics along with traits that identify other platymantid frogs (polymorphic colouration, terrestrial breeding, calling patterns), make for a particularly interesting branch of the anuran tree of life. We herein re-describe the conservation status of the Fijian frogs using geo-spatial and genetic analyses. We strongly recommend an upgrade for the conservation status of the Fijian tree frog (*P. vitiensis*) based on distribution data and for a systematic reappraisal of the Fijian ground frog (*P. vitianus*) based on new survey records and identification of significant genetic divergence of the Taveuni sub-population.

VE-05.5, July 11, AUSAID1, 11:30

Can we ensure the long-term survival of skinks on Fijian Islands?

Craig Morley (Wairiki Institute of Technology, Rotorua, New Zealand); Linton Winder (UNITEC, Auckland, New Zealand)

Skinks are successful colonisers of the Pacific islands and occur on most, if not all, islands of several hectares or larger. However, the presence of introduced predators and habitat modification now limits their survival. Fiji has twelve species of skink, 50% are endemic. The two most abundant skinks, *Emoia cyanura* and *E. impar* were observed in differing habitats using a visual encounter survey technique on 16 islands in Fiji, 8 islands with mongoose present and eight without mongoose. Mongoose are found on eight Pacific islands (and many other islands throughout the world), the precise impact of their introduction is not always clear. Present trends suggest an uncertain future for some skinks. However, several features of the remaining populations suggest long-term survival is possible if remedial measures are actioned soon. That is, we protect some populations from predatory species, such as mongoose, and habitat



destruction, use captivity programmes to breed their numbers, and “on-site” management techniques to improve their habitat quality.

VE-05.6, July 11, AUSAID1, 11:45

Community led conservation of the Pig-nosed Turtle of the Kikori River, Papua New Guinea

Eric Manasi (Institute for Applied Ecology, University of Canberra, Australia and Community Development Institute, Kikori, Gulf Province, Papua New Guinea); Carla C. Eisemberg (Environmental Sciences, Charles Darwin University, Darwin NT, Australia); Yolarnie Amepou (Institute for Applied Ecology, University of Canberra); Saina Jeffrey (WWF Western Melanesia, Diwai, Madang, Papua New Guinea); Jasmyn Lynch (Institute for Applied Ecology, University of Canberra, Australia); Arthur Georges (Institute for Applied Ecology, University of Canberra, Australia)

Community led conservation in the Kikori region of Papua New Guinea is an initiative taken up by a local landowner to see his area of land and river protected from human interference and disturbance. This area, Wau Creek, is one of the prime areas where the pig-nosed turtle, *Carettochelys insculpta* nests. Building on this initiative, the Piku Project endeavors to bring awareness to the wider Kikori region on the conservation of the pig-nosed turtle. The awareness program is done through various mediums such as school lectures and workshops, village monitoring and market surveys. School students and locals are engaged in the monitoring program as part of their experiential learning process. Ten thousand copies of a book “*Monty and the Lake Kutubu invasion*”, have been printed and will be distributed to the schools and villages in the Kikori region. The book tells the story of an invasive fish species “the carp” into Lake Kutubu and why it is undesirable. The production of the book and different awareness programs aims to educate locals about the importance of the pig-nosed turtle and its conservation and why it is undesirable to introduce exotic species. Such program aims at providing communities with basic information on the status of the pig-nosed turtle and how their actions are having an impact on its population. It provides an opportunity for the locals to make informed decisions on the use of their natural resources and to build ownership of their resource, not by external agents but through their own initiatives

VE-05.7, July 11, AUSAID1, 12:00

Nesting biology of the Pig-nosed turtles in Kikori and conservation initiatives

Yolarnie Amepou (Institute of Applied Ecology, University of Canberra, Australia); Carla Eisemberg (Research Institute for the Environment and Livelihoods, Charles Darwin University, Australia); Arthur Georges (Institute of Applied Ecology, University of Canberra, Australia); Eric Manasi (Institute of Applied Ecology, University of Canberra, Australia); Jasmyn Lynch (Institute of Applied Ecology, University of Canberra, Australia)

The Pig-nosed turtle, *Carettochelys insculpta*, is the sole extant species of its family Carettochelyidae. It has a globally restricted distribution, only found in the major rivers of Northern Australia and Southern New Guinea. The pig-nosed turtle is one of the largest of the four freshwater turtle species found in the Kikori River drainage of the Gulf Province, Papua New Guinea. Nesting patterns of *C. insculpta* in Kikori have a dichotomy in nesting, either on the coast or upriver. *C. insculpta* have temperature dependent sex determination and display embryonic aestivation with inundation by water. In the different nesting environments nests are either inundated for days at a time up river by floods or by daily tides on the coast. Current research on the nesting biology of the pig nosed turtle in Kikori include studies of inundation between these two contrasting nesting habitats, and how it affects survivorship, sex and the incubation period of hatchlings. The additional information from this research will supplement



and be compared to that previous research to draw rigorous conclusions on the patterns of *C. insculpta* nesting and how inundation affects hatchlings in Kikori. Research will also evaluate the efficacy of landowner community-led conservation action at Wau Creek, in the lowland headwaters of the Kikori, where a beach protection program is underway.

VE-05.8, July 11, AUSAID1, 12:15

Explosive speciation without the help of continents: a case study on insular radiations of Pacific and Indo-Pacific scincid lizards of the genus *Emoia*

Jonathan Q. Richmond (U.S. Geological Survey, San Diego, USA); Robert N. Fisher (U. S. Geological Survey, San Diego, USA)

Scincid lizards of the genus *Emoia* are the most abundant diurnal predators on many Pacific islands. Members of the genus extend from Malaysia in the west, to the Ryukyu Islands of Japan in the north, to the Loyalty Islands in southwestern Polynesia, and to Clipperton Island in the eastern Pacific. Of the 77 currently recognized species, all have evolved on islands, and only three have been able to establish populations on the fringes of Asia and Australia. Behavioral and ecological diversification is substantial, ranging from arboreal species that occur in native rain forest, to shrub and low-branch perchers that prefer disturbed forest, to semi-aquatic forms that inhabit rocky intertidal zones. Despite their widespread distribution and abundance in certain areas, many *Emoia* are threatened, endangered or have recently gone extinct, and in most cases the underlying cause of these declines are poorly understood. In this presentation we discuss the implications of recent phylogenetic analyses on the amount of species-level diversity within *Emoia*, the evolutionary process that gave rise to that diversity, and the uncovering of ancient dispersal pathways that ultimately led to separate, centers of origin for different clades within the group. Our results challenge many of the classic paradigms concerning historical island biogeography, as well as earlier perspectives on the taxonomy and evolutionary history of *Emoia*. That species are currently being lost to extinction in real time speaks to the importance of characterizing *Emoia* diversity before further, irreversible loss occurs, and to the use of genome-wide DNA sequence data as a tool for focusing conservation efforts in areas where the last of 'evolutionary lines' still exist.

VE-06: Systematic conservation planning for marine mega-fauna

VE-06.1, July 11, AUSAID1, 14:30

Prioritising multiple management actions for marine mega-fauna conservation

Mariana M.P.B. Fuentes (Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University); J. Blackwood (Mapoon Aboriginal Shire Council, Mapoon, Queensland); H. Marsh (School of Earth and Environmental Sciences, James Cook University); F.M. Pouzols (Department of Biosciences, University of Helsinki); R.L. Pressey (Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University); P. Visconti (Computational Ecology and Environmental Science Group, Microsoft Research, Cambridge)

Resources for conserving biodiversity are invariably insufficient. This situation creates the need for transparent, systematic frameworks to help stakeholders prioritize the allocation of resources across multiple management actions. We developed a novel framework that explicitly prioritizes actions to minimize the impacts of several threats across a species' range. The framework uses a budget constraint and maximises conservation outcomes from a set of management actions, accounting for the likelihood of the action being successfully applied and accepted by local and Indigenous communities. This approach is novel in that it integrates local knowledge and expert



opinion with optimization software, thereby minimizing assumptions about likelihood of success of actions and their effectiveness. To test the framework, we used the eastern Gulf of Carpentaria and Torres Strait flatback turtle, *Natator depressus*, population as a case study. This approach allowed the framework to be applied in a data-poor context, a situation common in conservation planning. The framework identified the best set of actions to maximise the conservation of flatback eggs for scenarios with different budgets and management parameters and allowed comparisons between optimized and pre-selected scenarios. Scenarios that used a combination of aerial and ground strategies to reduce predation of eggs performed better than scenarios that focused only on reducing harvest of eggs. The performances of optimized and pre-selected scenarios were generally similar among scenarios that targeted similar threats. However, the cost-effectiveness of optimized scenarios was usually higher than pre-selected scenarios, demonstrating the value of conducting a systematic optimization approach. Our method provides a foundation for more effective conservation investments and guidance to prioritize actions within recovery plans while considering the socio-political and cultural context of decisions. The framework can be adapted easily to a wide range of species, geographical scales, and life-stages.

VE-06.2, July 11, AUSAID1, 14:45

Challenges and opportunities for marine turtle conservation

Mark Hamann (School of Earth and Environmental Sciences, James Cook University, Townsville, Australia)

Managing migratory marine wildlife is challenging because the species ecological scale and the scales that management occurs offer differ in size. Marine turtles are a good example because they are found in a broad geographic area, and their management is a responsibility of several nations, states and local institutions. We used data from community based satellite telemetry projects on green turtles to demonstrate the various governance frameworks, and geographic cover required to suitably manage threats. During migration, inter-nesting and foraging individual turtles were found to move between and among International waters, State waters and areas designated for community management. In particular, each turtle we tracked spent time within more than one management jurisdiction or community management area and while inter-nesting female turtles occupied a home range of 170 km² and often spanned more than one jurisdictional area. Each of the satellite tracking releases was done as part of a community engagement exercise. The evaluation of which clearly indicate that involving indigenous, or other local groups, in monitoring projects can positively influence management initiatives. Further we highlight that effective management of green turtles needs a suite of management tools to cover local, co-management and top-down approaches and we advocate that threatened species monitoring programmes actively involve locals and indigenous people to further enhance the conservation.

VE-06.3, July 11, AUSAID1, 15:00

Critical habitats of sea turtles in Fiji

Laitia Tamata (WWF Pacific, Suva, Fiji); Merewalesi Laveti (WWF Pacific, Suva, Fiji); Penina Solomona (Pacific Regional Environment Program, Apia, Samoa); Aisake Batibasaga (Department of Fisheries, Suva, Fiji); Neema Nand (Fiji Community Development Program); Kasaqa Tora (National Trust of Fiji)

Fiji waters are known to be a critical habitat for foraging sea turtles population in the Pacific region. Recent surveys by the Secretariat of the Pacific Regional Environment Programme on satellite tagging revealed the migration of sea turtles to Fiji waters for feeding. Areas of importance for sea turtle conservation in Fiji were identified through community based sea turtle



monitoring and research, traditional knowledge and consultation with partners who have worked in these areas. The collated information were consolidated and mapped out revealing these critical habitats for protection. The great sea reef is one of the critical foraging sites identified given the results of the satellite telemetry in Fiji. It also highlighted that Fiji's sea turtle population are residential. More satellite telemetry works needed to be conducted to allow for a stronger justification of the migrating behavior of sea turtles in Fiji. All the seven satellite tagged turtles in Fiji did not show any migration out of Fiji. The migration patterns of the seven turtle species including loggerhead, green and hawksbill were mainly movements within inshore waters of more than one customary fishing grounds. It also showed the ecological connectivity of these marine protected areas and the greater need to enhance community based conservation and engagement in sea turtle monitoring to allow for an informed decision in the protection of sea turtles.

VE-06.4, July 11, AUSAID1, 15:15

Implementing conservation planning approaches for dugongs and their seagrass habitats in the Pacific Islands: Lessons learnt from a global perspective

Donna Kwan (CMS Dugong MoU Secretariat, Abu Dhabi, United Arab Emirates)

Conservation of marine mammals, which have diverse social, cultural, economic and ecological values, such as dugongs, is complex and challenging. The conservation of dugongs is further complicated by fragmented population distribution over vast ocean areas; substantial changes in life-history parameters associated with seagrass availability; high costs of real-time monitoring; and the small-scale artisanal nature of the gill-fisheries which cause the greatest mortality through bycatch. The Secretariat to the Dugong MOU (CMS Dugong MOU), under the auspices of the Convention on the Conservation of Migratory Species of Wild Animals (CMS), has been working to support the development of pragmatic and effective solutions for the conservation of dugongs and their seagrass habitats. The approach taken has been two-pronged: 1. To provide a rapid, low-cost solution to acquisition of scientifically robust dugong and fishery data, through the use of a questionnaire with a spatial analysis component to identify areas where dugongs and fisheries overlap ('conservation hotspot'); and 2. To use the results of the questionnaire to develop targeted pilot projects which utilise incentives for fishing communities to manage fishing interactions with dugongs. With several partners, the CMS Dugong MoU Secretariat is developing and implementing a series of innovative projects across the Indian and Pacific Ocean basins. The questionnaire generated baseline information for the development of pilot projects in eight developing countries (Indonesia, Malaysia, Madagascar, Mozambique, Solomon Islands, Sri Lanka, Timor-Leste, Vanuatu) as part of a Dugong and Seagrass Conservation Project funded by the Global Environment Facility. A further five countries with regionally important dugong populations have also been surveyed and are being supported by the CMS Secretariat to develop pilot projects (India, Myanmar, Papua New Guinea, Philippines, Thailand). The pilot projects are being developed to focus on opportunities that are financially sustainable in the long-term.

VE-06.5, July 11, AUSAID1, 16:00

Using aerial surveys as one of the key decision supporting tools to improve dugong conservation in New Caledonia

Christophe Cleguer (James Cook University, Townsville, Australia)

The dugong is listed as vulnerable at the global scale and there are growing concerns about how this coastal seagrass-dependent species will cope with the increasing human-derived pressures on



the coastal marine environment. The dugong range extends to the east to the Pacific island region where the species status is listed as 'data deficient' by the IUCN. In New Caledonia collective work is under way between local environmental managers and scientists to fulfil this knowledge gap and to improve local conservation strategies of dugongs at the scale of the territory. Dugong aerial survey is one of the tools that have been used locally in the last decade to (1) monitor the dugong population size and distribution and (2) assess the level of protection provided by marine protected areas for the species. Aerial surveys have identified spatial and temporal variations in dugong abundance and distribution which have implications for local spatial based coastal and marine management. During this symposium I will present the results from the surveys as well as discuss (1) the benefits of using aerial surveys as management decision supporting tools and (2) the precautions that need to be taken when interpreting the results.

VE-06.6, July 11, AUSAID1, 16:15

SPREP's Marine Species Action Plans – a regional blueprint for the conservation of charismatic marine mega-fauna

Penina Solomon (Pacific Regional Environment Program, Apia, Samoa); Mike Donoghue (Threatened and Migratory Species Adviser, Pacific Regional Environment Program, Apia, Samoa)

The Secretariat for the Pacific Environment Programme (SPREP) provides advice and support for its 21 Pacific Island members and 5 other metropolitan countries. Many species of endangered or threatened cetaceans, turtles, and sharks, as well as dugong, are found within the SPREP region, which covers some 40 million sq km of ocean, much of it within the Exclusive Economic Zones of its members. Various international instruments exist to provide for the conservation of these species, but the Marine Species Action Plans developed by SPREP members are the most effective, because most of them have been carefully negotiated between SPREP members. There is an urgent need for both well-focused research and additional funding to secure the future of these charismatic mega-fauna for future generations. Collaborations with NGOs and various international institutions, as well as national governments, may provide the most promising way forward.

VE-06.7, July 11, AUSAID1, 16:30

Population viability and major histocompatibility complex (MHC) genetic diversity of two dolphin populations in Western Australia

Oliver Manlik (Evolution and Ecology Research Centre, School of Biological, Earth and Environmental Sciences, University of New South Wales); Janet Mann (Evolution and Ecology Research Centre, School of Biological, Earth and Environmental Sciences, University of New South Wales and Department of Biology and Department of Psychology, Georgetown University); Michael Krützen (Evolution and Ecology Research Centre, School of Biological, Earth and Environmental Sciences, University of New South Wales and Anthropological Institute & Museum, University of Zurich); Holly C. Smith (Cetacean Research Unit, Centre for Fish, Fisheries and Aquatic Ecosystems Research, Murdoch University and Marine Science Program, Department of Parks and Wildlife, Perth, Western Australia); Jane A. McDonald (Evolution and Ecology Research Centre, School of Biological, Earth and Environmental Sciences, University of New South Wales); Simon Allen (Cetacean Research Unit, Centre for Fish, Fisheries and Aquatic Ecosystems Research, Murdoch University); Lars Bejder (Cetacean Research Unit, Centre for Fish, Fisheries and Aquatic Ecosystems Research, Murdoch University); Richard C. Connor (Biology Department, University of Massachusetts); Michael R. Heithaus (Department of Biological Science, School of Environment, Arts and Society, Florida International University); Claire Daniel (Evolution and Ecology Research Centre, School of Biological, Earth and Environmental Sciences, University of New South Wales); Bob Lacy (Chicago Zoological Society); William B. Sherwin (Evolution and Ecology Research Centre, School of Biological, Earth and Environmental Sciences, University of New South Wales, and



Cetacean Research Unit, Centre for Fish, Fisheries and Aquatic Ecosystems Research, Murdoch University)

Genetic diversity is considered essential for populations to adapt to a changing environment. Measures of genetic diversity to evaluate how isolated, inbred and viable a population is, are typically based on various neutral markers, such as microsatellites or mitochondrial DNA control regions. However, genetic diversity to guide conservation management is better reflected by coding regions of functionally important genetic loci, such as the major histocompatibility complex (MHC) genes. In this study we assessed population viability and MHC diversity of two bottlenose dolphin (*Tursiops cf. aduncus*) populations in Western Australia. From demographic data, the larger Shark Bay population appears to be stable, whereas the smaller Bunbury population was forecast to decline. Furthermore, we found the more viable Shark Bay population to be more genetically diverse for at least one (MHC II, DQB, exon 2) of the three MHC loci that we investigated. Our findings are consistent with the hypothesis that large, viable populations typically display greater genetic diversity compared to smaller, less viable populations. A larger population, such as the Shark Bay dolphin population, is thus potentially more robust to natural or human-induced changes to coastal ecosystems it inhabits across Oceania.

VE-06.8, July 11, AUSAID1, 16:45

Moving from National Cetacean Sanctuaries to Joined up MPA Networks and Spatial Planning for Pacific Whales & Dolphins

Cara Miller (Institute of Marine Resources, University of the South Pacific, Suva, Fiji and Pacific Islands Programme, Whale and Dolphin Conservation, Fiji); Erich Hoyt (Marine Protected Area Programme, Whale and Dolphin Conservation, United Kingdom); Margi Prideaux (Wild Migration, Australia); Vagi Rei (Department of Environment and Conservation, Papua New Guinea Government, Papua New Guinea); Mike Tetley (Department of Environment and Conservation, Papua New Guinea Government, Papua New Guinea)

To date, spatial planning and habitat management for cetaceans in the Pacific Islands has been addressed mainly at a broad scale via the declaration of 12 EEZ-wide sanctuaries. Such designations of large no-hunting areas for cetaceans are a welcome sign of conservation intention. However, in most cases on-the-ground strategic plans of action for such sanctuaries have yet to be considered. Two obstacles for this lack of implementation are: limited resources to design and implement effective marine protected areas (MPAs) and MPA networks, and the multitude of agreements and commitments that require action. Here we present an overview of current regional management measures for cetacean habitat protection. We also provide a case study outlining work being undertaken to implement a national cetacean management plan in Papua New Guinea (PNG). Keys to early progress in PNG have been: solicitation of input from a wide variety of stakeholders to forge a path that is synergistic with national priorities (e.g. the National Marine Plan, Coral Triangle Initiative, a national MPA network, and a Convention of Migratory Species agreement for Pacific Island cetaceans), identification of noted gaps in legislative frameworks, on the ground fieldwork that has formed strong partnerships and capacity-building opportunities with both government and local communities, and integration of best practices for MPAs and MPA networks with cetaceans through cooperation with international experts.



VE-07: Avifauna of Oceania

VE-07.1, July 11, AUSAID2, 14:30

Applying community assembly rules to seabird restoration: patterns of burrow-nesting seabird species co-occurrence after rat eradication

Rachel T. Buxton (Department of Zoology and Centre for Sustainability: Agriculture, Food, Energy, Environment, University of Otago, Dunedin, New Zealand); C. Jones (Landcare Research, Lincoln, New Zealand); P. Lyver (Landcare Research, Lincoln, New Zealand); D. Towns (Institute for Applied Ecology, Auckland University of Technology, Auckland 1142, New Zealand)

Community structure is thought to be regulated by assembly rules, where biotic and abiotic interactions shape species' occurrence. Habitat alteration and subsequent restoration can affect species distribution patterns profoundly. Around the New Zealand archipelago burrow-nesting petrel communities have been altered by the introduction of rodents by humans although, more recently, safe breeding spaces have been restored by rat eradication. It is unclear how species interactions will affect the re-assembly of burrow-nesting seabird communities. To draw inference on assembly rules in recovering communities, we evaluated inter-specific distributions and nesting habitat associations among six petrel species on six islands off north-eastern New Zealand: four islands from which Pacific rats (*Rattus exulans*) were eradicated between 3 and 26 years ago, an island that has never had rats, and an island with rats still present. Results indicated that community assembly is affected by abiotic factors, including soil properties and topography; and biotic factors, namely inter-specific facilitation. However, exclusion between species increased with time since eradication, suggesting that disturbance by rodents has altered petrel communities in such a way that has led to competition, rather than facilitation, governing community assembly. We recommend co-occurrence analysis to study post-eradication recovery with a focus on community-level, rather than single species restoration management.

VE-07.2, July 11, AUSAID2, 14:45

Optimising disturbance management of migratory shorebirds in Moreton bay, Australia

Kiran Dhanjal-Adams (Environmental Decisions Group, School of Biological Sciences, University of Queensland, St Lucia, Australia); Hugh Possingham (Environmental Decisions Group, School of Biological Sciences, University of Queensland, St Lucia, Australia); Richard Fuller (Environmental Decisions Group, School of Biological Sciences, University of Queensland, St Lucia, Australia)

In Moreton Bay Marine Park, Australia, disturbance is a major threat to declining migratory shorebirds and impacts individual species differently. On some tidal flats, disturbance from dogs, people or horses illegally causing feeding or roosting birds to take flight is almost continuous. Marine Park personnel therefore enforce regulations through patrols, yet have limited resources with which to carry out enforcement. We therefore determine how Moreton Bay Marine Park personnel can spatially allocate their patrol effort between sites to identify which combinations deliver the greatest reduction in disturbance to the largest number of birds for the least cost. We find that sites with large numbers of birds, but low disturbance rates, offer little management benefit, as do sites with high disturbance rates but few birds. For migratory species such as shorebirds, local scale management solutions can therefore play an important role in helping reverse international scale declines.



VE-07.3, July 11, AUSAID2, 15:00

Australia-wide conservation genetics of Little Penguins (*Eudyptula minor*):

Augmenting population genetics at neutral loci with the immunogenetic MHC

Sandra Vogel (School of Biological, Earth and Environmental Sciences; University of New South Wales, Australia); Jennifer Sinclair (School of Biological, Earth and Environmental Sciences; University of New South Wales, Australia); William Sherwin (School of Biological, Earth and Environmental Sciences; University of New South Wales, Australia)

Neutral genetic markers, i.e. genes not directly targeted by selection, are frequently used to quantify genetic diversity of populations and derive population structure and dispersal patterns, which often provide the basis for management plans. However, variation at neutral markers is not always correlated with patterns of diversity and divergence of adaptive traits influencing fitness, such as immune competence. Thus the validity of relying on neutral markers to shape conservation strategies is questionable. This study of conservation genetics and demography in *E. minor* assesses connectivity of penguin colonies along the Australian coast. A fine-scale analysis of genetic structure was conducted to determine the extent of dispersal among colonies and compare their genetic variability. In addition to using neutral genetic markers (microsatellites and mitochondrial DNA), we present the first study investigating non-neutral genetic diversity in Little Penguins. Sequencing of an immune gene of the major histocompatibility complex (MHC) showed high allelic diversity at the functionally relevant peptide binding groove of the MHC molecule in penguins from Western Australia (WA). It is thus an ideal candidate gene to augment the Australia-wide study. Together with recent demographic estimates based on minimal invasive methods, genetic data will be used to refine management strategies for *E. minor* with a particular focus on population viability and resilience to pathogenic threats.

VE-07.4, July 11, AUSAID2, 15:15

Postglacial expansion and not human persecution best explains the population structure in the endangered kea (*Nestor notabilis*)

Nicolas Dussex (Department of Zoology, University of Otago, Dunedin, New Zealand); Ian Jamieson; Bruce Robertson

Inferring past demography is a central question in evolutionary and conservation biology. It is however sometimes challenging to infer the processes that shaped the current patterns of genetic variation in endangered species. Population sub-structuring can occur as a result of survival in several isolated refugia and subsequent recolonization processes or via genetic drift following a population decline. The kea (*Nestor notabilis*) is an endemic parrot widely distributed in the mountains of the South Island of New Zealand that has gone through a major human-induced population decline during the 1860s-1970s. The aims of this study were to understand the glacial and post-glacial history of kea and to determine whether the recent population decline played a role in the shaping of the current genetic variation. We examined the distribution of genetic variation, differentiation and admixture in kea using 17 microsatellites and the mitochondrial control region. Mitochondrial data showed a shallow phylogeny and a genetic distinction between the North and South of the range consistent with the three genetic clusters identified with microsatellite data. Both marker types indicated an increase of genetic isolation by geographic distance. To try and explain this population structure, we estimated the probability of three possible population scenarios: (1) an “ancient divergence” in two glacial refugia followed by recent admixture, (2) a “recent divergence” from a single ancestral refugium or (3) a “recent human-induced bottleneck” leading to population divergence via genetic drift. Our data supported a scenario of “recent divergence”, suggesting that the contemporary genetic structure has resulted



from post-glacial recolonisation processes rather than from the recent population decline. The recent origin of this genetic structure suggests that each genetic cluster does not need to be considered as independent conservation units.

VE-07.5, July 11, AUSAID2, 16:00

The New Zealand rock wren (*Xenicus gilviventris*): impacts of past climate change on connectivity within an alpine archipelago

Kerry Weston (Department of Zoology, University of Otago, Dunedin, New Zealand); Bruce Robertson; Ian Jamieson

Many species occur in naturally subdivided populations due to spatial heterogeneity of the landscape. This is especially evident in alpine species where naturally fragmented habitat may be viewed as an 'alpine archipelago'. These high altitude habitat patches and the species they harbour can provide significant insight into past biogeographical change and serve as useful models for predicting responses to anthropogenic habitat fragmentation. The rock wren (*Xenicus gilviventris*) is a threatened alpine passerine belonging to the endemic New Zealand wren family (Acanthisittidae). Rock wren constitute a widespread, naturally fragmented population, occurring in patches of suitable habitat over c.900 m in altitude throughout the length of the South Island, New Zealand. The dispersal characteristics of rock wren are largely unknown, though given that they have limited flight ability, long-distance dispersal seems unlikely. We investigated gene flow and connectivity in rock wren (n=134) throughout their range. Using both microsatellites and mtDNA sequence data, we identify strong population structuring in rock wren and a genetic signal of historical climatic events. We also find evidence for a recent (i.e. within the past c.100 years) reduction in effective population size suggesting that although natural climate fluctuations have played an important role driving patterns of rock wren abundance in the past, these impacts are now being compounded by much more recent anthropogenic impacts, most likely, predation by introduced mammalian predators.

VE-07.6, July 9, AUSAID2, poster session, 18:00

Habitat restoration for Little Blue Penguins in New Zealand's capital

Rose-Anne Merz

Habitat degradation and competition by introduced predators are the two main threats for biodiversity loss worldwide. New Zealand's native little blue penguins (*Eudyptula minor*) have been affected and many colonies have declined or even disappeared. Our project 'Places for Penguins' (PfP), run entirely by volunteers aims to increase penguin numbers by restoring their habitat on Wellington's shores. The little blue penguin returns every evening from its feeding journey out at sea, to stay on shore overnight. During molting season penguins lose their buoyancy which forces them to stay on shore for several weeks. To provide a suitable and save habitat during its time on land PfP has equipped the shores with over 200 handmade wooden nest boxes that are especially designed for penguins and their offspring. Additionally PfP is replanting native vegetative cover that penguins prefer for natural nest sites. Another major problem is the predation of invasive pest species. We are using baiting stations to reduce pest numbers and initiated a program to raise public awareness to reduce other dangers such as dog attacks and penguin road kill from the nearby roads. More recently we have launched a monitoring program. The project anticipates finding an increase in penguin numbers.



VE-08: Freshwater, forest ecosystems and climate change

VE-08.1, July 9, N111, 10:45

Forecasting the availability of old-growth habitat features in relictual eucalypt woodlands

Jennifer E. Taylor (School of Science, Australian Catholic University, North Sydney, Australia); Murray V. Ellis (Science Division, Office of Environment and Heritage NSW, Hurstville BC, Australia); Laura Rayner (The Fenner School of Environment and Society, Australian National University, Canberra, Australia)

Understanding development time for habitat features that are critical to biodiversity is fundamental to management and restoration of relictual ecosystems. Our aim is to be able to predict changes in habitat features (e.g. tree hollows) in woodlands that are the focus of restoration in highly cleared agricultural landscapes. In semi-arid woodland in south-east Australia we measured habitat variables at 105 one-hectare sites to determine the availability of hollows and dead standing timber. At 40 sites we assessed stand condition and measured five-year growth for 1059 trees. Growth in diameter at breast height varied among six widespread *Eucalyptus* tree species and varied among sites. Growth was much more variable than described in previous studies and decreased with increasing canopy cover despite tree densities being low. Approximately 1% of trees died during the study period, and recruitment rate was <4% and was patchy. Modelling indicates potentially large variations in future tree densities even at these low mortality rates, and that large trees will be the major contributors to biomass production. In this environment with these rates of growth, we estimate it will take between 100 and 200 years for young trees to reach sizes where they have a 50% chance of containing hollows, and twice as long for large hollows. This demonstrates the length of time it will take to address the habitat needs of hollow-dependent fauna through restoration plantings.

VE-08.2, July 9, N111, 11:00

Restoration in highly degraded habitats: plant regeneration following ungulate exclusion and invasive plant control in a remnant semi-dry forest on Rapa Iti (South Pacific)

Tiffany Laitame (Université de la Polynésie française, Tahiti, French Polynesia); Jean-Yves Meyer (Délégation à la Recherche, Government of French Polynesia, Tahiti, French Polynesia); Jean-Claude Gaertner (Institut de Recherche pour le Développement, Tahiti, French Polynesia)

Anthropogenic disturbances and introductions of non-native plants and ungulates have dramatically altered the composition, structure and dynamics of island ecosystems, making restoration of these degraded habitats challenging. The combined effects of deforestation, fires, grazing and trampling by cattle, horses, feral goats and pigs have reduced the native forests of Rapa Iti, the southernmost inhabited island of French Polynesia (South Pacific), to 13% of its total land area. In 2011, a 1,200 m² fenced enclosure was built to protect a semi-dry forest remnant invaded by the small tree *Psidium cattleianum* (Myrtaceae). To evaluate the effectiveness of different kind of restoration interventions, we established sixteen 12x12 m permanent plots in which we applied four replicates of four treatments: manual removal (tree cutting) of *Psidium*, fencing without removal, fencing with removal, and an un-manipulated control. In each plot, native and alien plant species diversity and cover were evaluated in 24 randomly located 2x2 m quadrats in each plot. There was no effect of treatment type on plant recruitment after 6 months or 12 months. However, after 18 months, native plant species richness was significantly higher in the fenced plot with *Psidium* removal. Alien plants richness also



declined, but their cover remained higher than natives in all treatments. Preliminary results suggest that fencing and *Psidium* removal may be an effective restoration strategy for increasing native plants richness. Long-term monitoring (2 years or more) is needed to confirm these results before planning other restoration measures such as rare endemic plant reintroduction in the fenced area.

VE-08.3, July 9, N111, 11:15

An island of woodland in an ocean of wheat: endangered marsupials as egg-predators of endangered birds

Graham R. Fulton (Murdoch University, Western Australia)

This study was carried out in a 27,000 ha woodland island within a 14,000,000 ha ocean of wheat – Dryandra Woodland in south-western Australia. Woodland birds are of special interests within Australian ecology, because they have declined alarmingly in association with clearing for agriculture. This decline is amplified in ground nesting birds. I studied nesting ecology in woodland birds at a site where: foxes and cats were controlled, endangered native birds and marsupials remained in ecologically functional numbers and some marsupials, which are extinct from the mainland, were reintroduced. While 43 bird species with 542 nests were monitored over 11,200 nest-days only 7 nests built on the ground were detected. Therefore, artificial ground-nests were used (50 nests/year, over two years) to identify if marsupials might be potential predators of ground-nests. These nests collected imprints in clay eggs, which identified three marsupial predators and found that birds played a relatively minor egg-predatory role. The primary marsupial predators were: Brushtail Possum (*Trichosurus vulpecula*), Woylie (*Bettongia penicillata*) and Boodie (*B. lesueur*). In addition, The Bilby (*Macrotis lagotis*) depredated a natural an active burrow-nest of a Rainbow Bee-eater (*Merops ornatus*). Because the veracity of artificial nest procedures has been questioned, I use *A priori* evidence (knowledge deduced from the literature) to suggest that the role of these marsupials requires further investigation and must be considered in future conservation management.

VE-08.4, July 9, N111, 11:30

Community profiling and bioactive secondary metabolite potential of unexplored microbialites across Australia and implications for their conservation

David Vardeh (School of Biotechnology and Biomolecular Sciences, University of New South Wales, Sydney); Brett A. Neilan (School of Biotechnology and Biomolecular Sciences, University of New South Wales, Sydney)

The present study is the first to report microbial community composition of extant microbialites from hitherto unsampled sites and to assess their potential role in novel drug discovery. Microbialites are accreted structures that host microbes exhibiting a variety of metabolic pathways. Having been the dominant life forms on Early Earth, living microbialites can now only be found in systems that exclude eukaryotic competition due to extreme conditions such as high salinity. Microbialites from various environments were sampled: Caves in New South Wales and ephemeral hypersaline lakes along the coasts of South Australia and Western Australia. The microbial community composition was examined by next generation sequencing of the 16S rRNA region. Denatured primers targeting polyketide synthetase (PKS) and nonribosomal peptide synthetase (NRPS) domains were successfully used to screen for the occurrence of secondary metabolite producing regions. A wide array of microbial taxa harbouring a high percentage of unknown sequences has been unveiled, including groups known to have effective means of osmoregulation by metabolite production. With the ephemeral lakes frequently falling dry and



some being adjacent to settlements or pastures, conservation of these environments is critical in times of climate change and anthropogenic alterations. The lack of awareness of these rich microbial assemblages jeopardises the chance to tap their full potential for bioactive compound production.

VE-08.5, July 9, N111, 11:45

Next-generation sequencing as a tool to elucidate structural and functional responses of a sediment community to field manipulated stressors

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Next-generation sequencing (NGS) is a modern and powerful tool to characterize entire ecological communities in a cost-effective way. Extensive information relating to the structure and functional activity of a community can be extracted with NGS. This ecological information can then be interpreted with respect to different environmental and anthropogenic stressors. We investigated multiple stressor effects on microbial communities by mixing field collected estuarine sediments with fertilizer to create a gradient of metal contamination and organic enrichment. We deployed these sediments subtidally in recruitment containers for 4 months. NGS was then used to characterize the sediment microbial communities and measure the functional activity, whereas we mainly focused on biogeochemical processes. Preliminary results suggest that community structure changed in response to increasing organic enrichment, but metal effects were variable. On the functional gene level, we found specific genes that seem to be associated with metal contamination. Furthermore, nutrient cycling genes were up-regulated to cope with enriched sediments. Our results enhance understanding of the capacity for microbial communities to maintain important ecosystem processes in the presence of stressors. This study has implications for future estuarine ecosystem management and highlights the potential of NGS approaches to inform monitoring programs.

VE-08.6, July 9, N111, 12:00

Prioritisation of wetlands for waterbird conservation in a boom and bust system: a case study of the Murray-Darling Basin

Gilad Bino (Centre for Ecosystem Science, University of NSW, Australia); John Porter; Richard T. Kingsford (Centre for Ecosystem Science, School of Biological, Earth and Environmental Sciences, University of NSW, Australia)



Freshwater systems are degrading at an accelerated pace, possibly greater than terrestrial and marine biomes. River development and habitat loss are the main drivers of degradation, diminishing the frequency, extent, and quality of available habitats. We took a systematic conservation planning approach to prioritise wetlands across a sampled area (13%) of the Murray-Darling Basin (MDB), using 30 years of waterbird aerial surveys. We divided the MDB into ~5x5km planning units (PUs), selecting those that intersected with aerial survey bands (7,202). Representation targets of 80% of total abundance for each of the 57 waterbird taxa was achievable within 87 PUs. These were generally concentrated in the south-west of the MDB and were large prominent wetland systems. Setting representation targets based on five functional groups, approximately halved the number of PUs needed for representation. The large temporal span of our data in a system characterised by dramatic boom and busts in water availability provided us with a unique opportunity to also examine variation in prioritisation of wetlands during both wet and dry years. Annual variation in meeting target representation for all species ranged from 22 (1986) to 59 (1999) PUs (average $41.43 \pm 9.55sd$). Significantly different sets of PUs were identified between dry and wet years. In wet years, lacustrine and palustrine systems were prioritised for, while in dry years prioritisation identified lacustrine and riverine systems. Identifying variable wetlands function for waterbirds in a system characterised by dramatic boom and bust, is a critical first step in developing conservation planning and management strategies for the long-term persistence of waterbirds and freshwater systems.

VE-09: Species in Oceania

VE-09.1, July 9, N111, 14:45

A mismatch of community attitudes and actions: A study of Koalas

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Wildlife populations, particularly in urban areas, are declining at a rapid rate. This is in part due to a disconnection between the lives of urban residents and native wildlife. The reconnection of social and ecological systems by understanding the linkages between individual attitudes and conservation behavior will help improve conservation outcomes. This study investigated the attitudes of local communities towards koala populations and wildlife conservation in southeast Queensland, Australia. Data was collected using a questionnaire in face-to-face surveys ($n = 102$). Principal Component Analysis was used to quantify attitude and action statements into key components. Further analysis of demographics and knowledge of koalas was performed using analysis of variance and regression analysis. Results suggested that residents' attitudes toward koala conservation were strongly correlated with their home's proximity to relatively intact habitat. Residents living in peri-urban areas were significantly more likely than suburban residents to have a positive attitude towards koala conservation, and were considerably more willing to participate in actions to conserve koalas. These results highlight the importance of understanding variations in community behaviour towards biodiversity conservation in urban and



peri-urban neighborhoods and suggests that local governments and conservation groups use area of residence to target urban planning and conservation initiatives more effectively.

VE-09.2, July 9, N111, 15:00

Comparison of macro-moth diversity and community structure in a native and mixed forest on Viti Levu, Fiji

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Many Lepidopteran species are host-specific during their larval stages. Floristic and structural changes as well as environmental conditions could affect their community structure and biodiversity. For the same reason, various studies suggest a relationship between moth communities and forest types, illustrating how moths respond sensitively to variable habitats and their alterations. However, in the Pacific, including Fiji, there are a lack of studies and information to quantify and determine what affects and influences moth assemblages. In Fiji, nocturnal surveys were carried out in a native and mixed rainforest in order to determine differences in the biological diversity of macro-moths (species richness, abundance and patterns of endemism) across the two different vegetation types. Changes were anticipated because of the presence of different habitat types and host plant assemblage. The surveys used Mercury vapour light trap at night targeting three prominent forested landforms of slopes, ridges and river flats. The preliminary results from this study may be used as a baseline dataset for species diversity, community structure and trends of macro-moth abundance in these forest types. It also provides the significance of macro-moths as potential biological indicators of different (native and exotic) forest types.

VE-09.3, July 9, N111, 15:15

Can a Brazilian control your wandering willie? The use of beetles (*Neolema ogloblini*, *Neolema abbreviata* and *Lema basicostata*) from Brazil as a biological control for an invasive plant (*Tradescantia fluminensis*) in New Zealand

Rosalynn Anderson-Lederer (Queen Elizabeth the Second National Trust, Wellington, New Zealand); Genevieve Bannister ; Miles Giller; Nan Pullman

Tradescantia fluminensis (wandering willie) is a densely growing, invasive weed found throughout parts of New Zealand that inhibits the growth of native flora. Traditional control has been by hand spraying with a Glyphosate, Triclopyr or Amitrole based product (site dependant) with follow up spraying being necessary. Several native plants are particularly vulnerable to these sprays and spraying around waterways is undesirable. Hand weeding is ineffective because fragments from the stems, which break easily when pulled, are capable of resprouting. The Queen Elizabeth the Second National Trust (QEII), a New Zealand charity, which secures long-term legal protection of natural and cultural features on private land, works closely with landowners to preserve native flora and fauna by aiding in weed and pest control. The leaf (*N. ogloblini*), stem (*L. basicostata*) and tip (*N. abbreviata*) beetles are native to Brazil and Argentina but were approved by the Environmental Risk Management Authority (ERMA) for use as biological control in New Zealand. QEII released the leaf beetle into covenants in 2011 and 2014 to combat *T. fluminensis*, with future plans to release stem and tip beetles as funding becomes available. Preliminary results show that leaf beetles released near Whangarei in 2011 are having a positive effect in the treatment against *T. fluminensis* and further releases are indicated. The beetles are highly host specific and using these beetles as a biological control for *T. fluminensis* would mean



fewer resources (i.e. time, money) would be spent removing the weed by hand as well as a decrease in the use of herbicides.

VE-09.4, July 9, N111, 15:30

First matrix model for the vulnerable population of southern right whales (*Eubalaena australis*) in New Zealand waters.

Anthony Davidson (Department of Zoology, Otago University, New Zealand); Elisabeth Slooten (Department of Zoology, Otago University, Dunedin, New Zealand), William Rayment (Department of Marine Science, Otago University, Dunedin, New Zealand)

Southern right whales (*Eubalaena australis*) were nearly extirpated from New Zealand waters but are now thought to be recovering. Here we present the first matrix population model for this vulnerable population of southern right whales. This matrix population model will improve insights into population trajectory and demographic consequences of potential anthropogenic impacts such as ship strike and entanglement. Parameters used in the matrix model incorporate life history traits, conspecific parameters, and data collected in Port Ross, Auckland Islands (2006-2012). A three-stage, female only, matrix population model was used to estimate growth rate, stage distribution and sensitivity/elasticity. The estimated growth rate is $\lambda=1.056$ (95% bootstrapped CI: 1.019-1.130). Sensitivity analysis suggests the mature female stage had the highest proportional effect on growth rate. This population growth, coupled with recent recolonization of former habitats around mainland, and evidence from congeneric populations, suggest that southern right whales in New Zealand may become exposed to impacts in the future, e.g. from fishing and shipping. Conservation management aimed at maximizing mature female survival (e.g. MPAs, shipping restrictions) will be important for continued population recovery.

VE-09.5, July 9, N111, 16:15

Fiji's bats: understudied, undervalued, and in dire need of conservation measures

J.S. Malotaux; Kelera Macedru-Buadromo (NatureFiji-MareqetiViti, Fiji). H. Spencer (Australian Tropical Research Foundation)

Bats play a vital role in Fiji's ecosystems as they provide essential services such as pollination, seed dispersal and insect control. However, most of Fiji's six bat species are threatened. Roost disturbance, habitat loss and introduced predators are only few of the threats the bats face. Fiji's bats are poorly studied, and this lack of information makes it difficult to direct conservation efforts. We investigated the current status of bats in Fiji, conducting roost site checks and assessing threats at colony sites. Most bat roosts in Fiji are located on communal lands. We found that knowledge about bats is limited in local communities. Threats to bats are often related to ignorance of the bats and the important roles they play in ecosystem maintenance. As the support of local communities is critical to the long-term protection of bats, we set up a poster-based education and awareness campaign in communities to increase community awareness of the importance of these species. This project sheds light on the tenuous status of Fiji's bat species, highlights the importance of developing community awareness and support in species protection, and provides recommendations for further research as well as further conservation efforts.

VE-09.6, July 9, N111, 16:30

Potential predation of the Maud Island frog, *Leiopelma pakeka*, translocated into the Zealandia eco-sanctuary in Wellington, New Zealand

Tanya M. Karst (Centre for Biodiversity & Restoration Ecology, Victoria University of Wellington, New Zealand); Ben D. Bell (Centre for Biodiversity & Restoration Ecology, Victoria University of Wellington,



New Zealand); Shirley Pledger (School of Mathematics, Statistics and Operations Research, Victoria University of Wellington, New Zealand)

Insufficient numbers, poor habitat and predation are potential reasons for a reported translocation failure of 29 Maud Island frogs, *Leiopelma pakeka*, to the Zealandia eco-sanctuary in Wellington, New Zealand in 2006/07. After habitat enhancement and kiwi-exclusion, an additional 101 frogs were translocated to the sanctuary in 2012. Living sympatrically with house mice, *Mus musculus*, frog survival was monitored for nine months. These results indicated that the original translocation had not completely failed; four adults from the original translocation and 12 unidentifiable frogs were found. Jolly-Seber analysis indicated a high constant survival (0.914, 0.87/0.94 CI) for all 117 frogs and population estimates showed a negative trend starting at the second capture period (slope= -4.69, -6.70/-2.68 CI). A negative binomial generalized model indicated a positive correlation between temperature and total number of emerged frogs ($p < 0.001$); relative humidity approached significance with a potential positive trend ($p = 0.0517$). Mouse activity and precipitation did not show significance ($p > 0.05$). The predatory interest by little spotted kiwi (LSK), *Apteryx owenii*, was assessed using a five-night video analysis of foraging behavior in the presence of *L. pakeka*. This failed to indicate a strong response of LSK to the presence of *L. pakeka*. This study suggests that neither house mice nor LSK are likely candidates for the dramatic decline in the 2006/07 translocated population.

CBM-01: Advancing the integration of connectivity processes into marine conservation planning

CBM-01.1, July 9, AUSAID2, 10:45

Identifying patterns of network connectivity in marine metapopulations

Hugo B. Harrison (Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University, Townsville, Australia); Pablo Saenz-Agudelo (Red Sea Research Center, King Abdullah University of Science and Technology, Saudi Arabia); David H. Williamson (Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University, Townsville, Australia); Robert Pressey (Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University, Townsville, Australia), Geoffrey P. Jones (Australian Research Council Centre of Excellence for Coral Reef Studies and Australia and School of Marine and Tropical Biology, James Cook University, Townsville, Australia)

The precarious state of many coastal marine ecosystems has prompted the use of marine protected areas (MPAs) as a tool for management and conservation. However, the design of MPA networks is only as good as our understanding of the processes that determine the persistence of marine populations. Since coral reefs are a naturally patchy and fragmented environment, the degree of connectivity between discrete populations is likely to be an important factor in ensuring their persistence. Many marine species are sedentary or strongly site-attached as adults and dispersal from one population to another occurs during a planktonic larval stage. Obtaining empirical measures of larval connectivity remains challenging for most marine species, which is why it has rarely been considered in the design of marine management and conservation plans. However, recent studies from Papua New Guinea and Australia have successfully used genetic parentage analysis to identify patterns of larval dispersal between distinct populations of coral reef fishes. We use these empirical measures of larval connectivity to show how simple genetic distance metrics can be used to approximate the degree of connectivity between populations. Furthermore, we illustrate how network analysis can be used to identify source-sink dynamics in marine



metapopulations. Our approach aims to simplify the way we measure connectivity and make it more accessible in the design of MPAs and enhance their conservation value.

CBM-01.2, July 9, AUSAID2, 11:00

Movement patterns of tropical marine fishes and implications for conservation and management

Alison Green (Indo-Pacific Division, The Nature Conservancy, Brisbane, Australia); Aileen Maypa (Conservation and Education Foundation, Philippines); Glenn Almany (Laboratoire d'Excellence 'CORAIL', CNRS-EPHE CRIOBE, France); Kevin Rhodes (University of Hawaii, USA); Rebecca Weeks (ARC Centre of Excellence for Coral Reef Studies, James Cook University, Australia); Peter Mumby (Marine Spatial Ecology Laboratory, School of Biological Science, University of Queensland, Australia); Mary Gleason (The Nature Conservancy, Monterey, CA, USA); Rene Abesamis (Silliman University, Angelo King Center for Research and Environmental Management, Philippines); Alan White (The Nature Conservancy, Honolulu, HI, USA)

Connectivity is a key ecological factor to consider in designing spatial management tools for conservation and management. For these tools to protect biodiversity and enhance populations of fisheries species, they must be able to sustain focal species within their boundaries. Thus the size of spatial management tools must be informed by movement patterns of species for which protection is required. Our review of movement patterns of 34 families (210 species) of coral reef and coastal pelagic fishes demonstrates that movement patterns (home ranges, ontogenetic shifts and spawning migrations) vary among and within species, and are influenced by a range of factors (size, sex, behaviour, density, habitat characteristics, season, tide and time of day). Some species move <0.1-0.5 kms (e.g. damselfishes and butterflyfishes), <0.5-3 kms (e.g. most parrotfishes and surgeonfishes) or 3-10 kms (e.g. large parrotfishes and wrasses), while others move 10s-100s (e.g. some groupers and jacks) or 1000s of kms (e.g. some sharks and tuna). Synthesizing this information in different formats for different audiences (scientists, field practitioners, senior government officials and communities) allows us to provide species specific advice to a range of stakeholders to maximize benefits for conservation and fisheries management. This information is now being used to design, monitor and adaptively manage spatial management tools in tropical marine ecosystems worldwide.

CBM-01.3, July 9, AUSAID2, 11:15

Recognising the value of seascape connectivity in marine conservation

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Connectivity is an important consideration in marine conservation because it provides the mechanism for reserves to sustain populations beyond their borders, and is critical for reversing existing environmental impacts. Few studies, however, have adopted a quantitative approach, like landscape ecology, to assess the value of connectivity in conservation. To illustrate this point, I discuss findings from our work in tropical and subtropical Pacific seascapes. We show that seascape connectivity enhanced marine reserve effectiveness across the western Pacific. This includes synergistic effects on productivity, diversity and ecological processes. To broaden the relevance of these results, we evaluated published seascape connectivity studies (197 studies) and identified those that examined effects on assemblages in reserves. Of the 38 papers that met these criteria, few considered potential interactions between reserve and seascape effects. All that did



reported synergistic effects on fish abundance, diversity or ecological processes. In addition, >71% of studies that examined seascape effects in reserves, but not the interaction between factors, also reported positive effects on production, diversity and processes. By improving our understanding of seascape ecology and connectivity, and incorporating this field of research into conservation decision-making, we should therefore expect greater success in restoring exploited populations and the functioning of marine ecosystems.

CBM-01.4, July 9, AUSAID2, 11:30

A practical approach to design a network of marine reserves in the Midriff Islands (Gulf of California) considering connectivity and climate change

Jorge G. Álvarez-Romero (Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University); Adrian Munguia-Vega (Conservation Genetics Laboratory, School of Natural Resources and Environment, University of Arizona); Alejandro Castillo-López (Pronatura Noroeste, A.C.); Alvin Suarez (Comunidad y Biodiversidad, A.C., Guaymas, Son, México); Erin Graham (Centre for Tropical Biodiversity and Climate Change Research, School of Marine and Tropical Biology, James Cook University); Georgina G. Gurney (Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University); Gustavo Hinojosa-Arango (Center for Marine Biodiversity and Conservation, Scripps Institution of Oceanography, University of California San Diego); Héctor Reyes-Bonilla (Departamento Académico de Biología Marina, Universidad Autónoma de Baja California Sur, México); Hem Nalini Morzaria-Luna (Northwest Fisheries Science Center, NOAA, Seattle, WA, USA); Jeremy VanDerWal (Centre for Tropical Biodiversity and Climate Change Research, School of Marine and Tropical Biology, James Cook University); Jorge Torre-Cosío (Comunidad y Biodiversidad, A.C., Guaymas, Son, México); Leah Gerber (Ecology, Evolution and Environmental Science, School of Life Sciences, Arizona State University); Marcia Moreno-Baez (Center for Marine Biodiversity and Conservation, Scripps Institution of Oceanography, University of California San Diego); Maria Beger (Australian Research Council Centre of Excellence for Environmental Decisions, School of Biological Sciences, The University of Queensland); Maria del Mar Mancha-Cisneros (Ecology, Evolution and Environmental Science, School of Life Sciences, Arizona State University); Robert L. Pressey (Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University); Vanessa Adams (Research Institute for the Environment and Livelihoods, Charles Darwin University)

Overfishing and climate change threaten marine biodiversity and fisheries worldwide. Addressing these problems is particularly critical in areas of high species richness and endemism, such as the Midriff Islands, Gulf of California, where livelihoods of coastal communities are negatively affected by depletion of fish stocks and potential loss of valuable species due to climate change. Our study aimed to develop a practical approach to design networks of marine reserves that consider ecological connectivity and the effects of climate change. We used up-to-date data/models on marine species distribution and ecological connectivity, as well as current systematic conservation planning methods to design and test alternative reserve networks that achieve three objectives: represent biodiversity (species and habitats) associated with rocky reefs; minimise costs to fishers and/or maximise benefits to commercial fisheries; and account for ecological connectivity and predicted ecological changes wrought by climate change. To achieve our objectives, we developed and tested alternative methods to incorporate connectivity based on readily-available data and tools. To provide practical guidance to real-world marine planning exercises, we discuss the benefits and limitations of our approach, such as the assumptions underpinning our treatment of connectivity and climate change in the spatial prioritisation and the adequacy of our outputs to guide on-ground implementation of actions.



CBM-01.5, July 9, AUSAID2, 11:45

Conservation gaps in the Coral Triangle: Towards a representative, connected and climate-proof MPA system

Jennifer McGowan (Australian Research Council Centre of Excellence for Environmental Decisions, School of Biological Sciences, The University of Queensland); Maria Beger (Australian Research Council Centre of Excellence for Environmental Decisions, School of Biological Sciences, The University of Queensland); Scott F Heron (Coral Reef Watch, National Oceanic and Atmospheric Administration (NOAA), Townsville, Australia and Marine Geophysical Laboratory, Physics Department, School of Engineering and Physical Sciences, James Cook University); Eric A Treml (Department of Zoology, University of Melbourne); Alison Green (Indo-Pacific Division, The Nature Conservancy, Brisbane, Australia); Alan T White (Indo-Pacific Division, The Nature Conservancy, Honolulu, USA); Nicholas H Wolff (Marine Spatial Ecology Lab, School of Biological Sciences, The University of Queensland); Karlo Hock (Marine Spatial Ecology Lab, School of Biological Sciences, The University of Queensland); Ruben van Hooidonk (NOAA Atlantic Oceanographic and Meteorological Laboratory, Miami, USA); Peter Mumby (Marine Spatial Ecology Lab, School of Biological Sciences, The University of Queensland); Hugh P Possingham (Australian Research Council Centre of Excellence for Environmental Decisions, School of Biological Sciences, The University of Queensland)

The Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security (CTI-CFF) is a multilateral partnership of six countries aiming to protect coral reef ecosystems. It is located in the epicentre of reef biodiversity, threat, and human reliance on coral reef products. One of the goals of the CTI-CFF is to have a region-wide Coral Triangle Marine Protected Area System (CTMPAS) in place and functioning by 2019. This is intended to achieve the conservation objectives outlined for the region, which include: the establishment of a representative system of marine protected areas covering 20% of each marine habitat; the management and improved status of threatened species; and the adoption of climate adaptation measures. In this study we investigate how well these objectives are met under the current CTMPAS and identify the locations and extent of additional conservation priority areas. We highlight how these priorities change as we seek to implement the different objectives and identify “win-win” areas where the meeting of multiple objectives can be achieved. We discovered that the success of conservation efforts in this region not only depends on multi-lateral collaborations across all countries, but that certain objectives may best benefit through bilateral collaborations, particularly for migratory species and larval connectivity.

CBM-01.6, July 9, AUSAID2, 12:00

Towards explicit objectives for connectivity in conservation planning

Rebecca Weeks (Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University, Townsville, Australia); Bob Pressey (Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University, Townsville, Australia)

Systematic conservation planning requires quantitative objectives to link data on biodiversity pattern and process with potential locations of conservation areas. Connectivity processes such as larval dispersal are key to structuring coral reef fish populations, and the need to consider connectivity in designing networks of marine protected areas has been emphasised. However, in the context of conservation planning, connectivity is poorly defined, objectives fail to address the ultimate reasons for focusing on connectivity, and guidelines have provided broad “rules of thumb” rather than specific, quantitative recommendations. Recent empirical advances have increased the availability of spatially explicit, quantitative information on larval dispersal. These new data demand renewed efforts to specify quantitative conservation objectives. We outline the rationale for, and benefits and limitations of, different approaches



to defining explicit connectivity objectives. These include patch-specific approaches, specifying minimum thresholds for larval recruitment to individual marine protected areas, and graph-theoretic approaches that prioritise sites based on network-wide metrics, such as larval sources or stepping-stones. Choice of approach will vary with connectivity-related goals, data availability, spatial scale of analysis, and planning goals. We conclude with suggestions for improving planning guidelines for areas without empirical connectivity data.

CBM-03: Traditional ecological knowledge and conservation

CBM-03.1, July 9, AUSAID2, 14:45

Combining Traditional Ecological Knowledge and Collections Based Research to Aid in Community Based Fisheries Management

Joshua Drew (Department of Ecology, Evolution and Environmental Biology, Columbia University, New York, NY 10027 USA); Abigail Golden (Department of Ecology, Evolution and Environmental Biology, Columbia University, New York, NY 10027 USA)

As Fijian communities work to create networks of marine protected areas (MPAs) designed to protect coastal fisheries from overfishing and habitat degradation, it is important to take into account the ways local communities use their coastal environments and the traditional ecological knowledge they bring to bear. Nagigi, Fiji, is a coastal village in which village leaders hope to establish a short-term MPA. By conducting interviews with artisanal and subsistence fishers in Nagigi, we were able to determine what species are most heavily fished, how fishing employment breaks down along age and gender lines, and villagers' perceptions of the ways in which the fishery has changed over the decades. We coupled these interviews with fishery-independent surveys to determine the baseline biodiversity within the area. With this information, we present recommendations about the ideal size, duration, and location of Nagigi's proposed MPA based on the life histories of some of the area's most heavily targeted species. For instance, based on the fact that the thumbprint emperor (*Lethrinus harak*), the fishery's most heavily targeted finfish, does not begin to reproduce until age 3, we predicted that at minimum a 3-year MPA would be necessary to allow those populations to recover. This combination of local knowledge with life history and other scientific data represents a novel approach to marine reserve design, and one that has the potential to create reserves that are more effective at meeting both conservation goals and villagers' needs.

CBM-03.2, July 9, AUSAID2, 15:00

Tools and products for integrating traditional and place-based knowledge, experience, and wisdom to inform adaptation planning and resource management: an example from Hawai'i Island

Heather McMillen (Ethnobotany Program, Botany Department, University of Hawai'i at Mānoa); Pelika Bertelmann (Sea Grant, Na Maka O Papahānaumokuākea); Tamara Ticktin (Ethnobotany Program, Botany Department, University of Hawai'i at Mānoa)

The contributions that traditional ecological knowledge systems can make to understanding and responding to global environmental change are increasingly acknowledged. However, which approaches and tools can be used to bring those insights, experiences, and knowledge to bear on adaptation planning and resource management are not clear. Focusing on a case study based in Ka'ūpūlehu (North Kona, Hawai'i Island, USA), we describe our biocultural approach and collaborative process that places traditional and local ecological knowledge at the center. We identified and developed three tools and products that integrate TEK and science to address



social-ecological change. They are 1) a timeline of adaptation, 2) a seasonal calendar, and 3) a knowledge-base/observation network for monitoring change. We describe the process, the products themselves, and their contributions to: 1) providing reference points for evaluating social-ecological change over time; 2) strengthening local knowledge transmission and attachment to place; and 3) communicating to resource managers and policy makers the knowledge, observations, and values that may support resilience while maintaining the context of TEK.

CBM-03.3, July 9, AUSAID2, 15:15

Pilinakai: Integrating traditional knowledge and modern science to support holistic approaches to sustainable fisheries management in West Hawai'i

Kim Morishige (The Nature Conservancy Hawai'i Marine Fellowship Program, Honolulu, HI 96817, USA); Kehau Springer (Conservation International Hawai'i Fish Trust); Pelika Bertelmann (3Nā Maka o Papahānaumokuākea, Kamuela, HI 96743, USA); Kahoane Aiona (University of Hawai'i at Hilo, Hilo, HI 96720)

Exploring the resilience of Pacific Island species, habitats, ecosystems and communities Founded in the core values and relationship of indigenous people to place, Pilinakai is an integrated approach to understand the health of coastal fisheries threatened by numerous local and global stressors. Pilinakai utilizes traditional knowledge and modern science to monitor reef fish and intertidal communities. This project aims to implement place-based research that is meaningful to the Ka'ūpūlehu community and will inform the development of a sustainable fisheries management plan. Monthly monitoring was conducted along four km of rural basaltic coastline. Belt-transects were conducted at ten permanent sites within Ka'ūpūlehu and key marine invertebrates were collected to monitor gonad indices. The data show two periods of pronounced spawning and recruitment for the culturally-significant, endemic limpet species known as 'opihi (*Cellana* spp.). 'Opihi are one of the most heavily harvested shoreline invertebrate species in Hawai'i and they continue to decline across the Main Hawaiian Islands due to over-harvesting. This baseline data is provided for the Ka'ūpūlehu community to innovate tools that integrate traditional knowledge to sustainably manage 'opihi populations. Through long-term investment in building community relationships and conducting educational outreach, Pilinakai strives to support holistic health and wellness to build biological, social, and cultural resiliency of Hawai'i's local communities to navigate through conservation management challenges.

CBM-03.4, July 9, AUSAID2, 15:30

Assessing the Opportunities for Collaborative Marine Management in Hawai'i

Pua'ala Pascua (University of Hawai'i at Mānoa, Department of Natural Resource and Environmental Management)

Collaborative management of common pool resources like coastal fisheries rely heavily upon the adaptive capacity of those involved in the management practices. Within the coastal fisheries of the Hawaiian Islands, increasing efforts have been made to include diverse stakeholder groups like communities, state, federal, and conservation agencies in a collaborative approach to marine management. In this push to include diverse stakeholders, the role of communities within these collaborations has varied tremendously. The aim of this study is to identify some of the opportunities and obstacles faced by communities who engage in community-based marine resource management in the State of Hawai'i. Semi-structured interviews are being conducted to reveal these key components. This presentation will focus on the research approach with the hopes of identifying common themes amongst other Pacific communities engaged in community-



based marine resource management. By identifying barriers to adoption as well as factors that might encourage success, the anticipated deliverable of this research will provide communities, and those who work closely with them, with a set of on the ground action items to adapt current approaches so they might best address the complex requirements of the existing collaborative management framework in the State of Hawai'i.

CBM-03.5, July 9, AUSAID2, 16:15

Restoration of agroforestry in Hawai'i: A tool for cultural preservation, ecological conservation, and resilience to climate change.

Natalie Kurashima (Botany Department, University of Hawai'i at Mānoa, USA)

Pacific Island communities rely on reef fisheries as a main food source, but these systems are estimated to decline 20% by 2050. Simultaneously, terrestrial ecosystems are threatened by habitat loss, invasive species, and climate change. Therefore, there is a need to conserve native ecosystems, while re-opening arable land for food production in the Pacific Islands. Restoration of agroforestry systems in the vast alien-invaded areas of Hawai'i can provide a strategy to increase ecosystem services, restore native habitat, and increase local food production. Kamehameha Schools, a Native Hawaiian trust and largest agricultural lessor in Hawai'i, is seeking to restore the Kahalu'u field system, a 345-acre remnant of a once productive traditional Hawaiian agroecosystem. This study utilizes an interdisciplinary approach, employing archival research to understand the system's past production, ecological methods and remote sensing techniques to identify the current matrix of vegetation and soil, geospatial modeling to determine how areas of agroforestry will shift in climate change, as well as ecosystem service economic modeling to identify costs/benefits of different restoration scenarios. The results from archival research, vegetation and soil surveying, remote sensing analysis, and geospatial modeling will be presented. The integrated results will ultimately aid in the successful revitalisation of a cultural site, which produces food while conserving native ecosystems.

CBM-03.6, July 9, AUSAID2, 16:30

Participatory approach towards species conservation and livelihood generation in Andaman Islands, India: A case-study

Akshaya M. Mane (Sàlim Ali Centre for Ornithology and Natural History, India); S. Manchi Shirish

Amongst the greatest conservation challenges in India, is the paradigm shift from a protectionist approach to conservation, to one of sustainable use. An ongoing in-situ and ex-situ conservation programme of the Edible-nest Swiftlet by developing appropriate harvesting strategies at 25 caves with local participation is reviewed. Convincing the illegal nest collector that scientifically managed, legal harvesting of edible nest can lead to better economic gains without harming the species was the key to implement the in-situ conservation of the Edible-nest Swiftlet in Andaman Islands. Round the clock protection resulted in three fold increase in population at the focal site. Decline at one site is also presented and discussed. Adding another site allowed protection of 116 known swiftlet caves in this Archipelago. Detailed studies on breeding, foraging and habitat ecology of the species are undertaken for effective implementation of the programme. Along with in-situ, partially successful ex-situ efforts through cross fostering and call playback methods towards setting up alternate population lead to temporary change in legal status of the species towards generating legal deserving incentive and livelihood for the protectors and their families. Even after the on-ground success, advocacy to bring change in policy for successful outcome of the program continues.



CBM-03.7, July 9, AUSAID2, 16:45

Tambu: a Melanesian model for the sustainability of the Admiralty cuscus (*Spiloguscus kraemeri*)?

John Lamaris (Wildlife Conservation Society – PNG Program, Goroka, E.H.P, Papua New Guinea and University of Papua New Guinea, School of Natural and Physical Sciences, NCD, Papua New Guinea); Nathan Whitmore (Wildlife Conservation Society – PNG Program, Goroka, E.H.P, Papua New Guinea); Regina Kiele (University of Papua New Guinea, School of Natural and Physical Sciences, NCD, Papua New Guinea); John Genolagani (University of Papua New Guinea, School of Natural and Physical Sciences, NCD, Papua New Guinea)

Tambu areas are a well-respected concept in Melanesian societies where a no-go zone is imposed on a section of forest or coral reef to preserve plants, animals and fish stocks. Such tambu areas are used for customary obligations and restocking resources. They have also been suggested as the basis for conservation and sustainability in Melanesia. The Admiralty cuscus (*Spiloguscus kraemeri*) is an aboreal possum-like animal endemic to the Admiralty Islands of Papua New Guinea. It is important to the people of Manus Island as a major source of protein. The home range and movement patterns of 10 animals (8 females and 2 males) were investigated using radio telemetry in a 29 ha tambu area on Manus Island. Home range sizes were estimated using a 95% minimum convex polygon method and the associated factors were tested using model selection and linear models. Home range size was highly variable (mean = 4.5 ha ± 5.9 SD) and was not correlated with body mass, age, or sex. These results suggest this tambu area was not big enough to fully protect the resident cuscus, but it might provide partial protection sufficient to allow sustainability at current harvest rates.

CBM-03.8, July 9, AUSAID2, 17:00

Using Social Network Analysis and Network Weaving to Increase Effectiveness of Integrated Coastal Management in Bua Province, Fiji

Brooke M. McDavid (Department of Humans and the Environment, University of Alaska, Fairbanks, Alaska); Ged Acton (Wildlife Conservation Society, Suva, Fiji)

This study explores the feasibility of using social network analysis (SNA) and network weaving activities to increase the effectiveness of integrated coastal management (ICM) outcomes in Bua Province, Fiji. By applying social network theory to the ICM process in Bua, we recognize that stakeholders interact with each other through networks and that various network characteristics affect the way in which the network functions. We show how SNA, paired with qualitative investigations, increased our understanding of the roles various individuals play in sharing knowledge and skills, connecting marginalized groups, and making resource management decisions. By comparing network maps from different districts, we discuss how various network structures may affect desired management outcomes. We briefly explore the challenges for adaptive governance amongst diverse stakeholders from both traditional and legal institutions and from across nested political and spatial scales. Next, we show how applying what is learned from SNA via network weaving activities can help overcome some of these challenges by strategically building new, or strengthening existing, relationships. We conclude by evaluating the ability of SNA to contribute to effective ICM and the implications this has for other ICM sites in Fiji and abroad. This study is part of longer term research seeking to compare various ICM strategies and evaluate both their ecological and socio-economic outcomes in a continued attempt to develop best practices for ICM in Fiji.



CBM-04: Socioeconomic considerations in conservation planning: past, present, future

CBM-04.1, July 11, AUSAID2, 10:30

Incorporating socioeconomic criteria and data into conservation planning: examples from Melanesia

Sangeeta Mangubhai (Wildlife Conservation Society, Fiji Country Program, Suva, Fiji); Ged Acton (Wildlife Conservation Society, Fiji Country Program, Suva, Fiji); Margaret Fox (Wildlife Conservation Society, Fiji Country Program, Suva, Fiji); Yashika Nand (Wildlife Conservation Society, Fiji Country Program, Suva, Fiji); Stacy Jupiter (Wildlife Conservation Society, Fiji Country Program, Suva, Fiji)

Conservation planning has been applied in a range of different ways in Melanesia, reflecting differences in socioeconomic, cultural and political contexts, as well as differences in the way people/communities interact with, and are highly dependent on nature for basic life functions. There is an increasing recognition of the importance of including cultural, social, economic and governance factors into conservation planning. However, there is little practical guidance on how to use this type of data during the planning process and better engage multiple stakeholders for better outcomes (e.g. resource improvement, food security, compliance). In addition, systematic conservation planning still uses methods and tools that are biased towards biological systems and oversimplify 'real' world complexities by poorly representing socioeconomic conditions. This presentation will explore these themes and present a number of examples of how cultural, social, economic and/or governance data has been used in Melanesia (West Papua, Solomon Islands, Fiji) to inform conservation planning. Novel and innovative tools or approaches from Melanesia are shared, especially those that might be applicable to other regions.

CBM-04.2, July 11, AUSAID2, 10:45

Incorporating socioeconomic information into coral reef conservation planning in the Pacific: it's not all about fisheries

Mélanie A. Hamel (Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University, Townsville Australia)

In coral reef conservation planning, socioeconomic impacts are often minimized in the process of selecting potential marine reserves by accounting for fishing opportunity costs. In Oceania, where people are strongly connected to marine coastal habitats, this minimizes impacts on livelihoods, thereby maximizing compliance with conservation actions. However, potential forgone fishing opportunities might not represent all impacts of reserves on coastal communities. In November 2012, I interviewed the heads of households (n=53) of the Riwo community of the Madang Lagoon, Papua New Guinea to 1/ define their fishing practices, and 2/ identify and map places of value (including fishing) to their household. I also collected fish catch data and mapped fishing location for a random sample of fishers (n=68). Preliminary results show that Riwo people value specific places on the reef and in the lagoon for income and food from fishing, but also for recreational, aesthetic, spiritual, medicinal, and cultural reasons. I developed a straightforward method for collecting and incorporating these values into spatial prioritization exercises, and compared marine reserve systems generated with a fishery-based and value-based approach. The implications are significant for future conservation planning in the Madang Lagoon and for the field of conservation planning in general, as it paves the way for alternative approaches that allows better community engagement in the planning process.



CBM-04.3, July 11, AUSAID2, 11:00

Understanding the socio-economic context: research trends, gaps, and future directions

Vanessa M. Adams (Research Institute for the Environment and Livelihoods, Charles Darwin University, Darwin, Australia); Robert L Pressey (Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University, Townsville, Australia)

There has been a surge of recent papers demonstrating that spatial data on conservation costs can influence which areas are identified as priorities for conservation action and can lead to overall cost-efficiencies. However, these studies have failed to address some important aspects of using cost data in conservation planning, and have not drawn from well-considered perspectives from resource economics. We review the progress made in using costs in conservation planning and identify important conceptual and technical questions that remain unanswered but that will determine the real-world effectiveness of plans. We highlight some of these research gaps including accuracy of modelled cost data, partial accountings of costs, and dynamic costs. We also highlight new emerging approaches in the literature and future directions. We then discuss an important new trend in the literature: inclusion of data representing other socioeconomic factors such as governance, cultural values, and opportunities. While the increase in new approaches for including socioeconomic factors in planning is promising, it remains critical to address the limitations we highlight to ensure that conservation plans are truly minimizing impacts on stakeholders.

CBM-04.4, July 11, AUSAID2, 11:15

Modulation of habitat-based conservation plans by fishery opportunity costs

Serge Andrefouet (Institut de Recherche pour le développement, New Caledonia)

Conservation actions are needed to protect coral reefs and their assets. Availability of habitat maps promote the use of habitat-only designs, where a given percentage of the area of each habitat is set as a conservation objective. However, marine reserves change access to fishing grounds and generate opportunity costs for fishermen that need to be minimized in the design. In New Caledonia (Southwest Pacific), we used fine-scale fishery catch maps to define a variety of opportunity costs layers, that are used to modulate the habitat-only design. The expected lower impacts on fishery catch when using the different cost constraints were ranked according to effectiveness in decreasing the costs generated by the habitat-only scenarios. Two habitat maps differing in thematic richness were also used. We will present the different results (effectiveness of scenarios), and the practical implications for coral reefs and island conservation.

CBM-04.5, July 11, AUSAID2, 11:30

An economic valuation of ecosystem services in the Vava'u island group, Kingdom of Tonga

Jacob Salcone (Resource Economist, International Union for the Conservation of Nature Oceania Regional Office, Suva, Fiji)

Ecosystem Services are the benefits humans receive from ecosystem functions. Ecosystem Service Valuation (ESV) is the practice of using economic methods to quantify the human benefits provided by the functions of a given ecosystem or collection of ecosystems. Using primary economic data from households, businesses, and tourists, and ecological data from a recent Rapid Biodiversity Assessment, this study estimates the total economic value of ecosystem services in the Vava'u island group. This presentation will describe the methods and results of



this study and propose how quantitative measures of ecosystem benefits can be used to guide natural resource management decisions, inform policy, and champion the protection of ecosystems.

CBM-04.6, July 11, AUSAID2, 11:45

Achieving the triple bottom of social equity, economic return, and conservation

Carissa J. Klein (Australian Research Council Centre of Excellence for Environmental Decisions, University of Queensland, Australia); Benjamin S Halpern (Bren School of Environmental Science and Management, University of California, Santa Barbara, CA 93106, USA); Christopher J. Brown (Global Change Institute, University of Queensland, Australia); Maria Beger (Australian Research Council Centre of Excellence for Environmental Decisions, University of Queensland, Australia); Hedley S Grantham (Science and Knowledge, Conservation International); Sangeeta Mangubhai (Wildlife Conservation Society, Fiji Country Program, Suva, Fiji); Mary Ruckelshaus (Natural Capital Project, Stanford University, CA, USA); Vivitskaia J. Tulloch (Australian Research Council Centre of Excellence for Environmental Decisions, University of Queensland, Australia); Matt Watts (Australian Research Council Centre of Excellence for Environmental Decisions, University of Queensland, Australia); Crow White (Cal Poly San Luis Obispo); Hugh P. Possingham (Australian Research Council Centre of Excellence for Environmental Decisions, University of Queensland, Australia)

Triple-bottom-line outcomes from resource management and conservation, where conservation goals and equity in social outcomes are maximized while overall costs are minimised, remain a highly sought-after ideal. However, despite widespread recognition of the importance that equitable distribution of benefits or costs across society can play in conservation success, little formal theory exists for how to explicitly incorporate equity into conservation planning and prioritization. Here, we develop that theory and implement it for three very different case studies in California (United States), Raja Ampat (Indonesia), and the wider Coral Triangle region (Southeast Asia). We show that equity tends to trade-off nonlinearly with the potential to achieve conservation objectives, such that similar conservation outcomes can be possible with greater equity, to a point. However, these case studies also produce a range of trade-off typologies between equity and conservation, depending on how one defines and measures social equity, including direct (linear) and no trade-off. Important gaps remain in our understanding, most notably how equity influences probability of conservation success, in turn affecting the actual ability to achieve conservation objectives. Results here provide an important foundation for moving the science and practice of conservation planning—and broader spatial planning in general—toward more consistently achieving efficient, equitable, and effective outcomes.

CBM-04.7, July 11, AUSAID2, 12:00

Poverty and protected areas: an evaluation of a marine integrated conservation and development project in Indonesia

Georgina G. Gurney (Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University, Townsville, Australia); Joshua Cinner (Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University, Townsville, Australia); Natalie Ban (Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University, Townsville, Australia and School of Environmental Studies, University of Victoria, Australia); Robert L. Pressey (Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University, Townsville, Australia); Richard Pollnac (Marine Affairs Department, University of Rhode Island, USA); Stuart J. Campbell (Wildlife Conservation Society, Indonesia Marine Program); Sonny Tasidjawa (Wildlife Conservation Society, Indonesia Marine Program); Fakhri Setiawan (Wildlife Conservation Society, Indonesia Marine Program)



Protected areas are currently the primary strategy employed worldwide to maintain ecosystem services and mitigate biodiversity loss. Despite the prevalence and planned expansion of protected areas, the impact of this conservation tool on human communities remains hotly contested in conservation policy. The social impacts of protected areas are poorly understood largely because previous evaluations have tended to focus on one or very few outcomes, and few have had the requisite data to assess causal effects (i.e. longitudinal data for protected and control sites). Here, we evaluated the short-, medium- and long-term impacts of marine protected areas (MPAs) that were specifically designed to achieve the dual goals of conservation and poverty alleviation (hereafter “integrated MPAs”), on three key domains of poverty (security, opportunity and empowerment) in eight villages in North Sulawesi, Indonesia. Using social data for villages with and without integrated MPAs from pre-, mid- and post-the five-year implementation period of the integrated MPAs, we found that the integrated MPAs appeared to contribute to poverty alleviation. Positive impacts spanned all three poverty domains, but within each domain the magnitude of the effects and timescales over which they manifested were mixed. Importantly, positive impacts appeared to occur mostly during the implementation period, after which integrated MPA activities all but ceased and reductions in poverty did not continue to accrue. This finding questions the efficiency of the short-term approach taken in many international donor-assisted protected area projects that integrate development and conservation, which are often designed with the expectation that project activities will be sustained and related benefits will continue to accumulate after external support is terminated.

CBM-04.8, July 11, AUSAID2, 12:15

The Influence of Management and Tenure on Ecosystem Services in the Pacific

Cheryl Geslani (University of Hawai‘i at Manoa, USA)

Islands throughout the Pacific have undergone dramatic changes naturally and anthropologically. This research aims to characterize land uses within three watersheds in order to value the current environmental, cultural and economic ecosystem services. These island watersheds have similar highly integrated ridge-to-reef ecosystems that represent a spectrum of management and tenure. The most remote site is Kubulau in Fiji on south-western Vanua Levu. Clans still own large tracts of land in common. The other two sites are in Hawai‘i, Haena on the north shore of Kauai and Kaupulehu on the leeward coast of Hawaii Island. These watersheds have different mixtures of small households, commercial and conservation land. The trade-offs between potential management scenarios will be derived for each watershed based on our initial valuation benchmarks. Potential management alternatives may include scenarios such as 1) 100% native restoration, 2) agroforestry and 3) non-native but culturally or economically beneficial species management. We hope to draw general lessons from the similarities and difference among the three sites. Parallel research will be conducted to understand optimal land use in the face of climate change.

CBM-05: Integrated land-sea planning

CBM-05.1, July 10, AUSAID2, 10:30

Forest conservation delivers highly variable coral reef conservation outcomes

Hugh P. Possingham (Australian Research Council Centre of Excellence for Environmental Decisions, University of Queensland, Australia); Carissa J Klein (Australian Research Council Centre of Excellence for Environmental Decisions, University of Queensland, Australia); Stacy D Jupiter (Wildlife Conservation Society, Fiji Country Program, Suva, Fiji); Elizabeth R. Selig (Science and Knowledge, Conservation



International); Matt Watts (Australian Research Council Centre of Excellence for Environmental Decisions, University of Queensland, Australia); Benjamin S Halpern (Bren School of Environmental Science and Management, University of California, Santa Barbara, CA 93106, USA); Muhammad Kamal (Geography Planning and Environmental Management, University of Queensland, Australia); Chris Roelfsema (Geography Planning and Environmental Management, University of Queensland)

Coral reefs are threatened by human activities on both the land (e.g. deforestation) and the sea (e.g. overfishing). Most conservation planning for coral reefs focuses on removing threats in the sea, neglecting management actions on the land. A more integrated approach to coral reef conservation, inclusive of land–sea connections, requires an understanding of how and where terrestrial conservation actions influence reefs. We address this by developing a land–sea planning approach to inform fine-scale spatial management decisions and test it in Fiji. Our aim is to determine where the protection of forest can deliver the greatest return on investment for coral reef ecosystems. To assess the benefits of conservation to coral reefs, we estimate their relative condition as influenced by watershed based pollution and fishing. We calculate the cost-effectiveness of protecting forest and find that investments deliver rapidly diminishing returns for improvements to relative reef condition. For example, protecting 2% of forest in one area is almost 500 times more beneficial than protecting 2% in another area, making prioritization essential. For the scenarios evaluated, relative coral reef condition could be improved by 8–58% if all remnant forest in Fiji were protected rather than deforested. The results will support decisions made by the Fiji Protected Area Committee as they establish a national protected area network that aims to protect 20% of the land and 30% of the sea by 2020.

CBM-05.2, July 10, AUSAID2, 10:45

Politics and practice of integrated land-sea planning in Fiji

Stacy Jupiter (Wildlife Conservation Society, Fiji Country Program, Suva, Fiji); Carissa Klein (Australian Research Council Centre of Excellence for Environmental Decisions, University of Queensland, Australia); Hugh Possingham (Australian Research Council Centre of Excellence for Environmental Decisions, University of Queensland, Australia)

In 2011, the Fiji Department of Environment released a national Integrated Coastal Management Framework, which sets the stage for bridging jurisdictions to manage across the land-sea divide. Despite this, the national Protected Area Committee (PAC) had separated work among terrestrial and marine working groups to develop priorities for conservation, with little dialogue between. In order to improve integrated land-sea planning, we initially presented outcomes to the PAC from a return on investment model that optimized locations for forest conservation to minimize downstream runoff. The PAC requested for us to also consider national targets for terrestrial conservation. We therefore systematically analysed six scenarios for expanding Fiji's network of terrestrial protected area networks, with the aim to uncover how well each approach did to protect different target vegetation types and minimize land-based runoff to downstream coral reefs. We found that the areas that had been prioritized by the PAC did a reasonable job of providing downstream benefits, but did a poor job at representing key threatened vegetation types. The PAC was amenable to our recommendation to add additional forests to the priority list in places of notable terrestrial biodiversity and the revised list was endorsed by Fiji's National Environment Council in October 2013.

CBM-05.3, July 10, AUSAID2, 11:00

A ridge-to-reef approach to assessing the role of local ecological knowledge and management in enhancing adaptive capacity and resilience to climate change in Fiji



Tamara Ticktin (Department of Botany, University of Hawai'i at Mānoa, USA); Stacy Jupiter (Wildlife Conservation Society Fiji Country Program, Suva, Fiji); Rachel Dacks (Department of Biology, University of Hawai'i at Mānoa, USA); Kim Burnett (University of Hawai'i, Economic Research Organization); Alan Friedlander (US Geological Survey, Hawaii Cooperative Fishery Research Unit, University of University of Hawai'i at Mānoa, USA); Heather McMillen (Ethnobotany University of Hawai'i at Mānoa, USA); Shimona Quazi (Department of Botany, University of Hawai'i at Mānoa, USA)

Understanding how social-ecological systems can be resilient to climate change poses one of the most pressing problems today. This is especially true in the Pacific Islands, which are considered to be especially at risk to the effects of climate change. The local ecological knowledge (LEK) systems developed by Pacific Islanders over millennia have allowed them to adapt to living in highly uncertain conditions and to be resilient to many of the extreme climatic events that characterize the islands. However, the complex patterns and processes involved in these LEK systems, and their potential to enhance resilience to climate change today (and global environmental change more broadly), are poorly understood. We present an interdisciplinary research project that employs a ridge-to-reef approach to assess the relationships between LEK systems and social-ecological resilience to climate change in Fiji. We ask: Is LEK correlated with indicators of social-ecological resilience and adaptive capacity, and if so, how? We focus on LEK in terms of the knowledge, management and governance associated with traditional agroforests and near-shore marine fisheries; and our methods include household surveys, focus group discussions, and ecological surveys in agroforests and near-shore reefs in 20 communities across Fiji. We present our approach and preliminary results, and invite others working in Oceania to share our methodology to help build comparative research.

CBM-05.4, July 10, AUSAID2, 11:15

Prioritizing catchment agricultural management practice change through marine risk assessment in the Great Barrier Reef

Jon Brodie (Catchment to Reef Research Group, TropWATER, James Cook University, Townsville, Australia); Jane Waterhouse (Catchment to Reef Research Group, TropWATER, James Cook University, Townsville, Australia and C₂O Consulting coasts climate oceans); Jeffrey Maynard (C₂O Consulting coasts climate oceans and Laboratoire d'Excellence 'CORAIL' USR 3278 CNRS – EPHE, CRIOBE, Papetoai, Moorea, Polynesie Francais)

The iconic Great Barrier Reef (GBR) in Australia faces continuing and increasing threats from human activities including climate change, agricultural pollution and large scale port development pollution. The current degradation of many GBR ecosystems including, for example, reduction in coral cover and seagrass health and severely reduced dugong populations are linked to declining water quality in the GBR. Suspended sediment, nutrients and pesticides loads discharged to the GBR from agricultural and coastal development have increased greatly in the last 150 years. These pollutants disperse into the GBR during high flow river discharge and damage GBR ecosystems including coral reefs and seagrass meadows. Reef Plan, the joint Australian and Queensland Governments program to address land-sourced pollution, provides funding to farmers, matched by the farmers themselves, for improved management practices to reduce pollution. A requirement of a cost effective program of this type is the ability to prioritise where and how such funding should be applied in the GBR Catchment. We have developed and applied a risk assessment method to inform investment prioritisation and guide policy makers and catchment managers on the key land-based pollutants of greatest risk to the health of GBR coral reefs and seagrass meadows. The risk assessment uses a Multi Criteria Analysis approach with qualitative and semi-quantitative information on the influence of individual rivers in the 6 natural resource management (NRM) regions on coral reefs and seagrass meadows. Relative risk was



estimated from the habitat areas (coral reefs and seagrass) exposed to defined pollutant thresholds (observed or modelled) and this was combined with river pollutant load information to develop priorities for regional management areas within the GBR Catchment. The assessment showed distinct differences between NRM regions and between catchments within the regions in terms of potential impact from each pollutant and for coral reefs and seagrass meadows. The results, in conjunction with information on pollutant generation from dominant land uses in the GBR Catchment, are used to inform investment priorities both between and within NRM regions.

CBM-05.5, July 10, AUSAID2, 11:30

Hazard assessment for water quality threats to Torres Strait marine waters and ecosystems

Jane Waterhouse (Catchment to Reef Group, TropWATER, James Cook University, Townsville, Australia and C2O Consulting coasts climate oceans); Jon Brodie (Catchment to Reef Group, TropWATER, James Cook University, Townsville, Australia); Caroline Petus (Catchment to Reef Group, TropWATER, James Cook University, Townsville, Australia); Eric Wolanski (Catchment to Reef Group, TropWATER, James Cook University, Townsville, Australia)

The Torres Strait marine environment is of national and international significance. It includes critical coral reef and seagrass habitats, many species of fish, invertebrates and turtles, and one of the largest dugong populations globally. The region faces global pressures, such as increasing shipping traffic, demand for peak oil and impacts associated with climate change that could have complex impacts on Torres Strait's environmental assets, particularly when combined with local pressures. We undertook a qualitative assessment of the key threats to the Torres Strait region from water quality issues. The supporting information included analysis of remote sensing imagery, development of a hydrodynamic model, island inspections and a desktop review of previous studies. We concluded that the current hazards to the environmental values of the region from water quality are relatively minor, and are specific to local areas. However, a number of important future threats were identified. Most importantly, the potential hazards from the transit of large ships through the region, including oil or chemical spills and groundings, are of greatest concern due to the potential for long term retention in the Straits. Large scale development in Papua New Guinea including gas platforms, oil palm expansion and port development may also be significant. This study has provided the first hazard assessment of water quality issues in the Torres Strait region and provides guidance for environmental managers to make decisions regarding the relative importance of pollutant sources at a range of scales.

CBM-05.6, July 10, AUSAID2, 11:45

Prioritizing cost-effective management projects to improve water quality in the Great Barrier Reef

Carissa Klein (Australian Research Council Centre of Excellence for Environmental Decisions, University of Queensland, Australia); Jutta Beher (Australian Research Council Centre of Excellence for Environmental Decisions, University of Queensland, Australia); Hugh Possingham (Australian Research Council Centre of Excellence for Environmental Decisions, University of Queensland, Australia)

Half of the Great Barrier Reef's (GBR) coral cover has been lost since 1985. One of the most significant threats to the GBR is the declining water quality from land-based run-off. A significant amount of funding has been committed by the Australian government to invest in catchment management in order to improve downstream water quality. However, a transparent and economically sound investment prioritisation process for the allocation of funds does not exist. Here we present an approach that explicitly considers the economic costs, feasibility, and



biodiversity benefits of a range of management projects. We apply our approach to managing sediment run-off in two catchments, considering 296 projects focused on mitigating sediment run-off on grazing and sugarcane land. Using a model, expert elicitation, and existing management data, we calculated the amount of sediment reduced, the feasibility, and the economic cost of each project, respectively. We determined which projects would deliver the most cost-effective outcomes for sediment reduction for a given budget. We found that the rational use of cost and feasibility information substantially increased the amount of sediment reduced for a given budget, and prioritising management projects according to threat, area, or cost in isolation was inefficient. Our approach can be used to determine priorities for a range of threats to coastal ecosystems, including nutrients and pesticides, as well as threats to marine species.

CBM-05.7, July 10, AUSAID2, 12:00

Quantifying benefits of catchment management for coastal marine ecosystems

Megan Saunders (Global Change Institute, University of Queensland, St Lucia, Australia and Marine Spatial Ecology Lab, University of Queensland, St Lucia); Maria Beger (Australian Research Council Centre of Excellence for Environmental Decisions, The University of Queensland); Jutta Beher (Australian Research Council Centre of Excellence for Environmental Decisions, The University of Queensland); Michael Bode (Australian Research Council Centre of Excellence for Environmental Decisions, The University of Queensland); Sylvaine Giakoumi (Australian Research Council Centre of Excellence for Environmental Decisions, The University of Queensland and Hellenic Centre for Marine Research, Institution of Marine Biological Resources and Inland Waters, Agios Kosmas, Greece); Carissa Klein (Centre for Biodiversity and Conservation Science, University of Queensland); Joseph Maina (Australian Research Council Centre of Excellence for Environmental Decisions, The University of Queensland and Global Conservation Program, Wildlife Conservation Society); Anna Metaxas (Department of Oceanography, Dalhousie University); Morena Mills (Global Change Institute, University of Queensland); Viv Tulloch (Australian Research Council Centre of Excellence for Environmental Decisions, The University of Queensland); Hugh Possingham (Australian Research Council Centre of Excellence for Environmental Decisions, The University of Queensland and Silwood Park, Imperial College)

Globally significant declines in extent of coastal marine habitats, such as seagrass, mangroves and coral reefs, have generated concern for their continued ability to deliver ecosystem services. Marine ecosystems are influenced by threats occurring both in the sea and on land, thus integrated conservation strategies are required. Conservation outcomes are attainable through the protection of intact habitat or the restoration of degraded habitat. Restoration is generally believed to be the best option when habitat is no longer available for protection. We asked whether it is most effective to invest in restoring degraded habitats, or protecting intact habitats, in either marine or terrestrial environments, using a case study of seagrass meadows in Moreton Bay (Australia). An integrated catchment planning approach was used to prioritize conservation actions across the land and sea, maximising benefits for seagrass habitat while minimising costs of management. Conservation actions for terrestrial areas aimed to reduce sediment run-off to coastal areas, whereas those for marine areas aimed to remediate direct physical damage. We found that marine conservation was generally more effective than terrestrial conservation. Surprisingly, restoration was found to be a better investment than protection under certain conditions.

CBM-05.8, July 10, AUSAID2, 12:15

Moreton Bay and Catchments as a Socio-Ecological System: The Human Dimensions of Marine and Terrestrial Waterways in South East Queensland

Sylvie Shaw (School of History, Philosophy, Religion and Classics, The University of Queensland, St. Lucia, Australia); Helen Ross (School of Agriculture and Food Sciences, The University of Queensland, St. Lucia); Natalie Jones (School of History, Philosophy, Religion and Classics, The University of Queensland,



St. Lucia, Australia); Katherine Witt (School of History, Philosophy, Religion and Classics, The University of Queensland, St. Lucia, Australia); Bree Pinner (School of History, Philosophy, Religion and Classics, The University of Queensland, St. Lucia, Australia); Dave Rissik (National Climate Change Adaptation Research Facility, Griffith University, Southport, Qld, Australia)

Our research links marine and terrestrial systems through a socio-ecological lens. Our aim is to understand how people use, interact with and value marine and freshwater environments in order to better manage the land-based socio-economic and cultural drivers of human-induced ecological threats. The study is conducted in South East Queensland (SEQ) where a number of major waterways lead through diverse agricultural, industrial, and urban landscapes into the ecologically sensitive Moreton Bay and its marine park and islands. As one of the fastest growing regions in Australia, with an expanding population, and spreading residential and industrial development, there will be increasing demand on waterways to fulfil the desires and needs of different ‘users’. In this study we have interviewed waterways’ stakeholders and user groups, employing a typology of nature-centred values devised by Kellert (2012). This study is novel as it elicits values from upstream and downstream users as well as Indigenous and non-Indigenous people about the significance of their waterways connections, and their understanding of water quality and waterways management. Our research shows a depth of feeling about local places and water ecologies including a widespread desire, regardless of sectoral interests, to conserve Moreton Bay into the future. However, people remain divided on, or unsure of the role and usefulness of the marine park.

CBM-05.9, July 10, AUSAID2, 14:30

Setting spatial priorities for coral reef fisheries: managing interacting land-sea systems and stressors

Vivitskaia J. Tulloch (Australian Research Council Centre of Excellence for Environmental Decisions, School of Biological Sciences, University of Queensland, St Lucia, Qld, Australia); Christopher J. Brown (Australian Research Council Centre of Excellence for Environmental Decisions, School of Biological Sciences, University of Queensland, St Lucia, Qld, Australia); Carissa J. Klein (Australian Research Council Centre of Excellence for Environmental Decisions, School of Biological Sciences, University of Queensland, St Lucia, Qld, Australia); Hugh P. Possingham (Australian Research Council Centre of Excellence for Environmental Decisions, School of Biological Sciences, University of Queensland, St Lucia, Qld, Australia)

Effective marine spatial planning is crucial to manage direct stressors to biodiversity, but does not typically address one of the most significant threats to marine ecosystems, land-based run-off. Although millions of people depend on coastal ecosystem goods and services, management decisions often ignore cross-system interactions, increasing the potential for one sector (e.g. agriculture) to negatively impact another sector (e.g. fishing). Integrated land-sea planning is urgently needed, to ensure that land development occurs sustainably with minimal impact on vital marine resources such as fisheries. Here, we use coupled land-sea ecosystem models in spatial planning to minimise the impacts of palm oil agriculture on coral reef ecosystems in New Ireland, Papua New Guinea. Linking models of watershed run-off, marine water quality and habitat quality, we target multiple planning objectives of conservation and resource development to identify priority areas for management in the land and sea, and show how management priorities might change given future oil palm expansion. By taking into consideration land-sea interactions, we found important trade-offs between expanding oil palm on the land, conservation priorities, and costs to artisanal fisheries. Our approach provides a valuable evaluation and management tool for resource managers, planners and researchers of data-poor coral reefs in regions affected by changing land-use.



CBM-05.10, July 10, AUSAID2, 14:45

Sediment loads to coral reefs in Solomon Islands-what is natural?

Simon Albert (School of Civil Engineering, The University of Queensland, Australia); Alistair Grinham (School of Civil Engineering, The University of Queensland, Australia); Badin Gibbes (School of Civil Engineering, The University of Queensland, Australia)

Understanding catchment impacts on the water quality of inshore ecosystems is becoming increasingly important with the promotion of ridge to reef conservation approaches. Often coral reef ecosystems are assumed to occupy clean low sediment waters and inputs of sediments are considered a negative outcome for conservation efforts. This is despite the limited understanding of what represents natural conditions for water quality in Pacific islands. This study provides a detailed assessment of spatial and temporal trends in water quality within Solomon Islands coastal lagoons. Whilst in some cases local inputs of sediment from commercial logging operations have been detrimental to coral reefs, it is apparent the 'natural' sediment loads into inshore coral reefs may be higher than previously expected. Suspended sediment concentrations in Jejevo Lagoon adjacent to natural forested catchments on Isabel Island were significantly higher than international guideline levels at several sites. During rainfall events freshwater inputs with high suspended sediment concentrations typically reach outer reefs within hours and can remain in inshore areas for several days. Understanding these natural inputs of sediments into coral reef environments and the associated resilience of reefs to sediment loading is useful in guiding ridge to reef conservation planning.

CBM-05.11, July 10, AUSAID2, 15:00

Understanding Why Migratory Diadromous Indo-Pacific Fishes Migrate Can Aid Conservation

Gerard P. Closs (Department of Zoology, University of Otago, 340 Great King Street, Dunedin, New Zealand); Matthew Jarvis (Department of Zoology, University of Otago, 340 Great King Street, Dunedin, New Zealand); Manna Warburton (Department of Zoology, University of Otago, 340 Great King Street, Dunedin, New Zealand)

Diadromous fish (migrate between freshwater and marine habitats) dominate many streams across the Indo-Pacific region, representing a major conservation challenge. Migrations span many kilometres along narrow easily interrupted stream networks. Diadromous fishes can be classified as amphidromous or catadromous; amphidromous fish spawn in freshwater with larval migration to the sea and adult catadromous fish migrate downstream and spawn in the sea. Some amphidromous fishes also exhibit a downstream adult migration but to spawning sites near the sea. The distribution of, and mechanisms driving, these life history variations are poorly understood, yet the differences have major implications for management. Our studies of New Zealand diadromous fishes suggest migration patterns are closely linked to landscape. Based on our current research, we propose that these migrations can be partly understood as mechanisms to facilitate rapid transport of tiny pelagic larvae from harsh stream habitats to more benign pelagic habitat. In steep, short catchments, rapid transport of larvae downstream can be achieved by passive drift. However, across low gradient regions, varying degrees of downstream migration by adult fish to spawning sites close to the sea is needed to ensure rapid transport of larvae to their pelagic habitat. Stream management, especially as related to abstraction and impoundment, needs to reflect the contrasting migratory strategies used by fish across changing landscapes.



CBM-05.12, July 10, AUSAID2, 15:15

Interactive impacts of run-off and climate change determine the effectiveness of management for marine ecosystems

Christopher J. Brown (Global Change Institute, University of Queensland, Australia); Megan I. Saunders (Global Change Institute, University of Queensland, St Lucia, Australia and Marine Spatial Ecology Lab, University of Queensland, St Lucia, Australia); Hugh P. Possingham (Environmental Decisions Group, School of Biological Sciences, University of Queensland, St Lucia, Australia); Anthony J. Richardson (University of Queensland)

Tropical coastal ecosystems are typically impacted by multiple human activities. There is growing concern that these impacts on ecosystems will interact and accelerate the rate of ecosystem decline. Typically, methods for identifying priority actions to conserve ecosystems do not account for interactions. Using Australasian seagrass meadows as a case-study, we examined the effectiveness of improving water quality when there was also impacts of global warming. We considered antagonistic and synergistic interactions, because both are plausible in this ecosystem. Synergistic interactions increase the cumulative impact of the two stressors, whereas antagonistic interactions imply smaller impacts. While synergisms imply more rapid ecosystem decline, we show that they are also an opportunity for management to improve the ecosystem. Further, improving water quality in sites impacted by climate change was only beneficial for seagrass if there was a synergism, whereas, acting in refuges was always beneficial. Quantifying the types of interactions that predominate in ecosystems is needed to inform on the places where conservation action can provide the greatest benefits. Our results imply that conservation planning should consider interactions, or focus on refuges from climate change if the type of interaction is uncertain.

CBM-05.13, July 10, AUSAID2, 16:00

Climate change vulnerability and adaptive capacity assessment of three watershed sites in Kauai, Hawaii, and Fiji

Alexander Frost (University of Hawaii Manoa, Department of Urban and Regional Planning and University of Hawaii Economic Research Organization, USA)

An island is a model system for ecosystem research due to ease of identifying fundamental ecological, economic and cultural variables within a closed and bounded system. Traditional management systems of Pacific Islands, such as Hawaiian *ahupua'a* and the Fijian *vanua* all contain the basic ideas of an ecosystem framework that is culturally appropriate and a community-based approach to sustainable resource use. This research explores the climate change vulnerability and adaptive governance capacities of three watershed sites of Ha'ena Ahupua'a in Kauai Island, Kaupulehu Ahupua'a in Hawai'i Island, and Kubulau District, Vanua Levu, Fiji, which contains a diversity of land ownerships, land covers, uses, and tenures. The assessment seeks to identify the broad conditions and structure of these sites and their potential vulnerability to climate change based on interviews and insight from local decision makers, resource managers, scientists, and existing published and unpublished data and research. This work is one component of a larger project that will evaluate how climate change may impact ecological, economic, and cultural values at each site, and which will identify appropriate land management strategies based on these possible futures. Culturally appropriate vulnerability and adaptive capacity assessment will help identify and contribute to research on ecosystem valuation, downscale climate change modeling, resource management, and governance strategies for social-ecological resilience.



CBM-05.14, July 10, AUSAID2, 16:15

Evaluating dependencies in threat action prioritization

Nancy Auerbach (School of Biological Sciences, University of Queensland, St. Lucia, QLD, Australia); Ayesha Tulloch (School of Geography, Planning, and Environmental Management, University of Queensland, St. Lucia, QLD, Australia, Kerrie Wilson (School of Biological Sciences, University of Queensland, St. Lucia, QLD, Australia); Jonathan Rhodes (School of Geography, Planning, and Environmental Management, University of Queensland, St. Lucia, QLD, Australia); Hugh Possingham (School of Biological Sciences, University of Queensland, St. Lucia, QLD, Australia)

Conservation planning traditionally assumes that the impacts of threats are management. In real life, multiple threatening processes affect multiple species simultaneously, leading to dependencies between mitigation actions, their costs, and their outcomes. We evaluate how dependencies alter strategies for managing threatened species in a case study of the Burnett-Mary Natural Resource Management Region, Queensland, Australia. We use cost-effectiveness analysis to rank and prioritize three threat abatement actions: reduced fire frequency and intensity, invasive predator control, and reduced grazing pressure. We assess how dependencies change prioritizations of action across space by comparing the outcomes of prioritizing management assuming independent threats with additive effects, to assuming dependent threats with non-additive effects. When combined effects of threats are greater than would be expected from additive effects, threats are synergistic; when less, threats are antagonistic. We find that missed opportunities and wasted investment result if threats to species are assumed to be independent and are instead synergistic. Inflated expectations and underinvestment are the outcome if threats to species are antagonistic. Recognizing threat dependencies substantively changes decisions about where to manage with which action(s), leading to more strategic and efficient investment.

CBM-05.15, July 10, AUSAID2, 16:30

Partnership as a Tool for Reef-to-Ridgeline Conservation: Case Studies from the western Solomon Islands

Michael Esbach (Center for Biodiversity and Conservation, American Museum of Natural History, New York, USA)

The nearly 1,000 islands of the Solomon archipelago support an exceptional array of biological and cultural diversity. Marine diversity of the near-shore waters, lagoons, and reefs are of global significance, and the variety of life within the tropical forests has long been recognized for its extraordinary endemism. Access and resource use within these areas remains largely controlled by indigenous communities under customary law regimes recognized by the national constitution. These management regimes, meaning local practices designed to regulate the use, access, and transfer of resources, emerged through generations of human interaction with the environment and are informed by local ecological knowledge. With nearly 90% of rural land and virtually all nearshore marine systems in the Solomon Islands controlled through customary tenure, community-level partnerships have become an integral component of integrated land-sea planning and conservation initiatives. In the western Solomon Islands, the Solomon Islands Community Conservation Partnership (SICCP) is currently partnering with community-based organizations to manage a set of linked protected areas that include some of the last remaining coral reef to ridgeline systems in the western Pacific. Case studies from across this network, with a focus on the islands of Tetepare, Kolombangara, and Vangunu, help to elucidate a framework for community-level partnership, a critical tool in land-sea planning within a customary tenure context. This framework focuses on 1) building social capital, 2) accepting diverse perspectives,



3) empowering local decision-making, and 4) a long-term commitment to the partnership. By adopting such a framework in tandem with a range of biological and social science methods, practitioners can improve local capacity, decision-making, and governance in ways that are directly linked conservation, from the reef to the ridgeline.

CBM-05.16, July 10, AUSAID2, 16:45

Impacts of extreme climatic events on natural resource management

Sean Maxwell (Environmental Decisions Group, The University of Queensland, St Lucia, Qld, Australia)

Extreme climatic events, such as heat waves, polar vortexes and periods of heavy rainfall, pose profound consequences for conservation management. Extreme climatic events have led to rapid population decline (Gordon *et al.* 1988; Pavelka *et al.* 2003), species' range shifts (Bennie *et al.* 2013; Seabrook *et al.* 2014), and broad ecological change (Parmesan *et al.* 2000; Cavin *et al.* 2013). The direct impact of extreme climatic events on human health and wellbeing is more widely documented (Pielke Jr 1999; Changnon *et al.* 2000; Meehl & Tebaldi 2004; McMichael *et al.* 2006). Extreme climatic events are thought to prompt behaviour change in humans (McAllister *et al.* 2009; Berrang-Ford *et al.* 2011; Blennow *et al.* 2012) but little is known about how this change in behaviour translates to indirect impacts on threatened species. As a result, dynamic human behaviour is rarely incorporated into conservation management decisions. This is problematic because changes in human behaviour are likely to impact upon the effectiveness of natural resource management plans. For example, switching to a different cropping strategy to cope with more extreme climatic events will likely impact upon the fresh water and soil budgets across the landscape, whilst also presenting new threats and/or opportunities for biodiversity conservation. Similarly, the human response to climate-induced reductions in fisheries yield (Hori *et al.* 2012) is not well understood, and rarely considered in fisheries management. I aim to explore this space by asking the following fundamental questions: 1) what is the value of reducing uncertainty about human responses to extreme climatic events before implementing a natural resource management plan? And, 2) how can we better incorporate dynamic human responses to extreme climatic events into NRM plans?

CBM-05.17, July 10, AUSAID2, 17:00

How well are scientists helping the conservation community tackle climate change?

James Watson (Wildlife Conservation Society and University of Queensland, Australia)

The consequences for biodiversity of human-driven climate change cannot be ignored. I will present the results of a wide-ranging review of the conservation literature that has examined the impacts of climate change on elements of biodiversity. By categorising research papers on their primary research questions, my colleagues and I show that the vast majority of these articles (88.6%) focus only on those impacts that arise directly as a result of climate change, ignoring the potentially significant indirect threats that arise from human adaptation responses. We also find a strong bias in the time-frames considered by published articles that project future impacts of climate change on biodiversity, with more than three-quarters (77.9%) of papers only considering impacts after 2031, and almost half (49.1%) considering only impacts after 2051. Clearly understanding the links between climate and the natural environment will lead to a better ability to incorporate consideration of the threat posed by climate change in assessing vulnerability and identifying management actions that can help maintain ecosystem resilience. However this focus on long-term, direct impacts creates a mis-match, not only with the life-cycles of species and timescales of many ecological processes, but also with most management and policy timelines and the short-term nature of human decision-making processes.



CCO-01: Fisheries bycatch in Oceania: assessment & solutions

CCO-01.1, July 10, AUSAID3, 10:30

Tuna purse seine fisheries and FADs: an ecological perspective

David Itano (Research Associate, Pelagic Fisheries Research Program, University of Hawaii at Manoa, USA)

Drifting objects in offshore waters will collect a wide variety of life, from marlin and tuna to sea turtles and crabs. Fishermen have long exploited the phenomenon to increase efficiency. Unfortunately, drifting objects aggregate juvenile tunas at higher rates than can normally be targeted by conventional fishing methods and have tipped the balance of pelagic ecosystems by distributing thousands of drifting Fish Aggregation Devices (FADs) across the world's oceans that are electronically monitored and fished by purse seine fleets. Improving efficiency should be a good thing but can become problematic in the absence of effective effort limits. A wide variety of experiments and management scenarios are being undertaken to mitigate the unintended ecological consequences of large-scale FAD associated fishing. At issue is the fact that skipjack and yellowfin stocks can sustain high levels of harvest compared to bigeye tuna that have a very strong tendency to associate with drifting objects and less resilient life history characteristics. Technical solutions are being investigated, but thus far have met with limited success. The ultimate solution is an overall reduction in effective fishing effort coupled with dramatic reductions in FAD associated purse seining. These and other issues will be discussed.

CCO-01.2, July 10, AUSAID3, 10:45

Evaluation of Fiji's Tuna Fishery By-Catch Management System in Fiji

Esaroma Lедуa (School of Marine Studies, Faculty of Science, Technology and Environment, The University of the South Pacific)

In this study, the management and control systems of tuna by-catch in Fiji were analyzed to determine conformance to regional standards specified under the WCPFC-CMMs of 2006-04; 2008-03; 2009-05; 2010-01; 2010-07; 2011-04; and 2013-08. It provides an evaluation of the level of compliance to regional standards of governance, as stipulated in the WCPFC-CMMs and other international instruments. Results of this study show that a total of 62 species are classified as tuna by-catch in Fiji. Out of the 62 species only turtles, porpoise and dolphins are protected by law under the Fisheries Act Chapter 158 of the Laws of Fiji. It also be deduced from this study that existing management measures do not conform fully to the WCPFC-CMM standards. Since Fiji has not fully complied with the WCPFC-CMM standards, overexploitation of tuna by-catch stocks is a major concern. Furthermore, this report is proposing that Fiji apply Sections 16 and 17 of the Offshore Fisheries Management Decree (2012) to declare mahimahi, sharks and billfish as designated fisheries and implement Fishery Management Plans that complies fully with the WCPFC-CMMs, which will allow harvest at a sustainable rate and will enhance resource sustainability and economic viability to government, fishing industry and ultimately, to the public.



CCO-01.3, July 10, AUSAID3, 11:00

Marine mammal by-catch in fisheries in Oceania

Michael Donoghue (Pacific Regional Environment Program, Apia, Samoa)

Although artisanal, coastal and pelagic fisheries are of vital importance to food security in Pacific Island countries, little data have been published on the by-catch of marine mammals in the Pacific Islands region. The purse-seine fishery for tuna recently achieved high levels of observer coverage, but observation of the long-line fleet is less than 5%. Little is known of the by-catch of dugong and dolphins in coastal fisheries, but given the experiences of other countries, entanglement in coastal gill nets may be a significant threat. In Hawaiian waters, mitigation of cetacean by-catch has been achieved through a collaborative stakeholder effort, led by NOAA.

CCO-01.4, July 10, AUSAID3, 11:15

Update on Effective Fisheries Bycatch Research in Longline and Gillnet Fisheries

Yonat Swimmer (NOAA Pacific Islands Fisheries Science Center, Long Beach, California USA 90802);
John Wang (Joint Institute for Marine and Atmospheric Research, University of Hawaii, Honolulu, Hawaii, USA)

Incidental capture of unwanted species, or bycatch, in artisanal and commercial fishing operations has been shown to result in population-level impacts on threatened and endangered marine animals. Given the ecological concerns, as well as the enormous economic toll fisheries closures place on U.S. commercial activities, NOAA Fisheries aims to identify effective mitigation measures that would allow fishing operations to continue while simultaneously not posing a risk to sea turtle populations. In the past decade, our research group has provided funding and technical support to a variety of research projects, many of which involved field-trials of various mitigation methods. In longline fisheries, use of circle hooks, fish bait and increased hook depth have been shown to significantly reduce sea turtle interaction rates. For gillnet fisheries, recent innovation with net illumination suggest that various wavelengths of light may be effective in reducing sea turtle capture rates while not affecting catch rates of target species. Current and future research ideas will be discussed, with an emphasis on potential studies in Oceania.

CCO-01.5, July 10, AUSAID3, 11:30

SPREP's turtle research and monitoring database system - a platform for sustainable management and conservation of marine turtles; including a case study of by-catch in Palau

Catherine Siota (Pacific Regional Environment Program, Apia, Samoa)

The Turtle Research and Monitoring Database System (TREDS) is a programme that has been developed to be the overarching storage mechanism for turtle research and monitoring carried out by SPREP member countries and territories. It is a tool that can be used to bring together and manage data from various governments, NGOs and community groups who undertake turtle research, monitoring and tagging within the Pacific. TREDS is being currently used by 14 SPREP member countries and territories and 9 partner organisations. The use of TREDS ranges from the storage and consequent analysis of simple tagging survey information to complex researches that collect samples for genetics, laparoscopy and satellite tagging. There have been over 40 individual country reports and one regional report that has been produced from TREDS. One of the important uses of TREDS has been the extraction of data to construct the sub-regional management unit map for sustainable management and conservation of green turtles in the



PICTS. Data provided by Palau for TREDIS has enabled an estimate to be made of by-catch of turtles in their territorial waters.

CCO-01.6, July 10, AUSAID3, 11:45

Silky shark (*Carcharhinus falciformis*) bycatch in a tropical tuna purse seine fishery

Melanie Hutchinson (Department of Biology, University of Hawaii, Hawaii Institute of Marine Biology, Kaneohe, Hawaii. 96744 USA)

Juvenile silky sharks (*Carcharhinus falciformis*) comprise the largest component of the incidental elasmobranch catch taken in western and central Pacific Ocean tropical tuna purse seine fishery. High mortality on the juvenile life stages of silky sharks has the largest impact on population growth and a recent stock assessment concluded the population is overfished. To elucidate interaction and post release survival rates of juvenile silky sharks captured in purse seine nets we participated in a research cruise on-board a commercial purse seine vessel. Post release survival was measured using a combination of satellite tags and blood chemistry analysis. Animals were sampled during every stage of fishing operations, including animals that were captured by hook and line while free swimming. We obtained blood gas, electrolyte and metabolite levels to determine stress levels throughout the fishing and loading process. Our results indicate shark interactions recorded by the scientific party were markedly higher than those recorded by vessel officers and the observer. We also found that survival precipitously declines once the sharks have been confined in the sack portion of the net just prior to loading. Blood chemistry and tag data estimate total mortality rates exceed 84%. Future efforts to reduce the impact of purse seine fishing on juvenile silky shark populations should be focused on avoidance and releasing animals while they are still free swimming in the net.

CCO-01.7, July 10, AUSAID3, 12:00

Sharks: More than just bycatch

Ian Campbell (Global Shark Programme Manager, WWF)

Overfishing of sharks is widely recognised as a serious threat to the survival of some species. Many reproduce at such a low rate as to render them especially vulnerable to unsustainable levels of harvest. Many shark species are apex predators, other species are filter feeders or carnivores of a lower level. In general, indirect ecosystem effects induced by predator removal from the oceanic food webs remain unpredictable. WWF's Global Shark Programme aims to ensure that shark resources can, wherever possible, be used sustainably to provide practical benefits to people while not compromising the marine ecosystem. WWF's Global Shark Action Plan comprises of three programmatic strategies which include:

- Responsible shark management
- Responsible trade
- Responsible consumption

This presentation will give an overview of WWF's work in both a global and South Pacific regional context.



CCO-01.8, July 10, AUSAID3, 12:15

Bycatch in longline fisheries: effective mitigation tools

Susanna Piovano (The University of the South Pacific)

The viability of many sea turtle populations is threatened by human activities, among which longline fishing plays a major role. To reduce sea turtles incidental capture in longliners, and/or to increase turtles chance of survival after an incidental capture, bycatch reduction technologies (BRTs) and sea turtles handling techniques have been developed. In addition, turtles' behaviour with respect to bait and hooks has been studied in laboratory conditions, to help identifying possible new solutions to reduce turtles capture even more. In this presentation I will review published studies on BRTs and turtles behaviour, highlighting failure and success, to provide an opportunity for discussion at regional level within the theme *Conservation in a Changing Oceania*.

CCO-01.9, July 10, AUSAID3, 12:30

Smart Gear: Inspiring Innovation by Capitalizing Creativity

Mike Osmond (World Wildlife Fund)

Bycatch is among the most problematic aspects of modern fishing from a conservation perspective with unselective fishing posing a serious threat to numerous species of ocean wildlife and threatening the commercial viability of a number of mainstream fisheries. In response to this problem, World Wildlife Fund (WWF) launched the first International Smart Gear Competition in 2004, with the goal of identifying innovative and practical modifications for significantly reducing bycatch. Offering cash prizes totaling more than \$50,000 and open to all, the competition has attracted entries from countries all over the world. The ultimate goal is to have the winning ideas be adopted by fisheries to address the bycatch problem for which they were designed. To enable this, the competition is now run biennially - the intervening year allowing WWF to push forward research and development of previous winning entries, eventually leading to adoption of the new technology. 2014 will involve a pilot trial with Indonesian fishermen of a prize winning idea designed to reduce the bycatch of sea turtles in gillnets, a ubiquitous fishing technique in Oceania. Since 2004, more than 40% of the winning ideas have been advanced to the stage where they are being utilised by industry to reduce bycatch.

CCO-03: Spatial management of coastal seascapes for ecological functioning, ecosystem services and food security

CCO-03.1, July 9, AUSAID3, 14:45

Habitat corridors and fish movement in inshore coral reef seascapes

Jean Davis (Australian Rivers Institute - Coast and Estuaries and School of Environment, Griffith University, Gold Coast Qld, Australia); Kylie Pitt (Australian Rivers Institute - Coast and Estuaries and School of Environment, Griffith University, Gold Coast Qld, Australia); Brian Fry (Australian Rivers Institute - Coast and Estuaries and School of Environment, Griffith University, Brisbane, Australia); Rod Connolly (Australian Rivers Institute - Coast and Estuaries and School of Environment, Griffith University, Gold Coast Qld, Australia); Andrew Olds (Australian Rivers Institute - Coast and Estuaries and School of Environment, Griffith University, Gold Coast Qld, Australia and School of Science and Engineering, University of the Sunshine Coast, Qld, Australia)



Habitat connectivity facilitates ecosystem functioning in coastal seascapes. The degree of connectivity depends, however on how seascape structure facilitates the movement of organisms among habitat patches. Patterns in abundances of fish on coral reefs and in mangroves suggest that seagrass patches may function as corridors for tidally driven fish movement. We hypothesized that a higher abundance and diversity of fish move over seagrass habitats than reef flats when transitioning between coral reefs and mangroves during flooding tides. Using underwater video we compared assemblages of fish over intertidal seagrass and reef flat habitats during flood tides at three sites in southeast Queensland, Australia. Fish abundance and diversity was higher on the reef flat than in seagrass during flood tides. These results emphasize the importance of intertidal reef flat habitats as movement corridors for fish. Furthermore, differences in fish abundance and diversity at the site level suggest these intertidal reef flats may be best managed at local scales. Reef flats are largely underrepresented in current conservation planning, despite their importance in recreation, erosion protection and food provision to island nations and their impending vulnerability to overexploitation and sea level rise.

CCO-03.2, July 9, AUSAID3, 15:00

Insights into the life-history of the New Guinea Black Bass *Lutjanus goldiei*

Ronald Baker (TropWATER (Center for Tropical Water and Aquatic Ecosystem Research), School of Marine and Tropical Biology, James Cook University, Townsville, Qld, Australia and CSIRO Land and Water, ATSIP Building, JCU, Townsville, Qld, Australia); Katya Abrantes (TropWATER (Center for Tropical Water and Aquatic Ecosystem Research), School of Marine and Tropical Biology, James Cook University, Townsville, Qld, Australia); Adam Barnett (TropWATER (Center for Tropical Water and Aquatic Ecosystem Research), School of Marine and Tropical Biology, James Cook University, Townsville, Qld, Australia); Marcus Sheaves (TropWATER (Center for Tropical Water and Aquatic Ecosystem Research), School of Marine and Tropical Biology, James Cook University, Townsville, Qld, Australia)

Black Bass *Lutjanus goldiei* of Papua New Guinea support a potentially highly valuable sport fishing industry in a region where fishing also provides the primary source of protein for the local population. The sustainable management of this species requires an understanding of its ecology. Habitat requirements and the importance of different coastal, estuarine, riverine, and floodplain habitats during different stages of their life-cycle are currently unknown. We are using otolith microchemical analyses to identify movements of Black Bass through the coastal seascape and to pinpoint key habitats and connectivities that support this species. Chemical profiles of elements including strontium and barium in transects through sectioned otoliths will be compared to the chemical signatures of site-attached freshwater and estuarine species to infer the historic movements of individual Black Bass during their earlier lives. Knowledge of key habitats (e.g. nurseries) and connectivities through the seascape (e.g. access between instream and floodplain habitats, spawning migration routes) will facilitate the sustainable management of this species into the future.

CCO-03.3, July 9, AUSAID3, 15:30

Fish community structure and macroalgal browsing processes show significant temporal and spatial variation in the subtropical Moreton Bay Marine Park

Ben L. Gilby (Australian Rivers Institute- Coasts and Estuaries, Griffith University, Gold Coast, Qld, Australia); Ian R. Tibbetts (School of Biological Sciences, University of Queensland, St Lucia, Qld, Australia); Tim Stevens (Australian Rivers Institute- Coasts and Estuaries, Griffith University, Gold Coast, Qld, Australia)



Herbivorous fishes are important in regulating the ecological balance of benthic marine habitats. Notionally, large and diverse herbivorous fish populations increase reef resilience and act to prevent and reverse phase shift patterns. However, in the Moreton Bay Marine Park (MBMP) in subtropical eastern Australia, macroalgal populations on reefs are regulated more by bottom up processes than by the process of grazing. Both fish (pilchard) and alga-baited (the large brown alga *Sargassum* spp.) remote underwater video systems (BRUVS) were used to investigate fish community structure and macroalgal browsing across water quality, fishing intensity and temporal scales (6 months). Pilchard BRUVS indicated that whole fish communities varied significantly across both temporal and spatial scales and that no-fishing marine protection was not a significant influence given overall site variation. *Sargassum* browsing was dominated (>99% of observed browsing) by the commercially fished rabbitfish *Siganus fuscescens*, whose populations also varied significantly over the same temporal and spatial scales. Our results demonstrate the scale at which fish communities and browsing processes occur within the MBMP and contribute towards our understanding of spatial fisheries management in heavily impacted environments, such as Moreton Bay.

CCO-03.4, July 9, AUSAID3, 15:30

Conservation benefits of marine reserves are undiminished near coastal rivers and cities

Chantal M. Huijbers (Australian Rivers Institute – Coast & Estuaries, and School of Environment, Griffith University and Faculty of Science, University of the Sunshine Coast); Rod M. Connolly (Australian Rivers Institute – Coast & Estuaries, and School of Environment, Griffith University); Kylie A. Pitt (Australian Rivers Institute – Coast & Estuaries, and School of Environment, Griffith University); Dave S. Schoeman (Faculty of Science, University of the Sunshine Coast); Thomas A. Schlacher (Faculty of Science, University of the Sunshine Coast); Dana D. Burfeind (Australian Rivers Institute – Coast & Estuaries, and School of Environment, Griffith University and School of Biological Sciences, University of Queensland); Chantel Saunders (Australian Rivers Institute – Coast & Estuaries, and School of Environment, Griffith University); Andrew D. Olds (Australian Rivers Institute – Coast & Estuaries, and School of Environment, Griffith University); Paul S. Maxwell (Australian Rivers Institute – Coast & Estuaries, and School of Environment, Griffith University); Russell C. Babcock (Commonwealth Scientific and Industrial Research Organization, Marine and Atmospheric Research, Queensland, Australia); David Rissik (National Climate Change Adaptation Research Facility, Griffith University)

Recent evaluations of marine reserves identified the importance of socio-economic factors as influences on reserve performance, but whether we should avoid or promote reserves near external coastal influences is still under debate. We used a global meta-analysis of the effectiveness of marine reserves to test whether proximity to major coastal influences, like cities or rivers, affected organism abundance. A strong effect of reserve performance (comparing inside and outside reserves) was evident in the abundance of organisms from different trophic groups. For the majority of groups, the effect of reserves was undiminished by proximity to coastal cities or river discharges. We conclude that reserves in coastal areas are likely to protect marine populations to the same degree as more remote reserves. Moreover, coastal marine reserves can serve as an important tool to protect species and ecosystems in places that are heavily impacted by human-related disturbances.

CCO-03.5, July 9, AUSAID3, 16:15

Coastal ecosystem repair: joint livelihood and public health benefits of informed design

Marcus Sheaves (James Cook University, Townsville, Australia); Pat Dale (Griffith University, Qld, Australia)



Repair and revitalisation of coastal ecosystems are increasingly seen as important strategies to bring back lost fisheries productivity, with large amounts of aid money likely to flow into the Pacific over the next decade to support these endeavours. However, coastal ecosystem repair will fail and can even have negative public health consequences unless it is based on a detailed knowledge of the ecology of the ecosystems involved. Based on developing understanding from Australia's tropics and sub-tropics we evaluated the attributes of mangrove forests that support nursery ground value and those that negatively impact human and aquatic ecosystem health, to determine the characteristics required for informed design of mangrove forest rehabilitation projects. Small mistakes in forest restoration design can result in conditions that favour mosquitoes that are vectors for diseases such as malaria and Ross River virus, while being detrimental to the health of juvenile fish; both degrading nursery ground value for fish and limiting fish predation on mosquito larvae. Consequently, considerable integrated research and planning is needed if rehabilitation is to have positive outcomes because the solutions need to be context- and location-specific.

CCO-03.6, July 9, AUSAID3, 16:30

Managing the resilience of seagrass ecosystems to severe events: the role of phenotype and acclimation in determining ecosystem dynamics

Paul Maxwell (Australian Rivers Institute – Coast and Estuaries, School of Environment, Griffith University, Gold Coast, Qld, Australia); Andrew Olds (School of Science and Engineering, University of the Sunshine Coast, Australia); Rod Connolly (Griffith University, Gold Coast, Qld, Australia); Kylie Pitt (Griffith University, Gold Coast, Qld, Australia)

Managing coastal habitats requires an understanding of the processes that enable them to resist or acclimate to poor conditions to retain ecosystem structure, function and ultimately the provision of important ecosystem services. Some coastal habitats, like seagrasses are phenotypically plastic, showing high intraspecific variability in morphology and physiology in response to stress, so that the ability to resist threats and pressures is likely to vary across impact gradients that have different phenotypes. Measuring phenotypic characteristics of meadows can provide early warning of the possible risk of larger scale seagrass loss and can therefore be used in predicting how seagrass ecosystems might respond to severe events. We examined how different levels of acclimation among twelve seagrass meadows across a water quality gradient affected their persistence following a major flood. We recorded a significant variation in the physiology and morphology in meadows across the water quality gradient, and, despite a large discrepancy in flood exposure, all meadows responded consistently. This suggests that the plasticity of key habitat forming species to regular poor conditions enables them to withstand short but intense periods of stress. Our results provide managers with a better understanding of the potential response of key coastal habitats to future threats and pressures.

CCO-03.7, July 9, AUSAID3, 16:45

Reaping the reef: conflicting ecosystem services from coral reefs in Solomon Islands

Joelle Albert (WorldFish, Solomon Islands); Anne-Maree Schwarz (WorldFish, Solomon Islands); Andrew Olds (Australian Rivers Institute, School of Environment, Griffith University, Qld, Australia); Simon Albert (School of Civil Engineering, The University of Queensland, Australia); Abbie Trinidad (Asian Development Bank, Manila, Philippines Islands)

The marine biodiversity of the Coral Triangle sustains the livelihoods of roughly 100 million coastal people, yet this region is under threat from numerous local and global stressors. Regional



actions are underway to address coastal and marine degradation and an improved understanding of the social-ecological links between people and their environment will help target these efforts. Economic assessments of coral reef provisioning services afforded to rural communities in Solomon Islands identified a diverse range of fisheries-based (fish, seaweed, clam, trochus, crayfish and shells) and coral-based (sand, rubble, stone, lime and corals for aquarium and curio trades) products. Fisheries products (in particular reef fish) were important for both village subsistence and cash economies. In contrast, coral products contributed primarily to cash economies. Market proximity and area of reef per person were the main drivers of variation. Coral extractive activities resulting in short-term economic gain can rapidly reduce reef resilience, diminish the viability of fisheries and compromise the livelihoods of dependent communities. Improved management and policy implementation are critical to addressing unsustainable coral harvests across the Coral Triangle.

CCO-03.8, July 9, AUSAID3, 17:00

How well do fish serve as surrogates for invertebrate marine diversity in conservation planning?

Carolyn J. Lundquist (National Institute of Water and Atmospheric Research (NIWA), New Zealand and Institute of Marine Science, University of Auckland, Auckland, New Zealand); Judi E. Hewitt (National Institute of Water and Atmospheric Research (NIWA), New Zealand)

Spatial patterns in biodiversity underlie many conservation and management decisions. However, information to develop models of marine biodiversity is often inadequate for many ecosystem components, particularly marine invertebrates. Rather, vertebrates (usually fish) as well as physical habitats are often assumed to be adequate representatives of invertebrate (particularly benthic) diversity. Here, we assess whether demersal fish and environmental datasets could serve as surrogates of epibenthic biodiversity for data collected in four regions of New Zealand's territorial sea and exclusive economic zone. Incorporating demersal fish richness did not improve predictions of epibenthic biodiversity, or of benthic habitat forming species, over environmental factors alone. Similarly, model outputs using demersal fish biodiversity distributions to determine priority sites for marine protection were dissimilar to prioritisations developed for invertebrate taxa; fish-optimised models resulted in low levels of protection for invertebrate taxa. As objectives of marine protection often include protection of key habitat-forming benthic species from seafloor disturbance by fishing or mining activities, better understanding of the scale at which vertebrate, invertebrate and physical habitats are correlated can improve our ability to design marine protected area networks that adequately protect invertebrates.

CCO-04: Prioritising conservation actions on tropical islands

CCO-04.1, July 10, AUSAID3, 14:30

Conservation in paradise: prioritizing management actions on islands in the Great Barrier Reef and Pilbara regions of Australia

Bob Pressey (Australian Research Centre of Excellence for Integrated Coral Reef Studies, James Cook University, Townsville, Australia)

A team at James Cook University is collaborating with Queensland Parks and Wildlife, the Great Barrier Reef Marine Park Authority, and the Western Australian Department of Parks and Wildlife to develop a decision-support tool for management of islands in the southern Great Barrier Reef and off the Pilbara coast. The problem statement for both regions is identical:



hundreds of islands, a plethora of management problems, and limits on staff and funds combining to require an accountable and cost-effective approach to prioritising investments. Both projects involve island managers in the design of the tool and the collection of data. The operational model for the decision-support tool attempts to approximate, within the limits of reliable information, the full complexity of the decision-making process. The model considers spatially-explicit data on biodiversity features, threats, and the effectiveness and cost of alternative management actions. Sub-models address dynamics of threats (e.g. management actions on one island mitigating risk on others), costs (e.g. dependence on field itinerary and number of islands visited), and actions (e.g. recognition that not all actions will be fully implemented). Underway are development of the prototype software and intensive elicitation of data from managers and other experts. Work planned for the coming year includes analysis of the sensitivity of priorities to uncertainties around parameter values and missing data.

CCO-04.2, July 10, AUSAID3, 14:45

The use of expert elicitation in prioritising conservation management actions

Amelia Wenger (Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University, Townsville, Australia); Bob Pressey (Australian Research Council Centre of Excellence for Integrated Coral Reef Studies, James Cook University, Townsville, Australia); J. Hicks (Great Barrier Reef Marine Park Authority, Townsville, Qld, Australia and Department of National Parks, Recreation, Sport & Racing, Gympie, Qld, Australia); M. Turner (Great Barrier Reef Marine Park Authority, Townsville, Qld, Australia); J. Olds (Department of National Parks, Recreation, Sport & Racing, Gympie, Qld, Australia); Ian Craigie (Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University, Townsville, Australia)

Managers of the Great Barrier Reef's (GBR) islands face difficult decisions when it comes to prioritising conservation management actions. The islands contain a wide variety of natural and cultural values, which face multiple and dynamic threats. The threats have to be managed within a fixed budget, using actions with varying levels of effectiveness and costs. In order to improve management decision making on islands, we are collating existing data on features, threats, and management actions for a subset of islands and cays in the southern GBR. As with most environmental datasets, there are large knowledge gaps, relating not only to species, ecosystems and threatening processes, but also to the costs and effectiveness of management actions. To address these gaps, expert elicitation is necessary to improve the content and the reliability of the datasets. Expert opinion can provide valuable first-hand information about local environmental issues when little published information exists. However the quality of the data collected from experts is highly dependent on the design and execution of expert elicitation process. Here I will present the latest thinking in expert elicitation techniques and share lessons from our experiences of eliciting data from GBR managers.

CCO-04.3, July 10, AUSAID3, 15:00

The costs of conservation management on islands – developing a framework to understand and optimise spending

Ian D. Craigie (Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University, Townsville, Qld, Australia); Bob Pressey (Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University, Townsville, Qld, Australia)

The costs of conservation management actions are never far from the mind of managers who need to maximise 'bang for the buck' with budgets that are often inadequate. Yet financial costs are often one of the least understood aspects of conservation plans and projects, which are often



written without direct reference to their costs. Conservation on islands is logistically challenging and practically complex, so optimising spending to achieve multiple objectives on multiple islands over a number of years requires a framework to allow us to move beyond the current ‘back of the envelope’ calculations, which can lead to missed opportunities to maximise spending efficiency and reduce costs. Here I present a preliminary framework for thinking about management costs on islands using data collected from islands in the Pilbara region of WA and central Great Barrier Reef. I highlight the kind of data that are required for optimising spending and discuss some of the gaps that are often present in current plans. In future this work will be integrated into larger decision support and prioritisation systems for maximizing conservation outcomes for native fauna on Western Australian and GBR islands.

CCO-04.4, July 10, AUSAID3, 15:15

Optimal spatial and temporal management of invasive species: general principles for eradication and suppression

Christopher M. Baker (University of Melbourne, Australia); Michael Bode

Choosing effective management strategies for invasive species is a global challenge. The invasive species problem comprises a huge number of species, and modelling every invasive species to determine appropriate management strategies is impractical. There is a pressing need to provide general guidelines for invasive species managers that can robustly be applied in a range of locations and scenarios. We use a reaction-diffusion model and optimal control theory to determine cost-effective management strategies in a range of invasive species scenarios. We demonstrate how to adjust control effort through time for an island eradication; how control efforts should vary through space around high-value conservation assets; and how to vary control efforts through space and time to eradicate a new invasion. Our methods can also be applied to specific situations, and we demonstrate this with a case study of the invasive orange hawkweed (*Hieracium aurantiacum*).

CCO-04.5, July 10, AUSAID3, 16:00

The Critical Ecosystem Partnership Fund’s investment niche and strategy for the East Melanesian Islands Hotspot

Luisa Tagicakibau (CEPF East Melanesian Islands Hotspot, International Union for the Conservation of Nature, Oceania, Suva, Fiji); Helen Pippard (CEPF East Melanesian Islands Hotspot, IUCN Oceania, Suva, Fiji)

The East Melanesian Islands are one of the most biologically important regions on the planet due to their high levels of plant and animal endemism and accelerating levels of habitat loss, caused chiefly by widespread commercial logging and mining, expansion of subsistence and plantation agriculture, human population increase, spread of alien invasive species and the impacts of climate change. The Critical Ecosystem Partnership Fund (CEPF) has recognized East Melanesia as a biodiversity hotspot and developed an 8 year Investment Strategy that aims to empower local communities to protect ecosystems and biodiversity through increasing the capacity of civil society organizations. This talk shall discuss CEPF’s niche and strategy for the East Melanesian Islands and provide participants with information about its priorities for investment, including how and when to apply for funding.



CCO-04.6, July 10, AUSAID3, 16:15

Endemism and diversity: key avitourism attractions of island destinations and opportunities for conservation and development

Rochelle Steven

Avitourism is a specific type of nature-based tourism that can potentially contribute to community development and bird conservation. The Pacific region offers numerous opportunities for avitourism with many islands exhibiting high levels of endemism within their avifauna. The details of which destinations have been most memorable for avitourists are relatively under-examined. Similarly, the most desired destinations and what makes them sought after remains a gap in our understanding of traveling avitourists' preferences. An examination of these birding preferences was made by sampling the global birder population using questionnaires distributed electronically via birding forums, birder mailing lists and social media sites. Islands are highly sought after destinations. Of the seven Pacific Island destinations highlighted by avitourists, the most memorable was New Zealand (7.5% of respondents) and most the desired was Papua New Guinea (10% of respondents). Key aspects that influenced preferences for these destinations were the presence of diverse and often endemic species. Understanding these avitourists' preferences may help island destinations better manage avitourism to both increase their market share and conserve the birds/natural resources on which avitourism depends.

CCO-04.7, July 10, AUSAID3, 16:30

Assessment of reptile and mammal disease prevalence on Christmas Island

Jane Hall (Australian Registry of Wildlife Health, Taronga Zoo, Mosman NSW, Australia); K. Rose (Australian Registry of Wildlife Health, Taronga Zoo, Mosman NSW, Australia); D. Spratt (CSIRO Ecosystem Sciences, Canberra, Australia)

Christmas Island, an Australian territory in the Indian Ocean, has undergone significant ecological alterations over the past century including; human settlement and infrastructure development, vegetation shifts, open-cut phosphate mining, and introductions of invasive plants, vertebrate and invertebrate animals. Christmas Island has a history of endemic species extinctions and recently, a marked decline in the remaining endemic species has been documented. Christmas Island is ecologically unique, with a high level of endemism of its flora and fauna and is a strategically important site for wildlife and invasive species surveillance due to its geographic location. At the request of the Director of National Parks (DNP), we assembled a diverse, multi-disciplinary team to undertake an assessment of reptile and mammal fauna health that dovetails with other ecosystems-based research on the island. Although the investigation did not identify a single organism or toxin of high pathogenicity, we did identify: (a) multiple parasites with a new host or geographic record; (b) multiple parasites with the ability to be transmitted from feral and native host species; (c) undescribed parasite species; (d) the absence of widespread, naturally occurring or anthropogenic heavy metal toxins; (e) no evidence of viral pathogens within reptiles; and (f) seven potentially zoonotic agents, identified within both native and feral wildlife. This study has provided crucial data to inform disease risk assessments related to current and future species conservation activities such as captive breeding, animal translocation and re-introduction of animals back to Christmas Island. Additional animal and ecological health investigations are being undertaken to address ongoing declines of critically endangered species on the island.



CCO-04.8, July 10, AUSAID3, 16:45

Setting priorities to manage invasive species on tropical islands; whose priorities?

Alan Saunders (International Union for the Conservation of Nature, Oceania Regional office, Suva, Fiji)

In the last 50 years exciting achievements have led to increases in the number and scale of eradication projects globally. In the face of escalating biological declines and a growing array of conservation opportunities a number of initiatives have been taken to inform priority-setting. These have focused mainly on environmental and logistical features. As the scale and complexity of eradication projects continues to increase priority-setting tools that incorporate a range of economic, environmental, cultural, institutional and logistical considerations will be a key to minimising costs and risks and maximising conservation outcomes. Applying wellbeing and livelihoods considerations, alongside environmental ones as our focus moves towards inhabited islands may well represent a “new frontier” for some conservation management agencies. Prioritising research to reduce uncertainty, or contributing to regional capacity building could also present challenges for national organisations. As the number of stakeholders increases, so too will the number of suggested factors needing to be taken into account. It is appropriate that we recognize that there may be wider opportunities, as well as risks and costs that will need to be considered. The process of conservation planning could provide important opportunities to consider these wider values and to ask “Whose priorities we are talking about?”.

CCO-04.9, July 10, AUSAID3, 17:00

Alien Invasion of our Islands and Seas: A Call for Pacific Alien Species Action Plans (ASAP)

Randy Thaman (Professor of Pacific Islands Biogeography, The University of the South Pacific, Suva, Fiji)

Invasive alien species (IAS) constitute one of the most serious, but least recognized, threats to island biodiversity on islands. In the forms of a wide range of weeds, vertebrate and invertebrate animals and diseases, IAS are a “living pollution” just as serious, but harder to prepare for and recover from, than natural disasters, overexploitation, environmental degradation and economic downturns. Unlike these threats and like climate change, IAS will not go away . . . and, in most cases, only get worse. Largely unseen, IAS silently move beneath the radar screens of most of us, as they destroy the health, productivity and hopes of our islands. Dramatic examples of the negative impacts of IAS on island biodiversity and on food, health and livelihood security are presented from in New Zealand, Hawaii, French Polynesia, New Caledonia, Guam, Kiribati, Samoa, Fiji, Solomon Islands and many other island countries and territories. The long-term real cost of IAS is almost unimaginable, and, if economists would take the time to assess it, they would find that IAS contribute to a form of “bio-bankruptcy” that severely undermines food and livelihood security and increases the vulnerability of every country. This is particularly true for island countries where most of the extinctions of birds, mammals, reptiles, land snails, freshwater fish and many plants and animals, and historically, the devastation of taro and other important food and export crops and animals and death of large numbers of our indigenous human populations, have been due to IAS, against which islands species, ecosystems and human communities have little natural resistance. There is also increasing evidence that marine IAS constitute an extremely serious, but less understood, threat to our fisheries, coral reefs and marine ecosystems. If the control and management of IAS are not made a priority, building resilience to all forms of climate, environmental and economic change will be problematic. Accordingly the development and/or refinement of regional and national Alien Species Action Plans (ASAP) must be made a Pacific Island priority as soon as possible (ASAP).



CCO-05: Integrating science with participatory conservation

CCO-05.1, July AUSAID3, 10:45

A participatory framework for Chapter-lead community conservation programs: Lessons from Oceania

Monica Awasthy (Macquarie University, Department of Biological Sciences, Sydney, Australia); Sandra Vogel (University of New South Wales, School of Biological, Earth and Environmental Sciences, Sydney, Australia); David Vardeh (Macquarie University, Department of Biological Sciences, Sydney, Australia)

Engaging the community to participate in conservation is central to achieving long-term attitudinal and behavioural change and improving conservation outcomes, which are often influenced by a complex interaction of sociological issues and ecological processes. Here, we present a participatory framework for SCB Chapters who are leading community-based conservation projects in the Oceania region. We will describe feedback loops based on community science, where public participants can be involved in data collection, assisted in understanding data analysis, interpretation and results and encouraged to participate in the iterative aspects of the scientific process, leading to adaptive management. The mostly city-based Chapters' role in the feedback loop will be emphasised. They have to fill a central niche in urban landscapes by providing a centralised organisational infrastructure to promote individual, community and regional science-based management. We will illustrate our framework using a few relevant examples from urban, marine and wetland ecosystems in the Sydney region to assess opportunities of improving conservation outcomes by tapping into the potential of community-based science.

CCO-05.2, July 10, AUSAID3, 11:00

Vegetation cover and participation in voluntary planting help explain residents' wellbeing in Wellington City, New Zealand

Julie-Anne Whitburn (Centre for Biodiversity and Restoration Ecology, School of Biological Sciences, Victoria University of Wellington, New Zealand); Wayne L. Linklater (Centre for Biodiversity and Restoration Ecology, School of Biological Sciences, Victoria University of Wellington, New Zealand); Taciano L. Milfont (School of Psychology, Victoria University of Wellington, New Zealand)

Human wellbeing may be dependent on a relationship with nature. Highly modified urban environments provide fewer opportunities for people to interact with nature. We tested whether engagement with urban nature supported human wellbeing and which social-psychological constructs mediated the relationship between them. Engagement with nature was specified by the amount of vegetation cover in urban neighbourhoods and participation in a community-planting scheme. We conducted a postal survey during October 2012 of 1200 households in 20 neighbourhoods of Wellington City, New Zealand. There was a 36% return rate. *A priori* mediation models were specified to test the effect of engagement with nature on residents' wellbeing via the mediators. Structural Equation Modelling followed by Information Theoretic model selection and inference using Akaike Information Criterion identified the leading influences and tested the hypotheses for wellbeing. The level of neighbourhood vegetation and involvement in the planting scheme positively predicted human wellbeing, explaining 16, 13 and 3% of the variance in mental health, life satisfaction and physical health respectively. Neighbourhood satisfaction, psychological restoration and pro-environmental behaviour were the significant mediators. Respondents' socio-demographic variables did not improve the leading



models. Our study demonstrates the importance of urban residents' relationship with nature for their wellbeing.

CCO-05.3, July 10, AUSAID3, 11:15

Public participation for marine spatial planning

Rebecca Jarvis (Institute for Applied Ecology New Zealand, Auckland University of Technology); Barbara Bollard-Breen (Institute for Applied Ecology New Zealand, Auckland University of Technology)

The implementation of successful conservation actions is often limited by the inadequate consideration of the social systems in which conservation is embedded. To be more effective, conservation must be inclusive of the local communities who live and work in these areas. The Hauraki Gulf Use and Values Survey will be open to the public throughout March and April 2014 to collate information on how different stakeholders use and value the Hauraki Gulf, New Zealand. The survey crowd-sources public participation data within the online collaborative mapping tool, Seasketch, to integrate diverse value-based information with science-based methodology. This information is geo-spatially linked to produce use and values data layers in the same format as environmental, commercial and economic data that already exists for the area. The results of the survey will be used to enhance dialogue between the public, local communities and conservation managers, and will feed back in to the Sea Change – Tai Timu Tai Pari marine spatial planning process.

CCO-05.4, July 10, AUSAID3, 11:30

Enhancing community-led restoration of seabird driven ecosystems

Steph Borrelle (Auckland University of Technology, Institute for Applied Ecology New Zealand); David Towns (Auckland University of Technology, Institute for Applied Ecology New Zealand and The Department of Conservation, New Zealand)

Before invasions by introduced mammals, most island ecosystems were inhabited by seabirds that acted as ecosystem engineers, through marine nutrient subsidies and physical disturbance. Seabird systems are vulnerable to the effects of predatory mammals, which alter biological assemblages and interrupt ecosystem function. The removal of mammals from islands has provided opportunities to investigate and understand the engineering role of seabirds, and for local communities to become involved in conservation projects. However, island restoration projects have many challenges. When reconstruction of modified island systems is based on historic models, the complications of uncontrollable temporal change are ignored, and unpredictable and intractable alternative stable states may develop, where conservation goals may not be met. We investigated the recolonisation chronology of seabirds on islands in the Hauraki Gulf Marine Park, where there is a long history of mammal removals. Our work illustrates that temporal patterns of recolonisation are influenced by the proximity of source populations, the innate behavioural differences between seabird species, and the extent of habitat modification. If the aim of community conservation projects is to restore seabird islands to a pre-invaded functional state, then identifying sites where assisted recolonisation may be required increases the likelihood of achieving community-led restoration goals.



CCO-05.5, July 10, AUSAID3, 11:45

Conservation planning in Fiji – The participatory process and lessons learned from engaging local communities

Hans Karl Wendt (International Union for Conservation of Nature (IUCN-Oceania), Suva, Fiji); Rebecca Weeks (School of Marine and Tropical Biology and Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University, Townsville, Qld, Australia); James Comley (Institute of Applied Sciences-The University of the South Pacific, Suva, Fiji); William Aalbersberg (Institute of Applied Sciences-The University of the South Pacific, Suva, Fiji)

Pacific Island Countries have placed many efforts to sustainably manage and conserve marine resources in order to achieve biodiversity targets and have an improved future. In Fiji, the protection coastal and marine areas rely on communities who have user privileges to their fishing grounds through marine tenure system. In this study, we used systematic conservation planning approach with the communities of Kadavu, to integrate ecological, social and governance factors collected through a range of participatory methods to re-design a collection of marine protected areas (MPAs) with the aim that it may better achieve the benefits of a network. We demonstrate how planning in a local communities can be done with maps and tracing paper overlays rather than computers. The re-designed network had an increased number, area and representation of habitats and key ecological features yet had a higher average 'cost' per unit area protected based on lost fisheries potential and enforceability of the network. These results suggest that such reserve design undertakings may play an important role in the scaling up from individual community-based managed sites to a functioning network of MPAs. However we caution that suggest that such reserve design undertakings may play an important role in the scaling up from individual community there needs to be a solid foundation of belief and trust amongst communities in management on which to build more complex integrated planning approaches. Findings were crucial as Fiji strives to achieve bold conservation targets to effectively manage 30% of nearshore waters in a network of MPAs.

CCO-05.6, July 10, AUSAID3, 12:00

Kumutoto Forest Restoration Project; restoring native flora and fauna and cultural revitalisation in an urban New Zealand context

Bart Cox (Society for Conservation Biology, Wellington Chapter, New Zealand)

Kumutoto is a biodiversity restoration and cultural revitalisation project within an urban setting. Managed by the Wellington, New Zealand Chapter of The Society for Conservation Biology. Kumutoto was once a diverse forest ecosystem. Māori used this stream and forest as a source of food and as a place for birthing and naming rituals. They also established māra kai (food gardens) here. European colonisation displaced Māori from Kumutoto and subsequent urbanisation led to its gradual degradation. Until 2009 Kumutoto was neglected and overrun by weeds and non-native predators. This project aimed to restore the biodiversity and revitalise cultural history. We engaged the local community via native tree planting, predator pest surveys and management, stream health surveys and bird counts. After eight planting events (~ 850 trees) over four years, we recorded and ~ 75% winter and ~ 55% spring survival rate for saplings planted. Preliminary pest surveys showed rat infestation, which is currently being addressed. Bird surveys recorded ~ 7 native species and 8 exotic species can be found in this habitat. This restoration project connected the Chapter with the community and the local iwi (tribe), Te Ātiawa. Placing people at the centre of our restoration efforts has been the key to our success and is crucial to the continuity of this project.



CCO-05.7, July 10, AUSAID3, 12:15

Agency research for conservation – necessity or luxury?

D.J. Roux (South African National Parks, Pretoria, South Africa); Richard T. Kingsford (Centre for Ecosystem Science, School of Biological, Earth and Environmental Sciences, University of NSW, Australia); S.F. McCool (Department of Society and Conservation, College of Forestry and Conservation, University of Montana, USA); M.A. McGeogh (Monash University, School of Biological Sciences, Melbourne, Australia); and L.C. Foxcroft (South African National Parks, Pretoria, South Africa)

Biodiversity around the world is declining, driven by major threats including habitat loss and degradation, pollution, overharvesting, invasive species, disease and climate change. Governments charge their conservation agencies to reduce these impacts and protect biodiversity through protected areas and treat mitigation. Increasingly, effective conservation management and policy need to be supported by rigorous evidence provided by science. Can in-house agency research respond to this challenge? We examined the research capabilities of three conservation agencies from Australia, South Africa and United States. Eight indicators were used to characterize the reliability and relevance of agency research. We found similarities among agencies in their patterns of peer-reviewed publication, cultures of research collaboration, and tendencies to associate their research with the objectives of the agency. We postulate that achieving reliable research through peer-reviewed publication and relevant research supported by purposeful engagement is critical to effective research within a conservation agency. Research is an essential function of a conservation agency, providing and supporting rigorous and relevant information, capacity building, collaborative networks and engagement with various stakeholders. We should provide opportunities and reward individual researchers for producing peer-reviewed papers relevant to conservation and for engaging constructively internally and externally.

CCO-06: Protected areas and their management

CCO-06.1, July 11, AUSAID3, 10:30

Predator/prey interactions and the effectiveness of marine reserves in conserving ecosystem processes

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Predators perform crucial roles in terrestrial and marine ecosystems, and the interplay between predatory species and their prey can have a profound effect on the community structure of an ecosystem. On the Great Barrier Reef (GBR), piscivores are heavily targeted by both recreational and commercial fisheries, and densities are much lower in heavily fished areas compared to adjacent marine reserves. Marine reserves are a critical tool used to conserve populations of fisheries targets and promote biodiversity, however little is known about the efficacy of marine reserves in restoring and maintaining key ecological processes such as predation. This study aimed to address the effects of fishing on predator/prey interactions on the GBR, and assess the effectiveness of no-take marine reserves in conserving predators and associated top-down control of fish assemblages. We used underwater visual census to survey reef fishes in/out of marine



reserves over a wide latitudinal range on the GBR. We found strong evidence of prey release in heavily fished areas, and fish communities varied greatly in/out of marine reserves. Marine reserves were effective in re-establishing and maintaining top-down control of reef fish communities, through restoration of piscivore numbers. These data highlight the importance of understanding the trophic effects of fishing practices, and the importance of ecosystem-based management of fisheries and marine reserves.

CCO-06.2, July 11, AUSAID3, 10:45

The effects of water quality and marine protection on top-down control in the seagrass communities of Moreton Bay, Queensland

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Seagrass are globally distributed and provide numerous valued ecosystem services, not limited to the fuelling of primary production and carbon sequestration. Top-down control (predation and herbivory) on food webs in seagrass habitats is an important ecosystem process, which remains relatively unknown in this system. Habitat protection has been identified as being one of the most successful ways of rehabilitating habitats, by re-establishing ecosystem processes and allowing recovery of fish communities (i.e. fish abundance and diversity). We used urchin and algal tethers, combined with baited BRUVS, to assess the influence of marine protection on top-down controls in different seagrass meadows in locations of varying water quality within Moreton Bay, Queensland, Australia. Areas of Moreton Bay experience periods of poor water quality (low benthic salinity, low Secchi disk depth and high total nitrogen) due to estuarine input. Preliminary results presented here suggest that the intensity of bottom-up processes in seagrass ecosystems is greater than the influence of top-down processes. This highlights the importance of resilient ecosystems, particularly seagrasses, in re-establishing healthy ecosystem processes and fish communities and has important implications for the design of marine protected areas or other management measures in seagrass habitats.

CCO-06.3, July 11, AUSAID3, 11:00

Kaikoura community-led integrated marine management

Peter Lawless (The Lawless Edge Ltd, 7010 Nelson, New Zealand); Gina Solomon (Te Korowai o Te Tai o Marokura, The Kaikoura Coastal Marine Guardians, 14 Rakanui Rd, Peketa, Kaikoura, New Zealand)

Melding of traditional knowledge, science, law and the values of Western society is necessary for effective coastal management in the Pacific. Kaikoura, New Zealand, is the premier marine mammal tourism area in New Zealand. After eight years of discussion the community has agreed on a comprehensive package of protective measures for this unique environment. Central Government has agreed to implement the full range of legal instruments. These include a marine reserve over the Kaikoura Canyon, five Maori fishing reserves, two marine mammal sanctuaries, and changes to recreational fishing limits. Indigenous people have led the process and this paper explores how their values have driven and shaped the approach adopted. The compromises made by all sectors are described and how these have been translated in special legislation now under consideration by the New Zealand Parliament. Conclusions are drawn about lessons that can be applied to other jurisdictions where indigenous and Western traditions need to be drawn together in coastal management.



CCO-06.4, July 11, AUSAID3, 11:15

Operating MPAs as a business in Fiji – A case study of the Namena Marine Reserve

Arthur Sokimi (Coral Reef Alliance, Suva, Fiji); Juliane Diamond (Coral Reef Alliance, San Francisco, USA); Jason Vasques (Coral Reef Alliance, San Francisco, USA)

Marine Protected Areas (MPAs) are historically implemented as conservation and fishery management tools. However, mounting evidence and experience suggests that MPAs are good businesses - profiting communities beyond fisheries (Sala et al, 2013). Therefore, MPAs need to be managed not only as conservation tools but also as businesses. In Fiji, the Coral Reef Alliance has been working with the Kubulau community to implement this type of system in the Namena Marine Reserve. Thinking of MPAs as a business has provided a management framework for the Reserve that includes conservation and financial targets and accommodates on-the-ground management of the MPA through a sustainable financing mechanism. This framework also includes a resource and user fee management plan and projections for growth in tourism and income. In Fiji, this system has proven applicable to the local community, where real-world considerations have helped to shape the model. Key lessons learned include the importance of: cooperative enforcement and management with stakeholders, community benefit-sharing, and a transparent-agreed upon budget. A low-tech approach to business principles has helped the Reserve become a model for MPAs around Fiji and worldwide; and provides an ideal case study to test applicability elsewhere.

CCO-06.5, July 11, AUSAID3, 11:30

Breaking barriers — reef conservation

Rebecca Hobbs (Taronga Western Plains Zoo, Obley Road, Dubbo, NSW Australia); Rebecca Spindler (Taronga Western Plains Zoo, Obley Road, Dubbo, NSW Australia); Mary Hagedorn (Smithsonian Conservation Biology Institute, Smithsonian Institution, Washington, DC 2008 USA and Hawaii Institute of Marine Biology, University of Hawaii, Kaneohe, HI 96744 USA)

Worldwide, coral reefs are experiencing unprecedented degradation. An international collaboration of scientists and aquarists have joined forces to secure the future of coral reefs. Since 2011, we have used the techniques developed at the Smithsonian to the Australian Institute of Marine Science for the annual spawning event of the Great Barrier Reef. Our aim is to preserve the biodiversity of this World Heritage Area by cryo-banking living sperm and embryonic stem cells. To date we have over a trillion cells from 6 reef-building coral species frozen in Taronga Western Plain's Zoo's, AusCool. For the first time we have shown that frozen coral sperm stored for twelve months under liquid nitrogen can be thawed and fertilize fresh coral eggs with the same level of success as fresh sperm. These experiments produced 23,000 coral larvae from frozen and fresh sperm that developed and settled with the same success, suggesting that cryopreservation has little effect on these early developmental stages. Thus, our frozen repository can be scaled up to produce large numbers of coral to restore reef sections. Looking forward, AusCool will be a living, dynamic bank, who's goal is to build and restore more resilient reefs.

CCO-06.6, July 11, AUSAID3, 11:45

Uncharted waters: identifying priority areas for tropical seabird conservation in the Timor Sea

Jennifer L. Lavers (School of Biological Sciences, Monash University, Australia); Mark G. R. Miller (BirdLife International, Cambridge, United Kingdom); Rohan H. Clarke (School of Biological Sciences, Monash University, Australia)



The biodiversity and oceanography of the Timor Sea is poorly understood, yet the region is the fastest growing area of offshore development in Australia. To support strategic decision making aimed at sustainable management of the oceans, such as the establishment of protected areas for marine wildlife, we developed species distribution models for 19 seabird species based on oceanographic variables (e.g., sea surface temperature) and observations from at-sea surveys conducted during 2000-2013. The distribution model predicted the probability of seabird occurrence in areas where few or no surveys had been conducted and demonstrated three areas of high seabird richness that varied little between seasons. These were located within 150 km of Adele Island, Ashmore Reef and the Lacepede Islands, three of the largest aggregations of breeding seabirds in Australia. Although these breeding islands were foci for high species richness, model performance was greatest for three migratory species that would have been overlooked had monitoring been restricted to islands. Our results indicate many seabird hotspots in the Timor Sea occur outside of existing reserves (e.g., Ashmore Reef Commonwealth Marine Reserve) where shipping, fisheries and offshore development pose a threat to populations. To ensure biodiversity assets are appropriately represented in marine reserves, a number of Important Bird Areas (IBAs) are proposed.

CCO-06.7, July 11, AUSAID3, 12:00

Using volunteer collected data to evaluate the impact of protected areas for endemic birds of the Australian Wet Tropics

Megan Barnes (The University of Queensland, School of Geography Planning and Environmental Management, St Lucia, Qld, Australia and Australian Research Council Centre of Excellence for Environmental Decisions, School of Biological Sciences, The University of Queensland, St Lucia, Qld, Australia); Judith K. Szabo (Research Institute for the Environment and Livelihoods, Charles Darwin University, Darwin, Australia); Hugh Possingham (Australian Research Council Centre of Excellence for Environmental Decisions, School of Biological Sciences, The University of Queensland, St Lucia, Qld, Australia)

Protected areas are the cornerstones of global conservation management, but in many cases it is unclear whether they are effective in maintaining their biodiversity values. Long term systematic population monitoring data is exceptionally rare, but critical for determining species and community level changes in natural values. In Queensland this data exists only for a tiny fraction of all species. Long-term, increased monitoring is urgently required, but meanwhile, insufficient data exist with which to make adequate informed decisions. Conversely, species list data is common, especially for birds. We use Birds Australia atlas data and apply logistic regression within a Bayesian framework and List Length Analysis to evaluate changes in prevalence for over 100 bird species in the Wet Tropics since 1998 to investigate whether protected areas in the Wet Tropics region are effective in maintaining their biodiversity values. We also examine the influence of habitat type and species ecological traits on changes in abundance. The influence of protection varied among species and correlations with other variables were also idiosyncratic, but for some species clear trends are evident. Where systematic monitoring data is not available, List Length Analysis can be a valuable substitute to evaluate biodiversity status, identify monitoring priorities and inform policy and adaptive management.



CCO-06.8, July 11, AUSAID3, 12:15

Impact Investing for Coral Reef Management in the Pacific Islands

Melissa Bos (James Cook University, Townsville, Australia)

Coral reefs in the Pacific Islands sustain resilient island communities by providing food, income, storm protection, cultural and traditional practices, and other community benefits. Funding for the management of these reefs is limited. Grants are often too small and too short to realize conservation and community outcomes, and the over-reliance on a few philanthropic sources puts conservation programs at risk. Many non-profit organizations are pursuing ‘sustainable funding’ opportunities to move beyond grant-funded programs, but it is often difficult to translate these concepts to small island realities. Impact investing, or investing capital to achieve environmental and social outcomes alongside financial returns, has the potential to provide sustained solutions for the environment and communities of the Pacific Islands. This talk will present preliminary data from surveys of impact investors, examples of successful marine impact investments in the region, and opportunities and challenges for developing new impact investments.

CCO-07: Fisheries in Oceania

CCO-07.1, July 11, AUSAID3, 14:30

Implementing more effective sea cucumber fisheries management in Vanuatu

Jayven Ham (Vanuatu Fisheries Department, Port Vila, Vanuatu); Rocky Kaku (Vanuatu Fisheries Department, Port Vila, Vanuatu); Marc Leopold (Vanuatu Fisheries Department, Port Vila, Vanuatu and IRD (Institut de Recherche pour le Developpement), U227 COREUS2, BP A5, 98848 Noumea Cedex, New Caledonia)

Weak management system over the past years resulted in the collapse of sea cucumber fisheries in Vanuatu in the early 2000s. Consequently a five year moratorium was established in 2008 and a new management system has been developed in order to allow sustainable harvest of sea cucumbers when the moratorium is lift. This management regime is based on annual TACs (Total Allowable Catch) that are defined by species and by fishing area. Fishing areas can be opened for harvest one at a time for short periods of time. The TACs are set following biomass stock assessments of sea cucumber resources, using fine-scale habitat mapping and cost-effective underwater surveys. A database system (BDMer 2.0) was also developed to perform statistical analysis after every stock assessment and provide relevant indicators. The support of the coastal communities to this spatial and rotational management system is encouraged through their joint effort in assessment surveys and the definition of the local harvest rules. The Vanuatu Fisheries Department issued the first processing license under this new system in February 2014 for seven areas across Vanuatu archipelago. However the TACs of authorized species are relatively low given that stocks have been recovering slowly. The sea cucumber management system will be adjusted to the national and local community needs following an adaptive strategy.

CCO-07.2, July 11, AUSAID3, 14:45

Estimating sea cucumber stocks to inform fisheries management in Vanuatu

Rocky Kaku (Vanuatu Fisheries Department, Port Vila, Vanuatu); Jayven Ham (Vanuatu Fisheries Department, Port Vila, Vanuatu); Marc Leopold (Vanuatu Fisheries Department, Port Vila, Vanuatu and IRD (Institut de Recherche pour le Developpement), U227 COREUS2, BP A5, 98848 Noumea Cedex, New Caledonia)



Limited availability of biological data has been a critical issue for sea cucumber management in Vanuatu as in most Pacific Islands. Until the late 2000's the Vanuatu Fisheries Department (VFD) used historical export data only to determine fishing regulations for sea cucumbers. This approach failed and led to a 5-year moratorium in 2008. The objective of the VFD was then to define an effective way to collect biological data relevant for the management of sea cucumber fisheries. A large-scale assessment program started in 2011. So far the stocks of 21 commercial sea cucumber species have been estimated in nine areas (10-15 km²) in five major islands of Vanuatu. The assessment method includes habitat mapping using high resolution satellite images and stratified random sampling using GIS tools. All sea cucumbers are counted and measured (body length and width) alongside 200 m² transects. Statistical analysis is performed using a database (BDMer 2.0) to estimate the size structure, abundance, density, and biomass of the total stock as well as the spatial distribution for these indicators. The TACs are set conservatively taking into account the variability of species abundance across habitats. Overall results show that stocks are low for most commercial species, suggesting that resources have been recovering slowly from past overexploitation. Diversity of species varied among survey areas. The VFD used this biological information to design a new TAC-based system that has been implemented in February 2014.

CCO-07.3, July 11, AUSAID3, 15:00

Why do fishers break the rules? An investigation into the reasons behind regulation non-compliance

Alyssa S. Thomas (School of Geography, Environment and Earth Sciences, Victoria University of Wellington, New Zealand); C. Gavin (Warner College of Natural Resources, Colorado State University, USA); Taciano L. Milfont (School of Psychology, Victoria University of Wellington, New Zealand)

A major challenge in natural resource management is reducing non-compliance with conservation regulations, which can undermine conservation efforts. Designing effective strategies that encourage compliance requires a detailed understanding of drivers of non-compliant behaviour. The recreational blue cod fishery in Marlborough, New Zealand suffers from high levels of non-compliance with the two main regulations: daily and size limits. An anonymous online survey of over 300 fishers sought to determine the reasons behind non-compliance with these regulations. A starting framework of seven pro-environmental factors was used with additional normative factors added into the questionnaire based on the literature and semi-structured interviews. Results revealed that while a feeling of guilt was the largest predictor of compliance with the daily limit; perceived behavioural control (an individual's estimate of their ability to perform the behaviour in question) was the main factor behind size limit violations. This difference demonstrates the necessity of evaluating each regulation individually as the reasons behind non-compliance may differ. These findings provide important insights for the management as successfully addressing these factors should increase compliance. But doing so requires a shift in the approach and a willingness to explore the human dimensions side of resource management.

CCO-07.4, July 11, AUSAID3, 15:15

Implications of export trade for Pacific inshore coastal resources: the case of Fiji

Yvonne Sadovy de Mitcheson (University of Hong Kong and Science and Conservation of Spawning Aggregations (SCRFA)); Margaret Fox (Wildlife Conservation Society – Fiji Program. Suva, Fiji); Aisake Batibasaga (Fiji Department of Fisheries, Suva, Fiji)

Exports of inshore, coral reef-associated, fishes and invertebrates can bring social, food and economic benefits to source countries in the long-term if the underlying natural resource base is sustainably managed, harvest levels are enforced, catches and exports are monitored and exports



are surplus to local seafood security needs. We use Fiji as an example of the challenges and opportunities faced by many Pacific island nations that seek to ensure local food security while gaining earnings from marine species exports. Important distinctions are made between exports of species of domestic food importance and those not considered to be important food staples. While exports of the latter are relatively well understood, information on exported food fishes is surprisingly poor with this fishery believed to be overfished. Hence it is likely that exports of food fishes from inshore areas are not surplus to local food needs and threaten domestic food security, while posing a risk to certain vulnerable species and ecosystems and, can also contribute to certain social issues and even economically disadvantage some fishing communities. The direct and indirect effects and implications of exporting inshore species from Fiji are considered and recommendations for improving earnings and reducing impacts are given. Ceasing exports of inshore food fish until these can be managed could be considered as well as the importance of inshore resources to communities beyond monetary benefits.

CCO-07.5 July 11, AUSAID3, 16:00

Voices from the Lagoon: A retrospective taxonomic assessment of the recovery of a managed fishery – A case study of the Vanua Navakavu, Fiji Islands

Randy R. Thaman (Professor of Pacific Islands Biogeography, The University of the South Pacific, Suva, Fiji); Asakaia Balawa (Master Fisher (Gone Dau) and Matanivanua (Chiefly Spokesperson) Vanua Navakavu, Rewa Province, Viti Levu, Fiji); Teddy Fong (Research Associate, Pacific Centre for Environment and Sustainable Development, The University of the South Pacific, Suva, Fiji, and Founding member of the Econesian Society); Salanieta Bukarau (Research Associate, School of Geography, Earth Science and Environment, The University of the South Pacific, Suva, Fiji)

The disappearance of fish and other marine organisms that used to thrive in our seas is one of the most serious crises of our generation. It is a worldwide crisis, driven, first and foremost, by overfishing, but also, by pollution, habitat degradation and the lack of reliable written knowledge (or lack of acknowledgement) of how bad it really is, and that we must address it now! The paper presents the results of a taxon-by-taxon assessment of the changes in presence and/or abundance of over 1000 species over the past 50 years within the fishing area of Vanua Navakavu in the Fiji Islands. The findings are based on a comparison of time-depth testimonies of surviving older male and female fishers and ex-fishers with the results from more recent surveys in an effort to record and correlate observed changes with factors such as intense overfishing, use of fish poisons and destructive fishing methods, increasing pollution, a 1953 tsunami and the recent establishment of a locally managed marine area. Results show that the combination of the successful restriction of unsustainable fishing practices, such as the use of fish poisons, dynamite fishing, small-mesh gillnetting, plus the establishment of a successful MPA in 2001, seem to be largely responsible for increasing abundance of over 800 fish and invertebrate species, many of which had not been seen for decades. The results show that the combination of the best indigenous and modern scientific and taxonomic knowledge may be the only way of really determining how our efforts at marine conservation are impacting on marine biodiversity and highlights the incredible potential that the marriage of local and indigenous knowledge can play in sustainable fisheries management in the face of global change.



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