Abstracts
BAD NEIGHBOURS: THE DYNAMICS OF AMPHIBIAN CHYTRID FUNGUS INFECTION IN THREE FROG SPECIES IN SYDNEY

Jordann Crawford-Ash
University of New South Wales

Wildlife disease is a major cause of global biodiversity loss. Amongst the most devastating is the amphibian chytrid fungus, *Batrachochytrium dendrobatidis* (Bd), contributing to over 100 amphibian extinctions worldwide. In Australia, our understanding of Bd is derived from studies that are highly geographically biased, focusing on major biodiversity hotspots such as tropical north Queensland and the alpine region, and our ability to extrapolate lessons learnt in these unique environments to other regions is unknown. My study aims to gain a greater understanding of the dynamics of the amphibian chytrid fungus in the Sydney Region and analyse the intensity of Bd infection in three frog species; The Blue Mountains Tree Frog, a poorly known species likely to be susceptible to Bd infection, and The Common Eastern Froglet and Stony Creek Frog, known reservoir species in the alpine region of Australia. By determining if the Blue Mountains Tree Frog is effected by the amphibian chytrid fungus, and confirming whether the Common Eastern Froglet and Lesueur’s Tree Frog act as reservoir species in the Sydney region, management of highly-susceptible frog species that share habitat with these abundant frogs can be more effectively managed.

Photo: Stephen Mahony © Australian Museum
DEVELOPMENT OF FORENSICALLY INFORMATIVE DNA MARKERS FOR THE SHORT BEAKED ECHIDNA – THEIR UTILITY IN PEDIGREE TESTING AND APPLICATION IN WILDLIFE TRADE

Alexandra Summerell
University of Sydney

The short beaked echidna (Tachyglossus aculeatus) is an iconic Australian species, popular in the zoo industry. Monotremes however are notoriously difficult to breed in captivity, thus large numbers of supposedly 'captive bred' echidnas on the market, raises suspicion regarding their true origin. This study aims to develop a forensic toolbox to answer a range of questions relating to the suspected trafficking of this species. This presentation will cover the development of these tools which will be the first for any Australian mammal caught up in the illegal wildlife trade. These tools involve methods for non-invasive sampling from this species, and the use of phylogeographic techniques to determine source country. In addition, this toolbox involves research on the development of genetic markers for relatedness, using samples of known pedigree from four Australian zoos. This is a collaborative project with the Australian Museum Research Institute and The University of Technology, Sydney.
SYSTEMATICS OF THE LEAF BEETLE GENUS CALOMELA (CHRYSOMELIDAE: CHRYSOMELINAE)

Steven Chu
University of New South Wales

*Calomela* Hope 1840 is a speciose leaf beetle genus comprising 60 species distributed throughout Australia. The genus is found exclusively on *Acacia*, the most diverse genus of Australian plants, comprising about 1000 species with the vast majority occurring in Australia. It is the primary host of *Calomela* and their tight association is suggestive of a coevolutionary interaction. The systematics of *Acacia* has been revised extensively and a modern molecular phylogeny has been published. The opposite is true for *Calomela*, with many new species requiring description, and knowledge of the systematics of the genus is lacking. In this talk, I will be exploring issues involved with studying *Calomela*.
SURVEYING FROGS FROM THE BELLIES OF THEIR PARASITES

Tim Cutajar
University of New South Wales

Reliable species occurrence data are vital for conservation management, but can be difficult to collect. Recently, iDNA (invertebrate-derived DNA) has emerged as a powerful tool for increased detection of terrestrial vertebrates. Researchers can trap parasites and analyse their meals to detect their hosts. I will determine for the first time whether iDNA can be used to survey for frogs. By trapping haematophagous frog parasites in NSW, Australia and analysing their blood meals, I will investigate whether iDNA can be used to detect frogs, and if it can detect a rare frog species more effectively that traditional surveys.

Photo: Jodi Rowley © Australian Museum
FINDING ELIZABETH POPE

Ella Finney
University of Sydney

Elizabeth Pope worked at the Australian Museum for over 33 years from 1939 to 1972. Pope spent her life investigating the seashore in coastal towns all over Australia. As a public figure and head of the department of Worms and Echinoderms at the AM, Pope enthused and connected with intellectuals and interested amateurs over the minutia of seashore life. Her success as an educated female scientist stands out as unique. Rumoured to have been of formidable character and forthright disposition, Pope worked hard to match her male colleagues, eventually becoming Deputy Director of the Australian Museum in 1971. The Australian Museum’s archive provides some semblance of her life and career. Of particular interest is the two road trips she took with scientists William J. Dakin and Isabel Bennett along the East coast of Australia, in 1946. These collecting trips surveyed a range of sea animals and their distribution on the rocky shore, and many of the findings were eventually published in the popular seashore guide ‘Australian Seashores’ (1952). The unpublished data from this trip is a scientific, literary and visual record that neatly demonstrates why her work should be considered of enduring significance to scientific, historical and heritage contexts.

Photo: A nursing sister of the N.T. Medical Service © Australian Museum
INVESTIGATING THE NATURAL AND CULTURAL HISTORY OF THE DINGO THROUGH CRANIAL MORPHOMETRICS

Loukas Koungoulos
University of Technology, Sydney

The dingo (*Canis dingo*) is a canid that typically lives independently in the wild, but was also the sole domestic species found in Australia prior to European contact. It has been long debated whether the dingo is a true domestic dog, or is more closely akin to wild canids. Accordingly, there is accompanying debate regarding the nature of their relationship with Aboriginal people: was it truly “domestic”, or is it more accurately called “commensal” or even “parasitic”? The primary aim of this study is to revise and refine understanding of the natural and cultural (human associated) history of the dingo in Australia. Using 3D scanning technology to produce digital models, morphometric analysis will be used to examine stability and change in dingo skeletal morphology throughout different chronological, spatial, and environmental contexts. Are visually apparent changes due to the species' adaptation to different Australian biomes, genetic diversification between separate regions, or related to their history living with humans? The comparison of specimens from a wide range of contexts will help to disentangle and identify the settings between which changes in skeletal morphology have occurred. Analysis of these physical materials will be complemented by a comprehensive textual analysis of the evidence for the dingo’s role in natural and cultural systems.

Photo: © Loukas Koungoulos
USING LARGE-SCALE CITIZEN SCIENCE DATA TO EXAMINE ACOUSTIC RESPONSES OF FROGS TO ANTHROPOGENIC DISTURBANCE

Brittany Mitchell
University of New South Wales

One of the major drivers of global biodiversity declines is urbanisation. To halt biodiversity declines, and enable optimal ecosystem functioning, a comprehensive understanding of how species respond to environmental change is required. Urban environments have increased noise and light pollution, potentially affecting acoustically communicating species, including frogs. Urban areas may force frogs to modulate or alter their calls to communicate with potential mates, as they must compete with anthropogenic noise. My research examines the effect of urbanisation on the advertisement calls of the widely distributed red tree frog (*Litoria rubella*) using a large citizen science dataset from the Australian Museum’s FrogID project. This is the first large-scale analysis of the effects of urbanisation on a species across its entire range – a feat never before possible due to the remoteness and vast size of many species’ ranges. My research will help inform future conservation decisions for Australian frogs. Furthermore, as frogs are sensitive to environmental perturbations and can act as an indicator for other species, this research may aid in understanding potential impacts of urbanisation on other taxa in urban ecosystems.

Photo: Jodi Rowley © Australian Museum
BIODIVERSITY OF MARINE FLATWORMS IN SOUTHEASTERN AUSTRALIA

Jorge Rodriguez Monter
Macquarie University

This project plans to conduct research on the biology and biodiversity of polyclad flatworms - a group of marine, free-living invertebrates that is an important part of the Australian marine fauna throughout the South Eastern Australian region.

The main objectives of this programme include:

- Biodiversity – use of morphological and molecular data for the identification of current and newly found species and their distribution range.
- Systematics of the Order Polycladida – reconstruction of parental relationships between different species employing molecular data.
- Culturing and development – use of previous records and newly obtained data to observe the effects of climate change in the development of polyclad flatworms.

Moreover, the high biodiversity of this group is well known in regions like the Great Barrier Reef, but not so much in the rest of the Australian coasts. Conducting research in similar zones in Spain led to the discovery of several new species, which is to be expected in this region too.
NET DECADAL BIOEROSION AND ACCRETION IN THE GREAT BARRIER REEF: EXPERIMENTAL CORAL BLOCKS ON LIZARD REEF

Madhavi Anne Patterson
University of Sydney

Modern day coral reef systems are controlled by processes of accretion and erosion that modify and destroy reef architecture. An increasing amount of dead coral substrate is available due to back-to-back bleaching and COTs outbreaks, which may shift the balance towards processes of erosion. Important components of this are bioerosion, the degradation of substrate via biologic activity, and accretion, the growth of new substrate by corals and coralline algae. We investigate net changes in erosion and accretion from 32 experimental coral blocks placed at 6 different zones around Lizard Reef for 10 to 20 years - the longest study of its kind in the GBR. Distinct hydrodynamic settings, water depth and environmental conditions of each zone allow us to explore their effect on erosion and accretion. 3D morphometric analysis of trace bioerosion holes from MicroCT scans are paired with organism counts to uncover the history of accretion and bioerosion of each block. We find that the biggest contributors to bioerosion are external surface grazers. Bioerosion is influenced by reef zone and rates decrease with longer exposure periods. This study provides unique information for interpreting bioeroder communities and rates of bioerosion with important applications for understanding reef response during future climate change.

Image: © Madhavi Anne Patterson
A GEOCHEMICAL STUDY OF GROUND STONE AXE AND ADZE BLADES FROM WEST NEW BRITAIN

Alana Pengilley
University of Sydney

The importance of ground stone axe/adzes in regional exchange systems has been well documented in many regions of the Pacific, however, their utilitarian and social roles in West New Britain in Papua New Guinea have not been systematically studied. Only appearing on the island within the last millennia, these artefacts diverge from the much earlier axe and adze timeline recorded on the Papua New Guinea mainland. Through the application of portable X-ray fluorescence spectrometry (PXRF) to 99 ground stone axe and adze artefacts from the north and south coast of West New Britain, this study has identified potential source regions and traced the movement of the blades over space. Ultimately, the appearance of these ground stone artefacts on the island not only represents the introduction of a new technology, with potential implications for intensification of subsistence, but also, potentially, a new phase of exchange involving novel raw materials and items of value. Most importantly, it emphasises the value of applying non-destructive geochemical technology to a new region of the Pacific.

Photo: Robin Torrence © Australian Museum
POPPULATION DYNAMICS OF THE INVASIVE UPSIDE-DOWN JELLYFISH CASSIOPEA IN LAKE MACQUARIE: IDENTIFICATION AND DISTRIBUTION

Claire Rowe
University of Sydney

Scyphozoans of the genus Cassiopea are notable for their unusual benthic habit of lying upside-down with their oral (feeding) arms facing upwards, resulting in their common name, “upside-down jellyfish”. Cassiopea was first reported from a restricted area in Lake Macquarie in 2017. Historically these jellyfish have a more northern tropical distribution in eastern Australia. Other records in New South Wales are limited to occurrences in Wallis Lake and Lake Illawarra dating from 2009 and 2013, with at least two species involved. This genus is considered globally invasive. Specimens may reach over 20 centimetres in diameter and have blooms with densities of over 30 individuals per square meter, creating potential impacts on fisheries, tourism, and trophic structures.

This project will provide baseline information on the presence of Cassiopea in Lake Macquarie, to inform effective potential management strategies. Information on the distribution, seasonality and environmental factors triggering a bloom will be used to infer whether the population is increasing, stable, or declining, and therefore the anticipated impact of this invasive jellyfish. The data can also be used to inform potential management strategies including when and where in the lake future effort and resources need to be concentrated. Additionally, accurate identification of the species of Cassiopea will be addressed to determine whether it is a native species extending its range or a non-indigenous introduction (and therefore where it came from and by what means it arrived). This presentation will cover the first 6 months of the project and future plans, outlining field sampling to assess temporal and spatial variability, taxonomic study utilizing the DNA barcoding region of the cytochrome oxidase subunit I gene (COI), and laboratory experiments examining thermal tolerance of Cassiopea in Lake Macquarie.

Photo: Stephen Keable © Australian Museum
FROM A LAND DOWN UNDER: HISTORICAL BIOGEOGRAPHY AND SYSTEMATICS OF THE ANTI-EQUATORIAL FISH Microcanthus strigatus (Teleostei: Microcanthidae)

Yi-Kai Tea
University of Sydney

The monotypic fish genus *Microcanthus* has a large but disjunct anti-equatorial distribution across the Indo-West Pacific. Four isolated populations are known to occur, but these are regarded as a single species, and their phylogenetic relationships have not been confidently resolved. Here, we explore the phylogenetic relationships and population structure of *Microcanthus strigatus* using morphological studies, Sanger sequencing of mitochondrial loci, as well as 7210 single nucleotide polymorphisms (SNPs) obtained via DArT sequencing. Mitochondrial and nuclear analyses reveal strong population level structuring across the species’ distribution, suggesting that *Microcanthus strigatus* is a complex consisting of at least three cryptic species. Ancestral range reconstructions of our dated molecular phylogeny reveals that *Microcanthus* is south-west Pacific in origin, diverging from its closest ancestor approximately 1 million years ago. The results suggest a northward invasion across the equator as a result of glacial cooling during the last Pleistocene. This study adds to the growing body of research exploring biogeographic processes in relation to anti-equatorial patterns in marine fishes.

Photo: © Hiroshi Senou
ASSESSING THE CONSERVATION STATUS AND GENETIC DIVERSITY OF THE GIANT SYDNEY CRAYFISH, *EUASTACUS SPINIFER* USING MOLECULAR APPROACHES

Cara Van der Wal  
University of Sydney

Freshwater crayfish (Decapoda: Parastacidae) are experiencing significant human-mediated impacts, and are ranked among the five most endangered animal groups. Australia is home to approximately 140 species of crayfish, of which the genus *Euastacus* is one of the largest. *Euastacus* are of significant conservation concern owing to a number of key threats including climate change, habitat loss and illegal harvesting. Previous morphological studies have highlighted the difficulties associated with species delimitation in *Euastacus*. For example, it is unclear whether differences in colour and morphology reflect intraspecific or interspecific variation. In order to assess their biodiversity and conservation status within New South Wales we investigated the genetic diversity, population structure and phylogeny of *Euastacus spinifer* using mitochondrial and ddRAD nuclear SNP data. We hypothesise that the currently recognised distribution of *E. spinifer* is inaccurate, and predict that this species represents a species-complex with numerous populations in fragmented habitats. Our analyses of mitochondrial and nuclear data revealed strong clustering of individuals on the basis of their geography, with little evidence for gene flow between members of the 5 populations examined. Our results suggest that *E. spinifer* in its current form likely represents at least 4 distinct species. We are now examining morphological variation among members of the group to explore this possibility in more detail.

Photo: © Cara Van der Wal
USING ORIENTATION PATCH COUNT TO EVALUATE THE DIET OF HULITHERIUM

Joshua White
University of New South Wales

Hulitherium tomasetti is an extinct zygomaturine that lived in Papua New Guinea during the Pleistocene. H. tomasetti has been predicted to be a bamboo feeder, however there are no studies to quantitatively assess this claim. Here, we plan to use Orientation Patch Count (OPC) to measure the dental complexity of H. Tomasetti, relative to other diprotodontids, to assess its diet. Dental complexity is the measure of tools, features or “breaking sites” on a tooth’s crown, which are used to increase the efficiency of mastication. Studies on modern taxa reveal that there is a strong correlation between tooth complexity and diet. We predict that H. tomasetti was a bamboo specialist.