LINNEAN SOCIETY OF NEW SOUTH WALES

LINN S'O'C' NEWS

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IN THIS ISSUE

NEW MEMBERS:

We welcome
Mr Richard Bird. Field of interest: Geology
Ms Clare Brandenburger, School of BEES, University of NSW. Fields of interest: Plant evolution, plant ecology and introduced plants.

AWARDS FROM THE SCIENTIFIC RESEARCH FUNDS

WILLIAM MACLEAY MICROBIOLOGY RESEARCH FUND

Miss Michaela Ebony LARSSON, University of Technology
Project: Understanding the ecological niche of toxic dinoflagellates.

Ciguatera fish poisoning (CFP) arises when people eat fish contaminated with ciguatoxins and it is a problem world wide. There have been large outbreaks in Australia with two fatalities and more than 1400 cases documented in the last 50 years. Ciguatoxins are produced by dinoflagellates from the genus *Gambierdiscus* which was thought to be monospecific, but molecular techniques have defined at least 12 species. Over 20 strains of *Gambierdiscus* have been isolated from Australian sites and seven strains are growing well in culture. *Gambierdiscus* is notoriously difficult to grow in culture hence these cultures are extremely valuable and material is now available to be used in further research. This project aims to identify the strains isolated from Australian waters using molecular methods, characterise the toxin profiles of each strain and deposit the strains into a national collection so that they are made publically available for further research. Awarded $1,640

Ms Parisa NOORIAN, University of New South Wales
Project: Investigation of an iron-dependent antiprotozoal factor in *Vibrio vulnificus*
*Vibrio vulnificus.*is an opportunistic pathogen responsible for septicaemia following ingestion of contaminated raw oysters and wound infections on exposure to infected seawater. It has the highest reported mortality rate for seafood related diseases. It inhabits coastal marine environments where it is exposed to protozoan predation. Bacteria evolve anti-protozoal mechanisms that may increase its virulence. One strain of *V. vulnificus* shows toxicity towards a filter-feeding ciliate but this toxicity is dependent on iron in the media. Without the iron, the protozoans survive being preyed on by *V. vulnificus*. Humans with an iron overload are most susceptible to *V. vulnificus.* Not all the strains are equally pathogenic. The aim of this project is to identify the genetic factors that contribute to the survival of *V. vulnificus* in its natural environment. Intracellular iron is known to play a key role in the regulation of many toxins and virulence determinant factors. Awarded $1,000

BETTY MAYNE SCIENTIFIC RESEARCH FUND FOR EARTH SCIENCES

Ms Jodi Fox, University of Tasmania
Project: The physical volcanology of the Cenozoic volcanics, NW Tasmania
The volcanics of the Cape Grim and Stanley area are late Paeleocene to Pliocene in age, and the most recent rocks in the state are found here. They consist of well-preserved sheet lavas, pillow lavas, lobate lavas, volcanic breccias and tuff. This project will determine the facies architecture in the Cape Grim area and establish age relationships, including the first radiometric ages to be obtained on these rocks. The results should show the relative timings, volcanic products and processes in the area. Awarded $2,450

THE JOHN NOBLE FUND FOR INVERTEBRATE RESEARCH

Miss Mae Marjore NOBLE, Australian National University
Project: Population biology and ecology of the threatened Murray crayfish in upland streams.
Murray crayfish are relatively well known in their lowland habitat but little is known about their population biology and ecology in upland streams. This project will evaluate their environmental and habitat preferences in upland streams using in-stream snorkel surveys. Knowledge gaps for the crayfish in upland streams include size at maturity, sex ratio and abundance: all critical for management of the fishery and recovery plans for the species. Conservation requires a deeper understanding of the environment controlling distribution and abundance. In these upland streams, key environmental factors can vary considerably within relatively short distnces.This project will address these problems. Awarded $750.

THE SURREY JACOBS FUND FOR SCIENTIFIC FIELD WORK

Mr Timothy Lindsay COLLINS, University of New England
Project: Rare and endangered *Eucalyptus magnificata* L.A.S Johnson and K.D. Hill (Myrtaceae): genetic diversity and taxonomy.
Doubt about northern populations near Tenterfield and Warwick that are thought to be different varieties will be resolved. They may be new species or they may be part of a larger more genetically diverse population with a greater demographic range. If the latter, there are better prospects for the overall health and survival of the species. This study will inform conservation and land management practices for *E. magnificata.* Awarded $1,.000.

JOYCE W VICKERY SCIENTIFIC RESEARCH FUND

Mr Kye Rhys ADAMS, University of Wollongong
Project: Site fidelity and habitat preference of the banjo shark, *Trygonorrhina fasciata*
The behaviour and movement of the banjo shark will be studied in Jervois Bay, a no-take zone. It is not known if they migrate and a no-take zone is ineffective if movement patterns take the species beyond its boundaries. The banjo shark is a commercial by-catch species and this study should assist the assessment of no-catch zones and aid in the management and conservation of the species. Awarded $1,500.

Miss Kirilee Jane CHAPLIN, Museum of Victoria/University of Melbourne
Project: Taxonomy, ecology and conservation genetics of grassland earless dragons (Agamidae, *Tympanosryptis* spp) in Queensland
The taxonomy and systematics of the earless dragon is unclear because there are cryptic species that cannot be distinguished on morphology, but the species are genetically different. On the Darling Downs, taxonomic revision has resulted in three new species being described. These species occur in highly fragmented grassland. Several other mitochondrial DNA lineages have been identified elsewhere in Queensland and northwest NSW. Grasslands are in decline in Queensland, yet only one species is listed as endangered. The taxonomy will have to be resolved before the conservation status of species of earless dragons can be decided. Awarded $1,500

Miss Belinda FABIAN, Macquarie University
Project: Functional biology of extrafloral nectaries of Australian native cotton species *Gossipium sturtianum*, Sturts. Desert rose.
Extrafloral nectaries are found on leaves and sepals, and many plants in the arid region possess them. They produce sugars and amino acids that are a cost to the plant's metabolism but this is traded off against the benefit of ant mutualists that consume the nectar and and provide protection against herbivores. It is thought that increasing carbon dioxide will increase the carbon content of the nectar and make it less attractive to ants, but this has not been studied. The distinctive extrafloral nectaries have been bred out of the commercial species of cotton. This project will investigate the functional biology and structure of the arid species of native cotton and the effects of increasing carbon dioxide. Awarded $750.

Miss Jessica HACKING, Flinders University
Project: Factors shaping disease-resistance-gene diversity in the tawny dragon lizard .
Wildlife disease and mechanisms of disease resistance are poorly understood yet disease is among the top five causes of species extinction world-wide. A higher diversity of disease-resistance-genes (DRG) enables the immune system to identify and destroy a greater range of pathogens. Knowledge of such genes is lacking in reptiles: a concern as Australia has a very high diversity of reptiles. This study will examine the selective forces maintaining diverse DRG in the

tawny dragons lizard. Dragons in four districts in South Australia will be studied. Dragons in the three southern sites are monomorphic for throat colour but the northern site is polymorphic. Only the northern site has ticks. It is thought that parasite diversity/load drives diversity of these genes, but other factors, e.g. mate selection could be involved. Awarded $1,000

Mrs Anuradhi JAYAWEERA, Macquarie University
Project: The effect of sexual cannibalism on mate ejaculatory expenditure and female receptivity in false garden mantids (*Pseudomantis albofimbrata*)
The false garden mantid attack the male prior to copulation and only about 40% of males succeed in transferring sperm to their partners. Males do not seem to have evolved any defensive mechanisms such as preference for less risky females. This project will compare the resource investment between cannibalised and non-cannibalised males and the attractiveness of cannibal and non-cannibal females. This proposal should offer insights into our understanding of sexual conflict in mating. Precopulatory sexual cannibalism represents an especially extreme form of conflict. Awarded $500.

Dr Anna Rachel KEMP, Griffith University
Project: Environmental degradation will destroy the Australian lungfish (*Neoceratodus forsteri*)
Lungfish populations in southeast Queensland rivers suffered in recent droughts. They also suffered in the subsequent floods when washed over reservoir walls and smashed on the spillway below. Eggs of newly hatched lungfish rely on submerged water plants that are plentiful in normal flowing water of streams but do not exist in reservoirs with a fluctuating water level. Adults in reservoirs have so little food that they cannot provide eggs with sufficient nutrients and the young die. How widespread is this problem? So far, three localities have been examined for poor development and loss of recruitment and the same abnormalities are found in all three when eggs collected in the wild are raised in the laboratory. New spawning sites need to be found and tested for abnormalities. Analysis of the environmental conditions may make it possible to repair the situation for the lungfish. Awarded $500.

Miss Melanie Kate LAIRD, University of Sydney.
Project: Unlocking amniote live birth, the 'other' mammalian model.
This project aims to identify the uterine changes involved in preparation for pregnancy in marsupials and their importance for live birth. For live birth, the surface cells of the uterus must undergo remodelling to allow for implantation of the embryo and development of the placenta. A suite of changes in the epithelial cells, called the plasma membrane transformation appears to be the key component of pregnancy in live-bearing amniote groups. Marsupials have an unusual pregnancy with a very short gestation in the uterus and a long period of lactation in the pouch. Uterine changes have only been studied in one species of marsupial. This project will study uterine changes in the fat-tailed dunnart, tammar wallaby and brush-tailed possum. These three species, from different branches of marsupials, have different modes of implantation, hence are ideal for comparison. Awarded $1,000.

Mr Timothy Charles MORRIS, School of BEES, University of New South Wales
Project: The effect of dingoes via kangaroo regulation on vegetation, seed banks and soil nutrients.
Top predators have strong effects on the populations and behaviour of herbivores, and hence influence the intensity and spatial patterns of herbivory. Herbivores have the potential to influence nutrient cycling and the pool of nutrients available for plant growth. The loss of top predators such as dingoes or wolves can shift ecosystems to alternative states. This project focuses on the dingoes in the Strzelecki Desert that strongly regulate the kangaroo populations on the western side of the dingo fence but are prevented access in NSW. The effects of kangaroos

grazing on vegetation cover and composition has been studied, but the effects on plant traits, seed banks and nutrients is poorly understood. Awarded $1,500.

Mr Joshua PENALBA, Australian National Unviversity
Project: The genomic origin of species: a case study of the avian group the Australian Meliphagoidea.
The Meliphagoidea includes fairy wrens, honeyeaters, pardalotes and Australian warblers. Incipient species pairs, such as a northern and a southern species in Queensland that hybridise in the geographic contact zone will be studied. The genomes and morphological data of birds sampled through their ranges and the hybrids will greatly benefit our understanding of how speciation occurs. Awarded $800.

Mr Niels RUEEGGAR, Southern Cross University

Project: Factors influencing roost selection by Australian tree-hollow using bats.
Habitat clearing for any of the many uses of forests means the loss of tree hollows that are used for shelter and breeding by the fauna. Many species of microbats use tree hollows for daytime resting and the females aggregate in large chambers of hollow trees for breeding. There is a lack of information about the factors that influence roost selection, especially the number of maternity roosts required for a viable local population. The forest industry is required to retain some hollow-bearing trees in coups and buffers, but the effectiveness of current practices is largely unknown. Bat boxes are used to supplement tree hollows, but their effectiveness is largely unknown and some species do not take to standard designs. This problem will be investigated with the view to a better design of the bat boxes. Awarded $1,500.

Mr Ryan J SIMS, School of BEES, University of New South Wales

Project: Response of critically endangered box gum grassy woodland to exclusion of livestock.
Only about 10% of the once widespread box gum grassy woodland remains and it is subjected to numerous restoration projects. Mining approval requires that large areas of woodland and secondary grassland be offset and rehabilitated. There are other restoration projects as well. The most cost effective method removes the stock and hopes that the ecosystem will recover. Numerous projects have shown that this results in poor restoration and suggests a legacy of problems from past farming practices. This study will investigate these problems with a view to proposing better and cost effective ways to restore the woodlands. Awarded $500.

Mrs Connie Victoria WARREN, Deakin University

Project: Conserving biodiversity in agricultural landscapes: the role of land use
Remnant bushland in heavily modified agricultural landscapes are home to a diverse range of native species. However, little is know about how the context of surrounding agricultural land use affects the conservation values of these remnants or how agricultural land use affects the species that utilise the farmland. A region encompassing dairy, horticulture and cropping wiyh only one to 3% of native vegetation has been chosen for study. Birds, bats and bees will be studied because these groups provide important services to the ecosystem, namely invertebrate pest control and pollination of crops. Better understanding of how special composition and configuration of land uses influences these groups should provide guidelines for land owners on how to structure their agricultural production and increase biodiversity. Awarded $500.

A GEOLOGICAL TOUR OF ICELAND: a talk given by Dr John Pickett

Iceland is one and a half times the size of Tasmania and sits athwart the Mid-Atlantic Ridge. Its location gives us a unique opportunity to observe the processes and landforme associated with rifting. It also lies over a hot spot that is responsible for most of the cataclysmic volcanism for which Iceland is known. During the last Ice age, the entire country and continental shelf was entirely covered by ice, adding further to the environmental complexity.

At zones of divergence, the continental plates are being pulled apart and basalts form new crust. At zones of convergence, where one plate over-rides another and results in mountain building, the new rocks are richer in silica..

A geological map shows the Mid-Atlantic ridge running almost north-south through the island. The oldest basalts are 16 million years (Ma) old and are found the furthest away from the mid Atlantic Ridge. Basalts 8-3 Ma and 0.8 are progressively closer to the Ridge and patches of basalts less than 1,000 years old are located along the Ridge. The youngest basalts are only 10-20 years old. With the oldest basalts only 16 Ma old, Iceland is geologically very young.

The geology is even more complex: there is a micro-continent on the west side of the Ridge, hence convergence occurs against the micro-continent and divergence on the other side of the ridge. Where divergence is going on, there are lots of crevices and lava flows form longitudinal ridges. In 2010, one eruption produced a large ash cloud that caused havoc over Europe. In 1780, an eruption produced large quantities of sulphur dioxide that converted to acid rain over Europe, destroying vegetation and crops and causing much hardship. It took years to recover from the disaster.

The signs of volcanic activity are everywhere: there are geysers (an Icelandic word) in active areas and spatter cones where lumps of basalt are blown out of the volcano and then they stick together. These basalt boulders may have a thick covering of moss. An areal view shows several circular craters within an area rather like a golf course.

Where basalts flow over wet ground, steam vents cool and solidify the lava around it, forming basalt pillars. When eruptions occur under ice and the flow is contained by the pressure of the ice above it, the basalt forms a table. If the eruption breaks free of the ice, then it spews out volcanic ash. There has been a huge amount of alteration to the original basalts to form clay minerals and mud holes. All the volcanic rocks are so young that they have not had time to be compressed and hardened, hence break up easily. Icelanders use volcanic steam for heating and power.

The moraines of the glacial landforms all show that the glaciers are in retreat. When large chunks of ice trapped in the moraines melt, they leave holes called kettles. Frosts are incredible harsh causing cracking of the rocks and rapid weathering. The ground is almost a permafrost. An enormous amount of sediment is brought down by the rivers and deposited on the flood plains and estuarine environments. Sometimes there are lava flows interbedded with the sediments. The basalts also get wind and sand blasted. All the sand from the basalts is black, but in the west, there is one beach with white sand that has been formed from shells of barnacles that were washed up in Atlantic storms.

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For Security reasons, there is now a locked gate between the carpark and the Classroom. If it is locked when you come to a lecture, just wait and someone will come and let you in.

PROGRAMME

Wednesday 23 Septmber, at 6 pm, in the Classroom, Royal Botanic Gardens.
Enter through the gate to the Herbarium Carpark, on Mrs. Macquaries Rd.

Dr MAURIZIO ROSSETTO

Principal Research Scientist, Manager Evolutionary Ecology National Herbarium of NSW
Royal Botanic Gardens Sydney

AUSTRALIAN RAINFORESTS, A DYNAMIC MIX OF HERITAGE AND TRANSFORMATION

Despite occupying only a small fraction of the continent, Australian rainforests enclose considerable levels of biodiversity. For us to be able to conserve and manage this biodiversity we need first to understand it. With the help of students and collaborators I have been exploring the factors impacting on the distribution and assemblage of the Australian rainforest flora. This was achieved by integrating evolutionary, functional and environmental datasets obtained through a range of innovative tools and approaches. What has emerged is the portrayal of highly dynamic systems that respond to environmental heterogeneity and temporal change, a far cry from the now dated narrative of static island-systems sheltering evolutionary relics.

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Wednesday 21 October, at 6 pm, in the Classroom, Royal Botanic Gardens.
Enter through the gate to the Herbarium Carpark, on Mrs. Macquaries Rd.

A/PROF SHAUNA MURRAY

ARC Future Fellow, Plant Functional Biology and Climate Change Cluster, University of Technology, Sydney

THE MOLECULAR ECOLOGY OF PHYTOPLANKTON AND IMPACTS ON SEAFOOD SAFETY

Phytoplankton produce approximately half of the world's oxygen through their photosynthesis, and include representatives of most of the major groups of eukaryotes. Ecological interactions among phytoplankton species are complex, and involve similar mechanisms to those in multicellular organisms, including the evolution of chemical and physical defense mechanisms. Some of the

compounds involved in chemical defense have proved to be a problem for our fisheries and aquaculture industries, as they can lead to harmful algal blooms (HABs), which result in the deaths of marine life or in the uptake of toxins in seafood. Aquaculture continues to increase in importance worldwide, as fisheries catches are in decline. Ocean temperature changes and human assisted introductions appear to be impacting the distribution and abundance of some HAB species. Information from emerging molecular genetic techniques, such as transcriptomics and environmental sequencing, have provided the first information on the genetics of marine biotoxins and the presence of previously undetected cryptic species. The harnessing of such information allows for the development of rapid tools to protect seafood safety, and to build our understanding of marine microbial ecology. I will discuss examples of tools recently developed for the detection of *Alexandrium* blooms and cryptic species of *Gambierdiscus,* both of which appear to be increasing their ranges in Australian waters, with corresponding recent spikes in ciguatera fish poisoning and paralytic shellfish toxin incidences.

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Refreshments will be served from 5.30 pm

EVERYONE WELCOMED