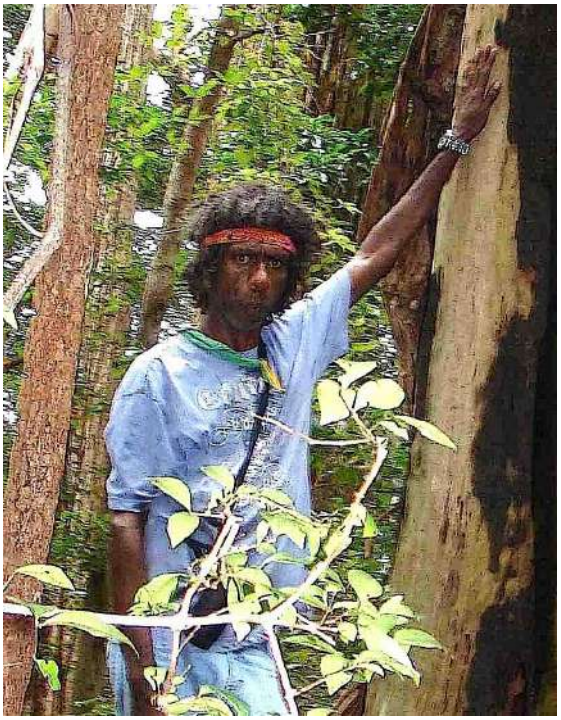
Abstracts for FIDO@40 Conference

Session 1
Opening
Joe Gala

Joe Gala (Jo-Jo to his friends) is a Fraser Island traditional owner. He is also a very talented and entertaining Butchulla man. Jo-Jo has been in a vanguard of re-establishing Butchulla culture through language and dance. He has a repertoire of fascinating stories that illustrate the complexities and frustrations of contemporary Butchulla life. His most colourful opening that shouldn't be missed.



Jo-Jo assessing a Pibin scar tree

Jo-Jo and Smiley dancing on Indian Head

Welcome

Hon Kate Jones
Minister for Environment and Resource Management

Walkabout Creek is part of Kate Jones Ashgrove electorate. Kate grew up in Ashgrove attending Kelvin Grove High School and worked at The Gap Family Markets while completing a Bachelor of Arts in Journalism and Politics at Queensland University of Technology. Kate Jones was elected to the Queensland Parliament in September 2006 and became the youngest member in the Bligh Cabinet in 2009 as Minister for Climate Change and Sustainability. She was appointed Minister for Environment and Resource Management in 2011. Kate firmly believes in education for all and has a strong interest in environmental policy.

Keynote Speaker
Prof Arthur Georges
Professor in Applied Ecology, Canberra University

Prof Arthur Georges, Professor in Applied Ecology Canberra University. He has the following qualifications: PhD, Zoology, University of Queensland, 1982, BSc Honours, Physiology, University of Queensland, 1975 , BSc, Mathematics, University of Queensland, 1973.

Arthur Georges has been invited to be keynote speaker because of his distinguished academic achievements and because of his involvement with research in Fraser Island lakes extending over more than three decades and which is on-going.

As a member of the Institute for Applied Ecology and its inaugural director, Arthur Georges has a broad interest in fostering research that underpins decisions on the management of our natural environment. Within this broad context, he has specific research interests in the ecology, evolution and conservation biology of Australia's reptiles and amphibians. A fundamental interest in these fascinating animals takes him into the field and the laboratory to learn more of their biology and to apply what he has learned in solving contemporary problems of their conservation.

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A specific focus of his research is on sex determination in reptiles. Sex determination has been a topic of speculation and rigorous inquiry since the time of Aristotle, and remains a hot topic today because of its intrinsic interest as a fundamental biological process, and because of its implications for the impact of climate change and habitat alteration on species with temperature-dependent sex determination.

A second focus is phylogeography, that is, applying DNA technologies to better understand the historical and contemporary drivers of biogeographic in the distribution of freshwater organisms in Australia and New Guinea.

Arthur is chair of the ACT Flora and Fauna Committee, serves on the management or advisory committees of the ARC Environmental Futures Network, the Environmental Futures Research Centre at Griffith University, the Australian Biological Information Facility (ABIF), and is an Associate Editor of Chelonian Conservation and Biology. He has served as President of the Australasian Wildlife Management Society and the Australian Society of Herpetologists.

His research and professional interests include: Conservation biology of native Australian species, the ecology, evolution and systematics of Australian reptiles and amphibians, temperature-dependent sex determination.

Visitors and climate will shape the future ecology of perched dune lakes on Fraser Island

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Abstract

Fraser Island's perched dune lakes are magnets for tourists. Our earlier research has documented the ecological consequences of unregulated visitor use of these systems, with a focus on the likely visitor-mediated delivery of nutrients to these oligotrophic systems. In addition to threats from visitors, a significant sleeper issue for perched dune lakes is climate change. Perched dune lakes are not connected to the regional water table and water levels are known to fluctuate wildly with local rainfall patterns. Given the projected changes in climate in the Fraser Island region - increased temperatures and reduced rainfall and increased variability – we anticipate that lake levels are likely to fluctuate even more in the future. These fluctuations are likely to have both ecological infrastructure consequences.

In this paper, we present a conceptual model of how visitor activities and climatic variability are likely to interact to shape the future ecology of Fraser Island's perched dune lakes. We predict that visitor-mediated nutrient inputs will stimulate algal growth, but that the consequences of this increase in algal biomass, especially for consumer organisms (but also for visitors themselves), will differ between wet (high water level) and dry (low water level) periods. Understanding the dynamic nature of perched dune lake ecosystems, particularly in a highly variable climate, needs to be a critical element of how these systems are managed, particularly for the highly visited systems that have additional stresses like nutrient inputs from visitors.

The Fraser Island coastal dunes and strandplains — An archive of wave climate, storms and supply during the late Holocene

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Abstract

Strandplains on the open coast of Fraser Island contain an archive of former shorelines that allow the reconstruction of modal and storm wave climate, planform geometry, sand transport and sand budgets during the Late Holocene. Variability in longshore sediment transport and phases of regional coastline progradation, recession, realignment and dune transgression in response to wave climate change are identified, at sites from Rainbow Beach to Sandy Cape. These reconstructions are constrained by sand deposition ages using optically stimulated luminescence (OSL) methods. Estuarine inlet migration at Wide Bay has played a pivotal role in the coastline evolution of southern Fraser Island, and the evolution of the Inskip Spit and Hook Point provides a window into the wave climate of the past millennium.

The emerging geo-historical record also provides the scientific basis for geo-evidence based projections since it contains the coastline response to the range of potential climatic impacts over the coming centuries.

Cyanobacterial extremophiles associated with the formation of the coloured sands on Fraser Island

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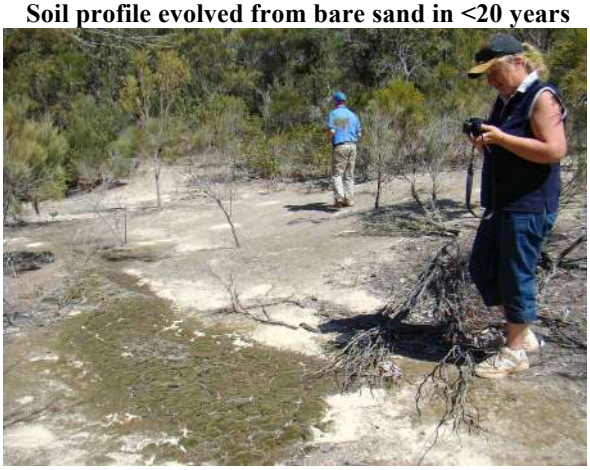
Abstract

Cyanobacteria are ancient prokaryotes that carry out photosynthesis for growth. Their long evolutionary history and success can be attributed to their capacity to evolve and adapt to their environment. Cyanobacterial extremophiles exist in some of the Earth's harshest environments, where they have developed strategies to protect themselves against high levels of UV, long periods of drought and extremes of temperature. On Fraser Island cyanobacterial communities have colonised on and underneath the silica sands and iron deposits. A study of the sub-surface cyanobacterial mats that were located on the marginal regions of the sand blows and fringes of exposed iron sediments showed there was a connection between their colonies and the coloured sands. Within these large-scale landscape processes micro-colonisation occurs with the distribution by wind and water of invisible fragments of cyanobacteria. The evidence points towards biogeochemical interactions occurring between cyanobacterial colonisation and underlying or exposed iron sediment layer with its weathered pedestal formations and ridgelines. Leaching of iron oxides occurs when cyanobacteria alter oxygen concentrations and raise the pH on a micro-scale basis. Cyanobacteria use ferrous iron to aid in its pigmentation and create protective layer against damaging UV rays. Eventually, well established cyanobacterial mats are formed stabilising the region on a larger scale and incorporating a diverse biological crust that includes a range of cyanobacteria, algae, lichens, mosses, liverworts, micro-fungi and bacteria. These are important ecosystems and need to be studied in more detail and protected from damage in critical environments.

Soil profile evolved from bare sand in <20 years



The effects of fire and fragmentation upon co-occurring threatened coastal heath plants in southern Queensland.

Gabriel Conroy
University of the Sunshine Coast

Abstract

This project investigates the potential impacts of fire and fragmentation on the long term viability of two co-occurring threatened heath species with differing life histories and responses to fire. Southern Queensland populations of *Acacia baueri* subsp. *baueri* (vulnerable) and *Blandfordia grandiflora* (endangered) will be examined under a variety of fragmentation scenarios. Fraser Island populations will be utilised as a control exhibiting close to natural fragmentation levels. Metapopulation models integrating ecological, genetic, fire history and spatial data will be used to conduct population viability analysis, to investigate any interactions between landscape level processes and to identify critical parameters regarding their conservation management. Estimates of historical gene flow among populations of *Acacia baueri* will be integrated into the models to identify vital genetic parameters, which are likely to be of relevance as populations become increasingly isolated. At present, little is known regarding the interplay between fire, fragmentation and metapopulation dynamics for co-occurring threatened species which depend on fire for regeneration. This project will enable an evaluation of which combination of life history, fire response and dispersal traits has been most historically sensitive to fragmentation. The outcomes will have direct implications in terms of fire and conservation management.

Aesthetics

No Abstracts yet

When Fraser Island was inscribed on the World Heritage List in 1992 it was judged to meet the criteria that it *contains superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance.* The Australian Government describes those values:
Fraser Island, the largest sand island in the world, has exceptional natural beauty and aesthetic importance and contains superlative natural phenomena including:

* *over 250km of sandy beaches with long, uninterrupted sweeps of ocean beach, with more than 40km of strikingly coloured sand cliffs, as well as spectacular dune blowouts; and*
* *ocean surf beaches, strikingly coloured sand cliffs, spectacular tall rainforests growing on low nutrient sands, perched dune lakes including both clear "white water" lakes and dark "black water" lakes, banksia woodlands, heath, patterned swampy fens and sheltered mangrove areas in a spectacular mosaic landscape.*

FIDO believes that these values may not have been properly appreciated and are now being compromised by man-made modifications epitomised by recent modifications to Lake McKenzie's beach. A qualified speaker will address the issue of protecting the integrity of those aesthetic values for which Fraser Island was recognized when it was inscribed on the World Heritage List.

Fraser Island after FIDO's first forty years

John Sinclair
Honorary Project Officer and Honorary Secretary, Fraser Island Defenders Organisation
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Abstract

This paper attempts to summarize four decades of the history of FIDO in campaigning to have the outstanding natural values of Fraser Island recognized and protected. Since the organization's founding in 1971 it took the organization six years see the end of Fraser Island sandmining. The campaign to have Fraser Island World Heritage listed and end of 128 years of logging lasted a further 16 years. During those 22 years FIDO was a pioneer in the field of ecotourism on Fraser Island to help finance those campaigns. The organization employed many innovative campaign strategies to advance its objectives to protect the natural values of the island. Because of the public perception that Fraser Island had been "saved", FIDO's most difficult time in its 40 years has been its watchdog role and getting appropriate action to protect the island's special values. FIDO has sponsored research, conferences and forums for all stakeholders. It has commissioned studies, built the first boardwalk on Fraser Island, initiated and prosecuted the interminable war on weeds on Fraser Island. It has produced educational backgrounders as well as many other publications in its educational role. FIDO is now working with other voluntary groups to create the longest volunteer initiated dedicated walking track in Australia. FIDO has become the corporate memory of Fraser Island accumulating significant archives and making the collection of Kgari's history a major role. It has been a vigilant monitor assessing environmental impacts of Fraser Island. Despite its energetic efforts FIDO's most recent assessment is that a number of the identified World Heritage values of Fraser Island have become significantly degraded since 2002.

Aerial view of Fraser Island sandmining just before it ceased in December 1976. The narrow coastal strip on the left was QTM and the Dillingham operations are on the right. This is what FIDO stopped.

(Lto R) John Sinclair, Rod Hiscock, Dr Arthur Harrol (Cooloola fame) and barrister for FIDO Lew Wyvill striding through Ngkala Rocks on their way to Sandy Cape in 1971 to inspect mining lease applications.

Modelling the potential invasion of basket asparagus fern (*Asparagus aethiopicus* L.) on Fraser Island, Australia.

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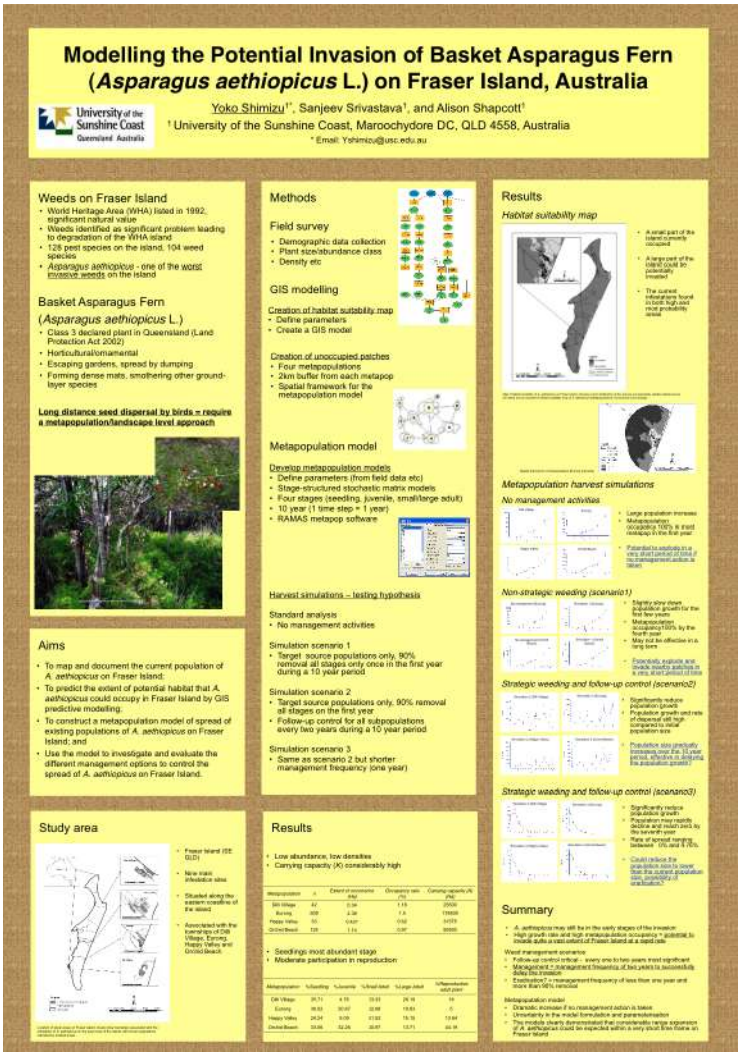
Abstract

The Fraser Island World Heritage Area is internationally renowned for its significant natural features; however, invasive weed species may threaten the island's unique biodiversity. *Asparagus aethiopicus* is a highly invasive, bird-dispersed perennial shrub from South Africa identified as requiring urgent control to limit its spread on Fraser Island. In this study, the potential invasion dynamics of *A. aethiopicus* on Fraser Island were predicted through a combination of spatial and metapopulation models. The results showed that whilst only a small part of the island is currently occupied by *A. aethiopicus*, a large part of the island could be potentially invaded by the species. Analysis of field data showed that the species currently has a relatively patchy distribution with low abundance, indicating an early stage of colonisation. The field data were used to parameterise and develop stage-structured stochastic models for each metapopulation of *A. aethiopicus* on Fraser Island, and a subsequent examination of their population dynamics under various scenarios. The model predictions indicate that populations of *A. aethiopicus* are likely to rapidly increase expand their distribution range dramatically in the next few years if no management action is taken. Based on the model predictions and current conditions, future management efforts would have to involve the removal of more than 90% of individuals in all stage classes (seedling, juvenile, small adult and large adult) from all populations, with follow-up control every two years to effectively delay the invasion of *A. aethiopicus* on Fraser Island.



Managing Biosecurity Threats to Fraser Island

Steve Csurhes
Biosecurity Queensland

Abstract

There are hundreds of invasive species established on Fraser Island and thousands of potentially invasive species, including vertebrates (mammals, reptiles, birds, fish and amphibians), invertebrates (ants, earthworms etc), plants and fungi/diseases. Some species are ruderals (symptomatic of disturbance) and relatively benign, whereas others are "transformer" species capable of causing serious and irreversible damage. Collectively, and in some cases individually, invasive species could cause significant modification to Fraser Island's unique ecosystems. This paper does not attempt to provide a comprehensive list of threats. Instead, this paper highlights some opportunities to avoid or minimise negative impacts of significant invasive species. General approaches for identifying potential threats (including listing, risk assessment and ranking), incursion pathway analysis (identification of likely entry points), early detection and surveillance, and effective management approaches for invasive species incursions will be presented. Strategies such as biosecurity planning, improving public awareness, accepting responsibility, maintaining ecosystem resilience (avoiding disturbance), improving hygiene and quarantine options will be discussed. Over-riding all these approaches is the adage that "prevention is better than cure". Excluding potentially invasive pests from Fraser Island is perhaps our most powerful and effective weapon. Once established, population suppression/control is almost always expensive, challenging and on-going, as eradication of invasive pests may not be possible.

Climate Change and Rainforest Refugia In Subtropical Australia

Lui Weber[1] Jeremy Vanderwal[2] and Luke Shoo[2]
[1]. University of Queensland
[2]. James Cook University

Abstract

The long history of Australia as a rainforest dominated continent is evident in the fossil record. As Australia's climate became increasingly arid rainforest ecosystems retreated to small areas along the East coast that maintained suitable climate. This study aims to increase the knowledge of the history of rainforests in subtropical Australia and provide insights into the potential future climate impacts on rainforest ecosystems. Distributional data was collated for 181 endemic plant species restricted to wetter rainforest types in subtropical Australia. Richness and weighted endemism were calculated on a 5km spatial grid and subjected to clustering analysis and Monte-Carlo tests to identify centres and foci of endemism and relationships between these areas. Spatial results were correlated to a model for rainforest habitat stability over the past 120 000 years. Five main centres of endemism were identified with Fraser Island forming part of the second most Northerly centre. This centre contains narrow endemic plant species including *Tecomanthe hillii* and *Archidendron lovelliae,* found nowhere else. Overall patterns of endemism are positively correlated to the size of the centres and past rainforest stability, indicating that areas with high concentrations of plant endemism correspond directly to areas that have maintained more suitable climate for rainforest ecosystems (refugia). Maxent modelling will also be conducted to investigate how anthropogenic climate change may impact these refugia. It is hoped that increased understanding of past and future rainforest refugia can improve conservation of rainforests in subtropical Australia.

Tecomanthe hillii

Archidendron lovelliae

Fire mapping approaches and its implications on management of Fraser Island's natural resources

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Abstract

Conservation managers are often reliant on manually derived fire history products that map the burn perimeter. These mostly provide an overestimate of the burnt areas. Archives of satellite images offer an opportunity for another approach to mapping, complementing the perimeter mapping approach. We conducted a study on Fraser Island; the World Heritage property in sub-tropical, fire-prone eastern Australia; to study fire regime characteristics for different vegetation types over a twenty year period (1989-2008). The Landsat Thematic Mapper images were analysed using a modified differential normalised burn ratio approach where a combination of shortwave infra-red and near infra-red bands were used. Additionally, the burnt area maps were derived from historical manual mapping approach maintained by Queensland Parks and Wildlife Services. The Landsat derived approach provided a more reliable estimate of the fire scars, demonstrated by a better relationship with the vegetation classes and fuel ages; however, for several events this approach had a tendency to underestimate the burnt areas. The characterisation of fire scars with diverse vegetation classes, using the combination of two approaches, provided deeper insight into the fire ecology for subsequent fire management practices.

The Late Quaternary Vegetation History of Fraser Island

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Abstract

The Late Quaternary period has been a period of dramatic climatic change. This study has investigated the response of two different vegetation communities to these changes, examining the resilience of vegetation, the impact of climate change, the impact of indigenous and natural fires and the impact of early European activities. Previous studies have identified a arid phase both on Fraser and North Stradbroke Island based on palaeo lake levels and sediment transport. The goal of this research was to see if this could be identified in the vegetation record and to see how the vegetation responded to this arid phase. In the central third of the island, where population's of Badtjalla/Butchalla people were greatest , the role of fire has been extremely important in controlling certain communities and restricting the emergence of rainforest species from the glacial refuges. The combined burning and timber harvesting of early European settlers has appeared to be the nail in the coffin for a lot of the more valuable species leaving a vegetation type that is more indicative of rainforest edges and mixed woodland. Further north on the island a second core was taken which displays that in the absence of logging and a reduction in fire and as a result Araucaria forests have been able to expand in the recent history.