

***Shark Bay's World Heritage assets: new findings and future questions***

**Professor Lindsay Collins**

**7.00 pm, 18<sup>th</sup> June, 2012**

**Kings Park Administration Centre**

**(map on back page)**

Initial studies of Shark Bay in the 1960s to 70s on hypersaline stromatolites, microbial tidal flats, and seagrass banks led to establishment of the World Heritage precinct with high conservation status, an important asset for all with an interest in specialised marine environments.



**Members, Guests & the Public all Welcome**

Enquiries: [secretary@royalsocietyofwa.com](mailto:secretary@royalsocietyofwa.com) or Lynne Milne 0414 400 219

<http://www.royalsocietyofwa.com>

This issue of the RSWA Proceedings was edited by Charlotte Mack and Lynne Milne



Ongoing research has included studies by astrobiologists, ecologists, geologists and many others. Geoscientific research has centred on a number of studies, notably by Playford, 1976, 1979, 1990; Burne, & Moore, 1987; Kennard & James, 1986; Awrick & Riding, 1988; Reid, Jahnert, and several others. The recognition of the significance of coquinas and microbialites in ancient systems has renewed geoscientific interest in Shark Bay, with the development of current and new research themes of management significance including:

- Microbial mat systems, environments, chemistry, organic composition and microbial communities,
- Subtidal microbial structures: origin, occurrence, distribution and growth history.
- Coquina ridge morphology, genesis, structures, chronologic record and evolution.

With the discovery of widespread subtidal microbialites in Shark Bay the intertidal stromatolite model was re-evaluated after initial reporting of mainly intertidal forms. Establishing the widespread nature and distribution of subtidal microbialites significantly enhances Shark Bay's heritage assets. New habitat maps of poorly known tidal flats have been generated, and these will be of benefit to management by improving habitat information and providing a baseline against which any future impacts/changes can be assessed. Knowledge of the species level composition of distinctive microbial habitats has been documented and comparisons made between systems of different salinity status.

A forty year climate drying in southwest Australia and interaction with the cyclone regime which impacts the semi-arid Shark Bay region has raised questions for marine park managers concerning potential future climate trends and their impact on World Heritage assets, and investigations of likely effects on World Heritage assets need to identify a mitigation and risk framework for future management.

**Lindsay Collins** gained his PhD from the University of Western Australia. After a period in industry working on reservoir studies of the North West Shelf he returned to Curtin University. His research interests include continental shelves and coral reefs, coastal geology and Tertiary limestones. A long association with Shark Bay led to the present work on hypersaline environments. Lindsay is a researcher within the WA Marine Science Institution and the International Program on Ocean Drilling.



Coquina ridges behind Nilemah Flats,  
Shark Bay



Stromatolites with coquina ridges in the  
background, Carbla Station

## NEWSFLASH – RSWA office at Curtin University and space at STAWA



The Royal Society of Victoria has its own magnificent premises, the Royal Society of NSW has premises at Sydney University – and until now, RSWA has been housed in the homes of various councillors. This has become unwieldy and as we approach our Centenary in 2014 it was felt that we needed a formal base. The Faculty of Science at Curtin University and RSWA have entered into an agreement to lease an office in the new Chemistry Precinct. The Faculty has kindly funded a laptop for RSWA use for three years and provided access to printers, internet and venues. The office is located on the ground floor of the building (access via the lower ramp, first office on the left) and is adjacent to the Exhibition space, the lecture theatre/seminar space and the coffee shop. These spaces/venues can be booked for future RSWA events. The office will provide a base for all RSWA records to be kept and will be manned two half days a week by our new part-time Administrative Secretary, Charlotte Mack. The office is only just being set up so office times and contact details will be advised in the next Proceedings. RSWA thanks Prof Jo Ward, Dean, Faculty of Science and Jeremy Lu for facilitating these arrangements, and the Faculty for assistance with the lease and laptop.

STAWA - The Science Teacher's Association of WA is also housed in the new Chemistry Precinct and has kindly provided RSWA with space at their Cannington premises, free of charge, for storage and the Society's Lanier Photocopier. We thank John Clarke and the STAWA Council.

## RSWA CENTENARY – 2014

RSWA received Royal assent to assume the name Royal Society of Western Australia on November 18<sup>th</sup> 1913. However, the name was not formally adopted until a meeting on 10<sup>th</sup> March 1914 when a new Constitution was approved. This marked the transition from the former 'Natural History and Scientific Society' to the RSWA. We received a letter from Government House on 11<sup>th</sup> March 1914 informing us that the King (George V) had agreed to become Patron of the RSWA. Our Centenary clearly dates from the meeting on the 10<sup>th</sup> March 1914. Dr Alex Bevan heads the RSWA Centenary Sub-Committee and has already planned an exciting scientific programme for the year. We expect to have several formal social events around the time of the important dates and to end the year. Ideas and offers of assistance are welcome. Alex can be contacted at [Alex.Bevan@museum.wa.gov.au](mailto:Alex.Bevan@museum.wa.gov.au)

---

### Jonathan Majer: Invertebrate surveillance on Barrow Island – a bare necessity

The presentation to the May RSWA meeting by Professor Jonathan Majer, from the Institute of Biodiversity and Climate Change at Curtin University, was well attended and followed by a lively question time. The following is a summary of his presentation.

Despite their collective significance to terrestrial ecosystems, terrestrial invertebrate species are generally overlooked during the Environmental Impact Assessment (EIA) process. Developments affecting wetlands often monitor aquatic invertebrates as bio-indicators while, on land, terrestrial and subterranean short-range endemic (SRE) invertebrates are regularly given consideration as environmental factors, because they are inherently susceptible to extinction as a result of human impacts. The remaining terrestrial invertebrate groups, which comprise the most diverse and abundant faunal assemblages present in most terrestrial ecosystems, are yet to be considered as important environmental factors in most EIAs. A variety of complex factors, including legislative, political, and logistical reasons, as well as low community concern, may contribute to this situation. By omitting terrestrial invertebrates, impact assessments underestimate the total biodiversity and conservation value of the survey area, and overlook potentially serious impacts on some of the most crucial biological components of any terrestrial ecosystem.



Aerial photograph of Barrow Island

A notable exception is the baseline terrestrial invertebrate survey undertaken as part of an EIA for the development of a Liquefied Natural Gas (LNG) facility on Barrow Island. Barrow Island is significant in that it overlies Australia's oldest and largest onshore oilfield. It is classed as an A-class Nature reserve and is an award-winning example of development co-existing with biodiversity protection.



NOTE. Barrow Island is an important Marine Reserve and has high terrestrial biodiversity. It has 25 + known endemic species (vertebrates, stygofauna), is a habitat for internationally significant shorebirds, is a regionally significant turtle habitat and is free from introduced mammal species.

In 2005, a pilot study of terrestrial invertebrates was commissioned by Chevron and awarded to Professor Jonathan Majer at Curtin University. A well-known champion of terrestrial invertebrate studies, Professor Majer and his team set out to assess the various land forms and habitats that were represented on the island. The pilot study quickly yielded that an intensive baseline survey was needed as many of the specimens collected could not be matched to an Australian species known to science. The uniqueness of Barrow Island's position as a large land mass unaffected by grazing or agriculture,

human habitation and introduced species meant that the island represented a near pristine Australian ecology; an island virtually unaffected by the colonisation by Europeans. A large number of national and international invertebrate taxonomists (scientists that describe new species to science) enthusiastically gave their services to look at the Barrow Island invertebrate fauna, a snapshot of Australia unaffected by invasive species.

In 2009, ministerial approval was granted to develop the Chevron operated Gorgon Project on Barrow Island based on a number of environmental conditions. One of the conditions of the approval was that all activities associated with the Gorgon construction could not introduce any non-indigenous species of plant or animal to the island, including invertebrates. Chevron could not have agreed to these conditions had they not already had existing baseline knowledge of the indigenous species of the island.

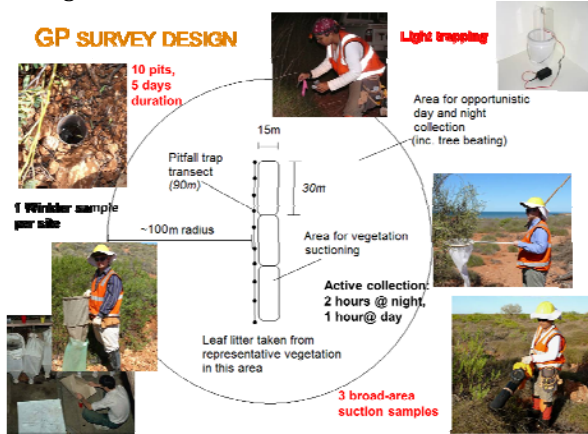
With the baseline knowledge of invertebrates and an assessment of quarantine risk by an external Quarantine Expert Panel, Chevron, Curtin University and statisticians at Queensland University of Technology devised a comprehensive program to carry out a regular surveillance of the island. This is part of a two tiered quarantine program to ensure that if a non-indigenous species is not intercepted during the supply chain the detection program will pick it up during routine surveillance and that it can be eradicated before establishment proceeds. The surveillance program is in its second year of implementation and so far the results are positive for the Gorgon Project.



Invertebrate exemplars include the big headed ant and white Italian snail

Further to this Jonathan covered his sampling protocol, Gas Plant survey design, the plan outline for the non-indigenous species (NIS) survey and the key findings in relation to indicator taxa analysed, inclusive of beetles, wasps, Homoptera, Ants, Flies, Collembola. At present the total number of species identified stands at 2,275, of these 29 were historical NIS and 6 putative. However, calculations suggest that

as many as 2,481 species could be in existence on Barrow Island. Collection methods used in these surveys include barrier pitfall traps, pitfall traps, termite traps, sticky traps, suction sampling and baiting.



**Our new postal address is**

PO Box 7026  
Karawara, WA 6152

**Annual General Meeting – 16<sup>th</sup> July, Webb  
LT, UWA**  
*“The wreck of the Zuytdorp in 1712”*  
**Dr Philip Playford**

The Zuytdorp was wrecked in 1712, probably during the first week of June, and major commemorative events to mark its 300<sup>th</sup> anniversary were held on 1 June 2012 in Kalbarri and Middleburg (capital of the province of Zeleand in The Netherlands, from where the vessel departed in 1711). The Zuytdorp wreck was the first of four early Dutch wrecks to be found and identified in WA, and Dr Playford has been recognised at one of the two primary discoverers. It is the only one of four Dutch wrecks on our coast from which no survivors ever returned to civilisation. There is evidence that some of them joined the local Aborigines.

**Earth Science Week**

Earth Science Week 2012 will be held from the 14-20 October this year and has the theme: Discovering careers in the Earth Sciences. Earth Science Week is an international celebration initiated and hosted by the American Geological Institute, promoting the importance of the geosciences to the community. This

year's theme aims to encourage young people and the public to explore the natural world and learn how geoscientists gather and interpret data about the Earth.

For more information, if you would like an Australian Earth Science Week 2012 poster or would like to register an Australian Earth Science Week 2012 event contact [education@ga.gov.au](mailto:education@ga.gov.au).

Visit the Earth Science Week website for more ideas for activities to celebrate Earth Science Week 2012.

**SKA telescope to be shared**

(Sourced from Astronomy WA)

The International SKA Organisation has announced Australia, New Zealand and South Africa will share the Square Kilometre Array (SKA) project, the world's most powerful and sensitive radio telescope.

The majority of SKA dishes in Phase 1 will be built in South Africa, combined with MeerKAT. Further SKA dishes will be added to the ASKAP array in Australia. All the dishes and the mid frequency aperture arrays for Phase II of the SKA will be built in Southern Africa while the low frequency aperture array antennas for Phase I and II will be built in Australia / New Zealand. The distribution of the three antenna types across the two countries will allow the SKA to cover 70MHz to 10GHz frequencies continuously.

Director of Perth-based International Centre for Radio Astronomy Research (ICRAR), Peter Quinn, says that the decision would reinforce the project's global cooperative focus.

The two countries already have precursory projects underway on their respective sites, the Australian Square Kilometre Array Pathfinder (ASKAP) and Murchison Wide Field array—the only low-frequency precursor to the SKA—and South Africa's Karoo Array Telescope (MeerKAT), both which will act as important test-beds for SKA technology.

“This hugely important step for the project allows us to progress the design and prepare for the construction phase of the telescope. The SKA will transform our view of the Universe; with it we will see back to the moments after the Big Bang and discover previously unexplored parts of the cosmos.” says Dr Michiel van Haarlem, Interim Director General of the SKA Organisation. With thousands of logarithmically positioned antennas across the sites, the SKA radio telescope will be 10,000 times faster at surveying the sky and 50 times more sensitive.

Construction of Phase 1 is set to start in 2016 with first observations scheduled for 2019 and full completion by 2024.

---

### **Radio astronomy receives boost with opening of new space centre**

(Sourced from Science Network WA)

Radio astronomy and Australia's space industry received a boost recently when the WA Space Centre was officially opened. The WA Space Centre, located 40 km from Mingenew and 400 km from Perth in the 114 hectare satellite park designated by the Australian Communications and Media Authority (ACMA), is in the radio quiet zone. It is owned and operated by Space Australia, a subsidiary company of the Swedish Space Corporation (SSC), which invested \$8 million in the project. "The pristine environment in Australia's mid-west is ideal for radio astronomy due to the lack of any man-made radio signals that could drown out the faint radio sources we're looking for in the sky" Director of the International Centre for Radio Astronomy Research Professor Peter Quinn says.

---

### **WA Herbarium scientist chances upon two new mid west triggerplants**

(Sourced from Science Network WA)



Western Australian Herbarium senior research scientist and former RSWA Councillor Dr Juliet Wege has discovered eight tiny new species of *Stylidium*, commonly known as triggerplants, two of which are confined to the Mid West region. Juliet came upon the Little Wildebeest (*Stylidium cornuatum*), a new species with petals shaped like the horns of gnus, during a field search for a different plant near Eneabba. The second species, the Glistening Triggerplant (*Stylidium scintillans*), named after its flower that glistens in the sunlight to lure nectar-seeking insects, was discovered in a mining area.

"These new finds kick-started my work on the tiny triggerplants because it was clear that our knowledge of these plants was far from complete," Juliet says.

"It was especially important to properly document the new species from the mining area to ensure its future conservation." With more than 300 species, *Stylidium* is widespread throughout the country, particularly in the South West of WA where it commonly grows in a range of habitats including swamps and sand-plain country.

However, Juliet says some species are rare or potentially threatened and only known from one or two populations, hence the importance of taxonomic work. "Taxonomic research helps us to understand what species we have, where they grow and how common they are," she says. "We now have much better information on the tiny triggerplants, and hopefully this information will be used to find more populations of the poorly known species." Juliet's research on the tiny triggerplants is part of a larger project to find, identify and provide taxonomic information on all triggerplant species in Australia.

---

### **Institute of Advanced Studies, University of Western Australia**

(Sourced from the AIP June Newsletter)

The Institute of Advanced Studies hosts a selection of public lectures by prominent local, national and international speakers. This month, there's a physics themed talk. On the 21<sup>st</sup> of June Michael Tobar, from the University of Western Australia, will be giving a talk entitled 'It's about time - the quest for a physical "Theory of Everything"'. The talk will be held at the Lotterywest Science Theatre at Scitech on Sutherland Street in West Perth. More information can be gained by emailing [ias@uwa.edu.au](mailto:ias@uwa.edu.au).

---

### **Raymond C. Moore Medal awarded to Professor Ken Campbell**

Professor Ken Campbell has been awarded the Raymond C. Moore Medal from the Society for Sedimentary Geology for Excellence in Paleontology.

This is an extraordinary achievement as Prof. Campbell is the first Australian working in Australia to have received this award. Prof. Campbell is a palaeontologist at the Australian National University and has worked there for 50 years. He was nominated for the award for the breadth and global significance of his research achievements, international

collaborations and the exceptional scientific progeny his teachings have spawned. The RSWA extends its warmest congratulations to Professor Campbell.



Professor Ken Campbell inspects a *Dipnorhynchus - sussmilchi* specimen collected at Wee Jasper at the ANU School of Research Sciences

---

## Queen's Birthday Honours

The RSWA would like to extend congratulations to Prof. Stephen Hopper and Dr Harry Butler on receiving the Order of Australia (AC) and Officer (AO) in the General Division respectively. Congratulations also to Dr Alex George and Emeritus Professor Jennifer McComb for being recognised as Members (AM) in the General Division.

Prof. Hopper received the honour for eminent service as a global science leader in the field of plant conservation biology, particularly in the delivery of world class research programs contributing to the conservation of endangered species and ecosystems.

Dr Butler was recognised for distinguished service to the community through the promotion of public understanding of natural history and wildlife conservation and for the development of collaborative environmental partnerships with industry.

Dr George received the Honour for service to conservation and the environment as a botanist, historian and author, particularly in the area of Australian flora, and through roles with national and international professional organizations.

Emeritus Professor McComb was recognised for services to plant science, and to education, as an academic, researcher and author, to professional science organisations, and to the community.

---



Journal of the Royal Society  
of Western Australia

*A journal for science in Western Australia*

## Revised Instructions to Authors

The *Journal of the Royal Society of Western Australia* publishes peer-reviewed articles dealing with research in all aspects of the natural and physical sciences of relevance to Western Australia. Research papers reporting original research should not normally exceed 5000 words; review papers should not exceed 10 000 words. Short papers not exceeding 2000 words will be given priority in publication. Discussions and Replies of recently published papers in the journal should not exceed 1000 words.

Authors are encouraged to submit a list of potential reviewers in Australia or overseas, but choice of reviewers is at the discretion of the Editor. Submission of a paper is taken to mean that the results have not been published or are not being considered for publication elsewhere. Authors are solely responsible for the accuracy of all information in their papers, and for any opinions they express. Papers accepted for publication become copyright of the Royal Society of Western Australia and authors will be required to assent to the transfer of copyright. A pdf of the published paper is provided free to corresponding authors and their coauthors; hard copy offprints may be ordered at proof stage at a rate of \$100 (incl. GST and postage) for 50 offprints.

**Manuscripts** should be submitted as pdfs or Word (doc or docx) files to the Editor in the following format: Title page; Abstract; Key words; Text; References; Figure captions; Tables; Appendices (if any); and Figures.

**Headings:** Authors may use up to four levels of headings, all of which are left justified: first-order headings are bold capitals; second-order headings are bold upper and lower case; third-order headings are capitals; and fourth-order headings are upper and lower case. All pages should be numbered consecutively, including those carrying tables and captions to figures.

**Illustrations:** All illustrations, both line drawings and photographs, are to be numbered as figures (not plates) in sequence, and each must be referred to in the text in consecutive order. In composite figures made up of several photographs or diagrams, each part should be designated by a lower-case letter (e.g. Figure 2b).

Authors are advised to use the most recent issues of the Journal as a guide to the general format and bibliographic style of the manuscript, and to conform as closely as possible to the style in preparing the manuscript. The metric system (SI units) must be used. Taxonomic papers must follow the appropriate International Code of Nomenclature, and geological papers must adhere to the International Stratigraphic Guide. Spelling should follow the Concise Oxford Dictionary. Following the review process, authors should revise their manuscript and send one printed copy together with a digital (doc or docx) file to the Editor for final technical editing.

The **Title** should begin with a keyword.

The **Abstract** should not be an expanded title, but should include the main substance of the paper in a condensed form.

Six to ten **Keywords** should be provided.

The **Text** should be organised under the following headings: *Introduction*, which should contain the reasons for doing the work and essential background material, but not the results or conclusions; *Methods* (if applicable), which should provide sufficient details of techniques to allow them to be repeated; *Results*, which should not include material more appropriate to the discussion; *Discussion*, which should emphasise the significance of the results and place them in the context of related work; *Conclusions*, which summarise the main findings of the paper; *Acknowledgements*, which should acknowledge any appropriate assistance from colleagues and also the journal reviewers.

**References** must be set out as follows, with journal titles spelled out in full;

**Paper:**

COLLINS L B, TESTA V, ZHAO J & QU D 2011. Holocene growth history and evolution of the Scott Reef carbonate platform and coral reef. *Journal of the Royal Society of Western Australia* **94**, 239–250.

**Book:**

HARPER J L 1977. *Population biology of plants*. Academic Press, London.

**Chapter in Book:**

DAVIE P J F & SHORT J W 1995. Decapod—Anomura, Brachyura. In: Wells F E, Hanley J R & Walker D I (eds) *Marine biological survey of the southern Kimberley, Western Australia*, pp. 118–126. Western Australian Museum, Perth.

High-quality **Illustrations** are required, no larger than 300 mm x 400 mm, with sans serif lettering suitable for reduction to appropriate publication size (81, 115 or 170 mm wide). Scale must be indicated on illustrations. Photographs must be good quality

prints, not exceeding 170 mm x 252 mm. Colour figures incur a charge of \$300 (incl. GST) per colour page. Additional printing costs for folding maps and charts will be charged to authors: please consult the Editor before submitting these items. Figures should also be provided as high-resolution (300 dpi) tif, jpg or eps files to ensure high-quality reproduction.

Extensive sets of data, such as large Tables or Appendices, may be classed as **Supplementary Papers** and not printed with the paper but lodged with the Society's Library (held in the Western Australian Museum, 49 Kew Street, Welshpool, WA 6106) and with the National Library of Australia (Manuscript Section, Parkes Place, Barton, ACT 2600). They should be supplied in printed and digital form (preferably as pdfs). Copies of a Supplementary Paper may be obtained from either institution upon payment of a fee.

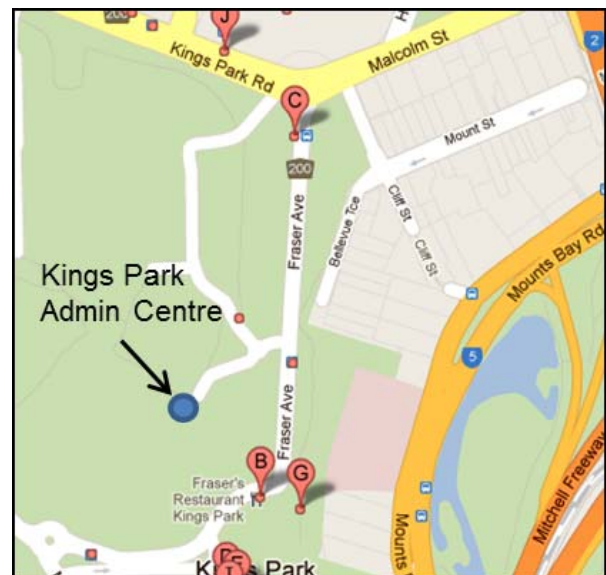
Contributions should be sent to:

**Editor-in-Chief**

**Journal of the Royal Society of Western Australia**  
**104 Hensman Street**  
**South Perth WA 6151**  
or (preferably) ✉ [journal@royalsocietyofwa.com](mailto:journal@royalsocietyofwa.com)

---

#### Location of the Kings Park Administration Centre





## RSWA Events Calendar 2012

<b>Date</b>	<b>Time</b>	<b>Venue</b>	<b>Event</b>
June 18 <sup>th</sup>	7.00pm	Kings Park Admin Centre	Prof. Lindsay Collins - Shark Bay's World Heritage assets: new findings and future questions.
July 16 <sup>th</sup>	TBA	Webb LT, UWA	Dr Philip Playford – The wreck of the <i>Zuytdorp</i> in 1712
Aug. 20 <sup>th</sup>	TBA	TBA	Science Week – A/Prof. Kate Trinajstic: Palaeontology gets high tech. – new ways of looking at old bones
Sept. 17 <sup>th</sup>	TBA	TBA	Postgraduate Symposium
Oct. 15 <sup>th</sup>	TBA	TBA	TBA*
Nov.19 <sup>th</sup>	TBA	Kings Park Admin Centre	Dr Barry Green: Fusion – a sustainable energy source for the future
Dec.	TBA	TBA	Christmas Party