

ZSL SCIENCE AND CONSERVATION EVENT

Coral reefs: running the gauntlet of climate change

Tuesday 14 January 2020

Huxley Lecture Theatre, Zoological Society of London,
Regent's Park, London NW1 4RY

AGENDA

Chaired by Dr Catherine Head, Institute of Zoology, ZSL

Receive the following communications

**Dr Jamie Craggs FLS, Horniman Museum & Gardens and Natural History
Museum, London**

Can ex situ coral collections support global reef restoration efforts?

Dr James Guest, Newcastle University

Assisting coral reef survival in the face of climate change

Dr Rosa van der Ven, University of Essex

Chasing corals: how coral reefs are connected in space and time

Dr Chris Yesson, Institute of Zoology, ZSL

The genetic value of aquarium collections: identification and biobanking

ABSTRACTS

Can ex situ coral collections support global reef restoration efforts?

Dr Jamie Craggs FLS, Horniman Museum & Gardens and Natural History Museum, London

Coral reef habitats are declining globally, leading some scientists to suggest human intervention through active coral restoration, particularly utilising sexual recruits, is of increasing importance. However, considerable challenges hamper the effective scale of these efforts, and therefore new research and technical developments are required to provide solutions. Successful reproduction is the fundamental process by which a population or species continue and therefore studying reproduction provides important insights into long term population trends in a changing world. Broadcast spawning, the release of gametes (eggs and sperm) into the water column during annual events, is the most widespread reproductive mode in reef building corals and these events strongly correlate with a number of seasonal environmental signals (temperature, solar irradiance, lunar and diel cycles). To support the coral reproductive research in 2012 an innovative programme commenced at the Horniman Museum and Gardens along with international partners with the goal of developing techniques to predictably induce broadcast coral spawning events ex situ, utilising a bespoke mesocosm design that accurately replicate these environmental spawning cues. To date, 24 species of coral have spawned in London and following successful in vitro fertilisation numerous studies have been run on coral reproductive biology and the development of applied approaches to support reef restoration efforts. Our techniques of inducing ex situ broadcast spawning are now being utilised by our project partners (Florida aquarium) and other international institutions, for active in situ reef restoration purposes. This presentation will cover some of the ex situ broadcast spawning methodology, our research and future aspirations.

Jamie Craggs is professional aquarist with over 20 years of experience working within the public aquarium industry. Currently he works as the Aquarium Curator at the Horniman Museum and Gardens. He completed his PhD on developing techniques to induce ex situ broadcast coral spawning through the University of Derby. In addition he is a Scientific Associate at the Natural History Museum, London, a fellow of the Linnean Society of London and in 2018 was voted [MASNA Aquarist of the Year](#).

Assisting coral reef survival in the face of climate change

Dr James Guest, Newcastle University

Dramatic changes to coral reefs are inevitable in the face of climate change because corals are highly vulnerable to changes in temperature. Corals have the capacity to adapt, but it is unclear whether rates of adaptation are sufficient to cope with current rates of change. As a result, innovative approaches to conservation of corals are now being seriously considered. These include generation of coral genotypes preadapted to higher temperatures via selective breeding and assisted gene flow (AGF), i.e., deliberate movement of individuals or gametes within and between populations. Corals reefs provide an excellent model for testing the feasibility of selective breeding and AGF because reef building corals: i) provide much of the habitat complexity on reefs; and ii) show considerable variation in thermal tolerance, even within populations. Selective breeding and AGF involve certain risks for the fitness of recipient populations. For example, there may be resource trade-offs between adaptive traits, furthermore, it is not known if selected traits are heritable over multiple generations. Therefore, considerable research is still needed before selective breeding and AGF can be implemented as conservation tools. CORALASSIST is a 5-year, European Research Council funded project that spans the disciplines of evolutionary biology, restoration ecology, microbiology and proteomics to examine the role that

selective breeding and AGF can play in sustaining biodiversity and ecosystem services in the face of climate change. In 2017 the CORALASSIST team began work at the Palau International Coral Reef Center (PICRC). Our main aims were to examine the extent of trade-offs between thermal tolerance and the potential for long-term heritability of thermal tolerance in a range of coral species with different life-history strategies. During this talk Dr Guest will give an introduction and background to the project, discuss the rationale for this research, present results from field work carried out during 2017-2019 and discuss future directions for this work.

James Guest is a coral reef ecologist currently leading a 5-year, 2 million Euro, European Research Council Consolidator Grant at Newcastle University to assess the feasibility of assisting coral reef adaptation via assisted gene flow. He has lived in five countries and worked with a diverse group of scientists from a range of disciplines in large, international multi-disciplinary research groups. His current goal is to bring together the different branches of his research to better understand what active measures can be used to maintain ecosystem services from coral reefs in the face of climate change. [Web page: www.coralassistlab.org/; Facebook: www.facebook.com/coralassistlab/; Twitter: twitter.com/coralassist_lab; Photostory from ERC: vimeo.com/285833555.]

Chasing corals: how coral reefs are connected in space and time

Dr Rosa van der Ven, University of Essex

Reef building corals are not only beautiful to look at, they are also important ecosystem engineers that form the basis for one of the most productive and diverse marine ecosystems in the world. Coral reefs provide essential ecosystem goods and services such as fisheries and tourism to many coastal communities. However, coral reef ecosystems suffer from overexploitation, pollution as well as sedimentation, and face a global decline through increasing sea surface temperatures and ocean acidification. Marine Protected Areas (MPAs) could increase coral reef resilience, but in order to design and manage MPAs, knowledge on the connectivity between such areas is essential. Connectivity between reefs determines the genetic diversity and genetic structure of populations, as well as the ability of coral reefs to persist under and recover from current stressors, and to adapt to future climate change. As corals are attached to the substrate, exchange among populations occurs through dispersal of larvae and depends heavily on habitat suitability, ocean currents, and oceanographic barriers. This presentation will discuss innovative methods to determine how coral reefs were historically connected, how coral reefs are connected now, and how to strategically manage conservation efforts for future preservation of these essential coral reef species.

Rosa van der Ven studied biology in Wageningen, the Netherlands. Focusing on zoology, she studied how corals react to changes in light period and intensity in the Ocean aquarium of Burgers' Zoo. Following that, she studied the life cycle of parasites in introduced blue striped snappers at the Hawaiian Institute of Marine Biology. In her PhD at the University of Brussels, Rosa returned to the corals by investigating genetic connectivity of corals between Indian Ocean reefs. Currently, Rosa joined the University of Essex as a lecturer where she teaches evolution and coral reef biology.

The genetic value of aquarium collections: identification and biobanking

Dr Chris Yesson, Institute of Zoology, ZSL

Coral reefs are some of the most diverse habitats on earth. However, these habitats are under a direct and severe threat from climate change. Coral bleaching events have led to dramatic die-offs in major reef habitats, and this looks set to continue. In the face of in-situ threats, a major focus of conservation has been ex-situ

preservation of corals. Keeping living corals in aquaria, away from rapidly heating natural habitats, may be the only way to preserve some species. Public aquaria have played a large role in researching corals, with many species being grown and propagated for many years. However, having a good understanding of what species are in the collections is fundamental to their research and conservation value, but often identifying specimens in collections is difficult. One solution to this problem is the genetic identification of corals through DNA barcoding. DNA barcoding involves examining the DNA sequence of specific short regions of the genome. Unfortunately, there is no 'universal barcode' that works for all species, and corals have proved particularly problematic. Researchers at ZSL are at the centre of a new initiative to use DNA barcodes to identify species in coral collections of European aquaria. This talk will present our research on using DNA barcodes to identify coral species in aquaria, enabling us to assess the levels of genetic diversity and species duplication in institutional collections. This work forms part of a wider project to document coral collections in aquaria. The idcoral.org database houses collection, measurement, high resolution imagery and DNA sequence information for multiple aquaria. This work is creating an extensive reference library for aquaria collections, expanding our knowledge and understanding of coral collections.

Chris Yesson is a research fellow at ZSL Institute of Zoology. His research is focussed on benthic ecology with a particular focus on coral and seaweeds from the north Atlantic. He is investigating the impact of trawling on the seabed in West Greenland, by surveying, documenting and analysing the benthic diversity of the region. He is also researching the distribution, abundance and genetic connectivity of habitat forming seaweeds around the UK.

Join us at our next event

Holistic approaches to conservation

11 February 2020, 6pm – 7:45pm

As conservationists we aim to create a world where wildlife thrives, but how can we achieve this? To reduce the threat to wildlife, a holistic approach is needed, capable of reconciling the diverse interests of local people, government agencies and corporations for the benefit of biodiversity. This event will explore the different approaches underpinning holistic conservation, using examples from ZSL's overseas conservation programmes.



ZSL Library Events

The library will continue their monthly talks at **4:45pm before each Science & Conservation Event** this year, each one focusing on different examples from their Special Collections! No need to book, just come along, or find out more here... www.zsl.org/about-us/zsl-library-collection.

ZSL Wild Science Podcast

We will be creating a podcast relating to this event topic, so be sure to keep an ear out for it in the following months! Listen to more of our award winning **ZSL Wild Science podcast** episodes produced by Dr Monni Bohm and Eleanor Darbey here... www.zsl.org/zsl-wild-science-podcast.

Please feel free to contact the Scientific Events Coordinator, Eleanor Darbey (eleanor.darbey@zsl.org), if you have any queries about our events.