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Conservation gene drive governance in Australia



Gene drive is a cutting-edge genetic technology, which has the potential to address pressing conservation problems. However, governance challenges associated with gene drive may prove significant, requiring careful consideration before the science becomes conservation policy.

A workshop held at The University of Queensland, in March 2020, brought together genomic scientists, social science scholars, government regulators and managers and an environmental NGO to explore: (i) how and if gene drive might be useful in contributing to conservation in Australia, and (ii) social and governance implications of such technology. This document summarises key insights from the workshop.

Conservation applications

Potential use of gene drive for conservation outcomes in Australia include invasive species control (e.g., cane toads, rats, feral cats), controlling outbreaks of native species, which impact ecosystem functions (e.g., crown-of-thorns-starfish), and reef restoration and adaptation in the face of a warming global climate.

The most technically advanced potential application of gene drive in conservation aims to control invasive rodents. Rodent models have been extensively used and characterised with fully sequenced genomes.

Gene drive applications for control of other species and for other purposes (e.g., coral reef restoration and adaptation) have been limited by a lack of technical knowledge and more complex implementation requirements.

Environmental risks of gene drive conservation are yet to be fully understood. They may include unintended impacts on species, populations and ecosystems and dispersal of modified organisms across geographical and political boundaries.

Social implications

Conservation gene drive applications involve highly contested environmental and social values, which are compounded by the novelty of the technology and high uncertainty in relation to risks

and benefits. The use of gene technology in conservation will need to reflect the values and concerns of the communities, including Traditional Owners, it aims to benefit.

Social license or public acceptance will depend on a number of factors, including who funds gene drive research, which species is targeted and how the debate on conservation gene drive is framed. Overall, stakeholders and other publics are as yet unaware of gene drive and its potential to address conservation issues in Australia. Genuinely involving them from the outset will be critical to ensuring that gene drive research and policy are developed in a responsible way.

Governance challenges

Gene drive technology is primarily regulated by the Commonwealth Office of the Gene Technology Regulator (OGTR). However, the environmental release of gene drives for conservation purposes is likely to involve different agencies, at multiple levels of government, responsible for biosecurity, pest control, environmental protection and biodiversity conservation. Collaboration between these agencies will be required to minimise ambiguities in relation to regulatory oversight.

Gene drive conservation will challenge existing regulatory and policy frameworks to address uncertainties in relation to risks and benefits and contested environmental and social values. Innovative forms of governance will be needed to allow for meaningful stakeholder and public engagement, and integrated risk-based approaches. Ultimately, governance arrangements will need to be flexible to enable responsiveness to new evidence as gene drive technology develops and public debate matures.

Future directions

Insights into specific governance arrangements for conservation gene drive may be gained by considering plausible future scenarios. One such scenario under current discussion is that of controlling invasive rodent populations on uninhabited islands. Analysis of the social, policy and regulatory implications of a gene drive application in this scenario could underpin the development of a tool to support decision-making around where, how, when and by whom gene drive may be used for conservation outcomes.

The conservation gene drive project

This project is funded by the QUEX Institute, a partnership between The University of Queensland and University of Exeter. The QUEX Institute aims to co-produce research of the highest quality, boost industry and business collaboration, and publish high-level policy reports designed to inform and shape key government initiatives across the globe.

Gene drive is a cutting-edge genetic technology, which facilitates the spread of a modified gene through sexually reproducing plant or animal populations. To date, efforts have focused on the development of gene drive mosquitoes in Africa, with the goal of reducing transmission of vector-borne diseases. More recently, scientists have started to explore the possibility of using gene drive to solve conservation problems caused by invasive species, such as mice and rabbits, and are looking to protect or restore coral reefs blighted by increasing ocean temperatures – both problems that are especially relevant in Australia. Gene drive is an unusual technology because it is designed to spread through and possibly eliminate whole populations or species. As such it is a global, transboundary technology that will not respect political or geographical boundaries. This will undoubtedly make governance difficult.

This timely QUEX partnership draws together world-leading social science experts at UQ (environmental sustainability governance) and Exeter (gene drive governance) to understand the governance challenges associated with the movement of gene drive into the conservation and environmental domain. So far, few social scientists have engaged in this area.

Understanding the governance challenges associated with the movement of gene drive into environmental conservation will be critical in determining whether and how the technology is developed and deployed.

Our partnership contributes to the important process of developing a research agenda for conservation gene drive governance. It will identify case studies where the technology might address conservation needs in Australia, the potential risks and concerns raised, and the governance architecture needed. Through workshops, the partnership will expose our

research agenda to an interdisciplinary network of researchers at The University of Queensland and University of Exeter, and engage with regulators and experts active in environmental conservation and interested in gene technology. Capitalising on this opportunity, we will help shape the international debate through policy and academic publications.

Research team

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