

GENETICALLY ENGINEERED GENE DRIVES

IUCN report on Synthetic Biology lacks balance

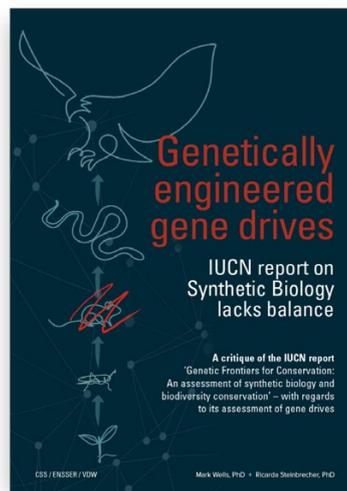
A critique of the IUCN report 'Genetic Frontiers for Conservation: An assessment of synthetic biology and biodiversity conservation' – with regards to its assessment of gene drives

Critical Scientists Switzerland (CSS) • European Network of Scientists for Social and Environmental Responsibility (ENSSER) • Vereinigung Deutscher Wissenschaftler (VDW/FGS) • May 2021

Brief Summary

Ecosystems and biodiversity are declining rapidly; this is a global emergency that requires concerted and well-planned responses. Action is urgently needed, yet it is essential to avoid poor decisions and the tendency to grasp at flawed quick-fixes. The IUCN's¹ assessment report 'Genetic Frontiers for Conservation'² is meant to consider the biodiversity implications of a range of genetic engineering technologies put forward as solutions to pressing problems in areas such as biodiversity conservation and human health. Unfortunately this report fails to provide the necessary scrutiny in its assessment of these technologies.

In this critique, we focus solely on the IUCN report's discussion of engineered gene drive organisms, a technology suggested as a new way to manage or eradicate problem species. **We find that the report downplays the many risks and uncertainties surrounding gene drive technology**, and possible 'unintended consequences' are not explored in any depth. Far more attention should have been given to the gaps in knowledge concerning this new technology and the fact that the risks inherent in altering the evolution of entire species are neither fully understood nor manageable. It is also of concern that **the IUCN report actually side-lines and even tries to redefine the precautionary principle, in a manner that markedly weakens it.**



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What are gene drive organisms?

Gene drive organisms (GDOs) are genetically modified organisms (GMOs) carrying specially constructed genetic material that is capable of overriding the normal rules of inheritance. When these organisms reproduce, selected traits are passed on to the offspring at a much higher rate than would normally occur.

The term 'gene drive' can have different meanings, including:

1. a method used to increase the inheritance of specific genes or traits;
2. the modified genetic material within a GDO that causes such altered inheritance, and is itself passed on at an artificially high rate.

Gene drive organisms could be used to rapidly alter the genetic make-up of wild populations, with the aim of either changing certain characteristics, collapsing these populations, or even eradicating an entire species. All of these possibilities would have the potential to irreversibly alter ecosystems and adversely impact biodiversity.

¹ International Union for Conservation of Nature

² 2019 IUCN report: <https://portals.iucn.org/library/node/48408>

³ Full 2021 CSS/ENSSER/VDW report: <https://genedrives.ch/new-publications/>

We have identified eight major areas of concern with the IUCN report's analysis and conclusions regarding gene drives.

1 The risks of uncontrolled or 'global' spread of gene drives are not properly examined

The risks and potential consequences of engineered gene drives spreading uncontrollably within the target species—and potentially modifying or eradicating the entire species—are not adequately covered or explored.

2 The weaknesses of proposals to 'localise' gene drives are not made clear

The report incorrectly suggests that gene drives are controllable designer tools that could be readily confined to a limited geographical area once released. It does not make clear that so called 'local' gene drive systems are largely hypothetical and those developed to date have very limited capabilities. It is highly uncertain how they would perform under real life conditions.

3 Little attention is given to the difficulty of reversing gene drives

If gene drives were used in the environment it would be vital to ensure that their action and effects could be stopped and even reversed, for example if causing unexpected harmful effects. However, halting or reversing gene drives is likely to be extremely difficult, and fully restoring the genomes of affected species may well be impossible. The report gives very little attention to these concerns or the possibilities for irreparable ecological damage that could result.

4 A flawed analysis of the risks of gene drives affecting non-target species is presented

The report downplays the risk of gene drives moving between species through cross-breeding. Furthermore, the risk of horizontal gene transfer (HGT), in which genetic material moves between species by processes other than sexual reproduction, is dismissed on the basis of the incorrect assertion that HGT is reliant on sexual reproduction.

5 Risks to biodiversity from the use of gene drives for agricultural pest control are ignored

While research is well underway to employ gene drives for agricultural 'pest control', the report does not discuss these possible applications and associated risks. Such applications have great potential to harm biodiversity and ecosystems.

6 The assumption that the risks of releasing Gene Drive Organisms can be fully predicted and managed is highly premature

Discussions of risk in the report are minimal and fail to consider how harmful outcomes could actually play out at the level of ecology and biodiversity. Instead they move on quickly to asserting that risks can be 'managed'. It is not made clear that, due to the complexity of biological systems, there is no certainty that all the risks have even been identified.

7 Many authors have a conflict of interest

Many of the report's authors are involved in developing gene drive systems, however these conflicts of interest are not stated at the outset of the report but only acknowledged halfway through. Too few sceptical voices have been included to balance those authors who show a tendency to advocate for the technology.

8 The 'key messages' are not balanced

Only one of the ten 'key messages' addresses risks and potential harm, whereas three discuss the speculative potential benefits of synthetic biology for conservation.

Our concerns with this report go beyond these eight points: for instance, the tone of important sections is one of enthusiasm about the potential of genetic technologies, when an objective presentation and analysis would be more appropriate. On the whole the report fails to ask searching question about this potentially very consequential technology, including failing to consider the potential for military and malicious use. **We conclude that the current IUCN report does not give an adequate basis for policy decisions regarding engineered gene drives and biodiversity, and that a robust application of the precautionary principle is required in this matter.**

FURTHER INFORMATION

We recommend the 2019 report by eight European Environment and Nature Conservation Agencies '**Gene Drive Organisms: Implications for the Environment and Nature Conservation**'.⁴ For more detail please consult '**Gene drives: A report on their science, applications, social aspects, ethics and regulation**'.⁵

4 <https://www.umweltbundesamt.at/fileadmin/site/publikationen/rep0705.pdf>

5 CSS / ENSSER / VDW 2019. <https://genedrives.ch/report/>