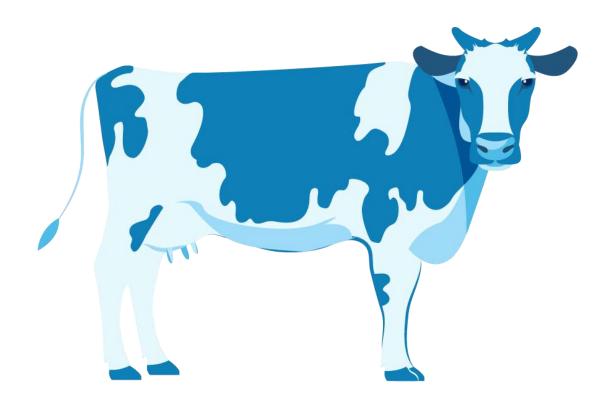


# Genetic Frontiers in Conservation An Assessment of Synthetic Biology and Biodiversity Conservation

IUCN Task Force on Synthetic Biology and Biodiversity Conservation

# When we think of cows .....

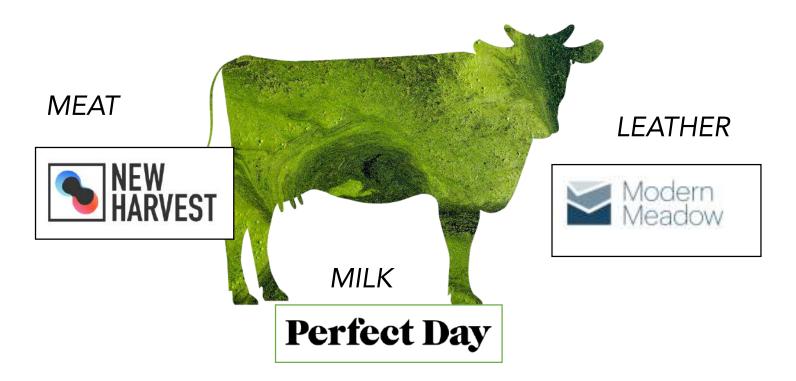


We think of products from cows:

- Leather
- Meat
- Milk

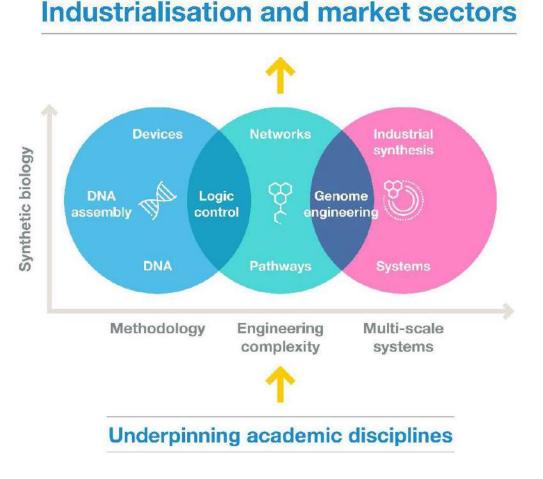
What if we could get 'cow products'.....without the cows?

Products from cow genes inserted into algae – with the application of the tools of <u>synthetic biology</u>:



# What is synthetic biology?

"Synthetic biology is a further development and new dimension of modern biotechnology that combines **science**, technology and engineering to facilitate and accelerate the understanding, design, redesign, manufacture and/or modification of genetic materials, living organisms and biological systems." -CBD



# Synthetic biology and Agriculture

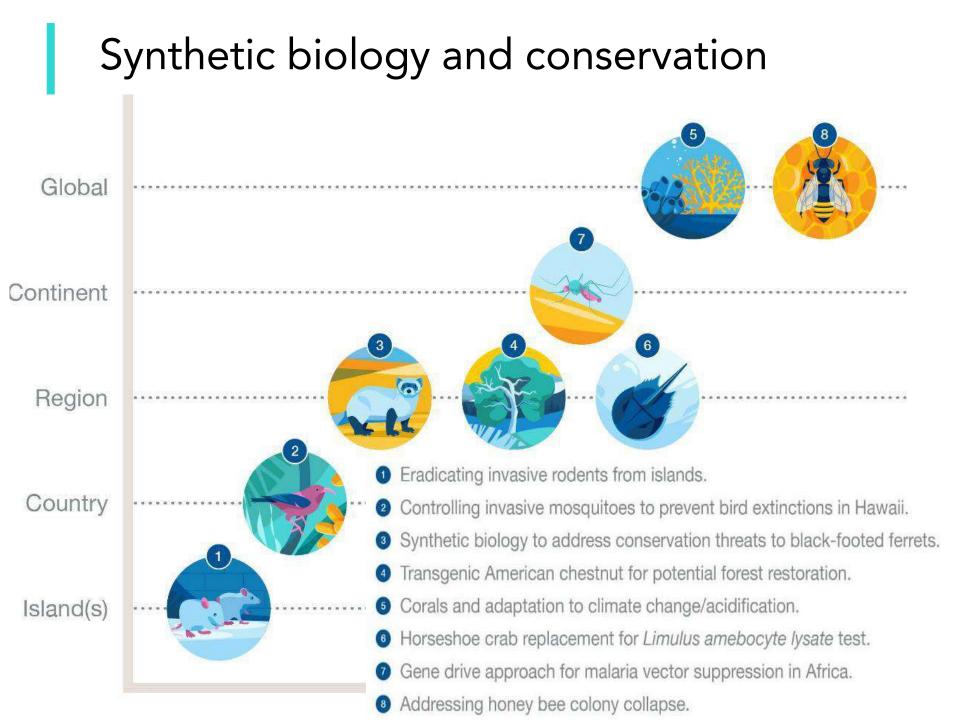


- Transform rice from inefficient C3 photosynthesis to C4 photosynthesis (as in corn, sugarcane, and sorghum)
- 2. Increase micronutrients in existing crops
- 3. Create new domestic crops
- 4. Increase drought tolerance
- 5. Increase disease resistance
- 6. Add nitrogen-fixing capacity to crops
- 7. Improve animal production

# Synthetic biology changes in human health



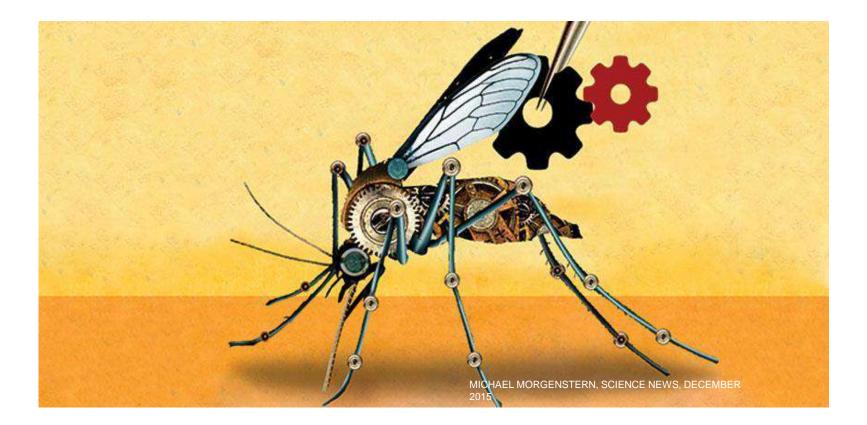
- 1. Reduce malaria burden
- 2. Develop new/improved drugs
- 3. Improve drug effectiveness
- 4. Improve disease monitoring
- 5. Improved nutrition



# **Resolution 086** – "Development of IUCN policy in biodiversity conservation and synthetic biology" ....

- to undertake an assessment...
- to examine the organisms, components and products resulting from <u>synthetic biology</u> techniques and the impacts of their production and use, which may be beneficial or detrimental to the conservation and sustainable use of biological diversity and associated social, economic, cultural and ethical considerations; and
- to assess the implications of gene drive and related techniques and their potential impacts on the conservation and sustainable use of biological diversity as well as equitable sharing of benefits arising from genetic resources





# Task Force

IUCN Commission members and Secretariat

- Natural, social sciences
- ✤Governments, NGOs, Academia,

Business

Indigenous Peoples

Africa, North America, Latin America, Europe, Asia, Australasia



# Technical Subgroup Lead authors of Assessment

IUCN Commission, Secretariat & Specialist Group members

- Natural, social sciences
- Governments, NGOs, Academia, Business
- Indigenous Peoples
- Africa, North America, Latin America, Europe, Asia, Australasia



# **Technical Assessment**

# Genetics Frontiers for Conservation:

An Assessment of Synthetic Biology and Biodiversity Conservation

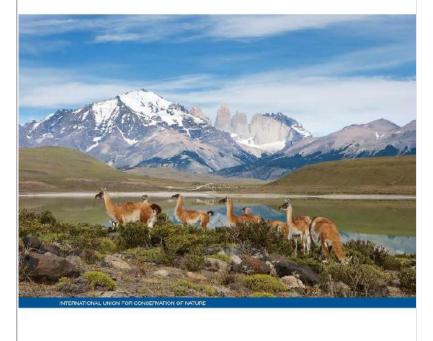
#### **EVIDENCE-BASED**

220+ pages text English, Spanish, French Online appendices

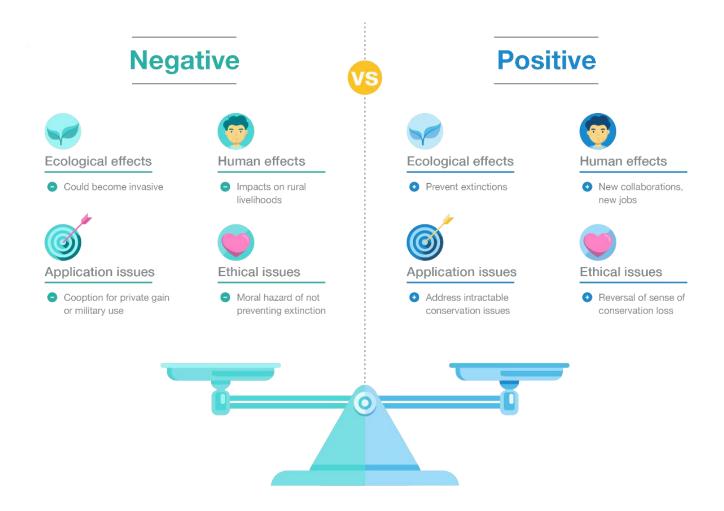


#### Genetic Frontiers for Conservation

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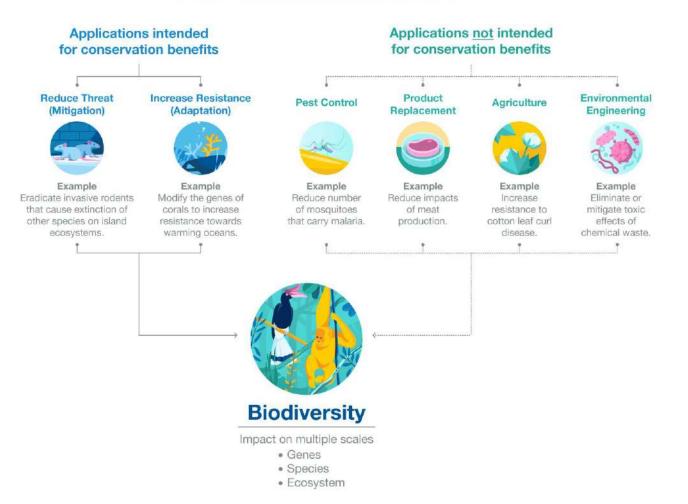


Strengthening our analysis of both positive and negative anticipated effects of synthetic biology



# Ways that synthetic biology can affect conservation

#### Ways that synthetic biology can affect conservation



# Key Messages



Conservation implications: Important implications



New tools: conservation needs them



Rapid growth: of synbio globally – 5x increase



Engineered gene drive: unproven, great potential plus & minus



Beneficial conservation impacts: *possible but untested* 



Detrimental conservation impacts: *possible but untested* 



Values and worldview: influence development and assessment



Indigenous and local communities: key actors in research and decisions

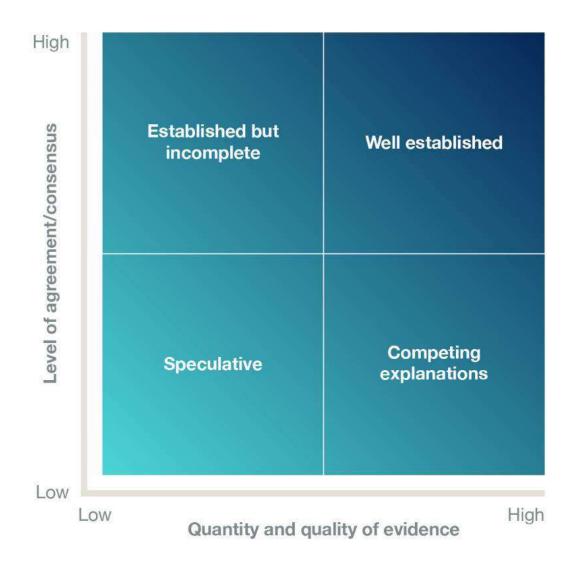


Governance: existing structures may be challenged



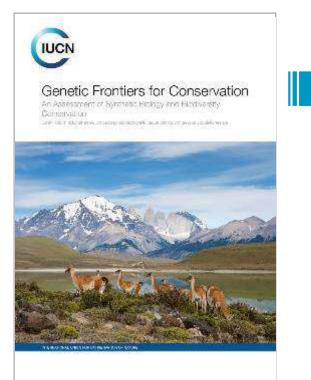
Risk assessment: not what Assessment is - for technology or cases

### Assessing the Evidence – Qualitative uncertainty terms



### <u>DRAFT</u> IUCN Principles on the Intersection of Biodiversity Conservation and Synthetic Biology

#### **Technical Assessment**



#### **Principles**

IEEE Policy on Symbolic Biology and Biodiversity Conservation. Visus Pernary, 2019

5. PERIOSE STATEMENT

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IV. CONTEXT OF THIS POLICY

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### <u>Draft</u> IUCN Principles on the Intersection of Biodiversity Conservation and Synthetic Biology

### **III. Principles**

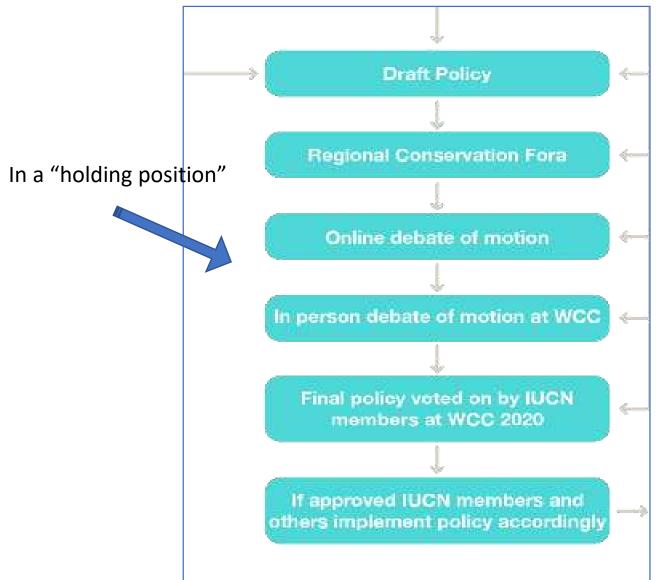
- 1. Biodiversity conservation imperative
- 2. Intergenerational Equity and Sustainable Development
- 3. Respect for rights, beliefs and cultures
- 4. Stakeholder and rightsholder participation
- 5. Free, prior, and informed consent
- 6. Evidence
- 7. Multidisciplinary dialogue between conservationists and synthetic biologists
- 8. Ethics

## <u>Draft</u> IUCN Principles on the Intersection of Biodiversity Conservation and Synthetic Biology

#### IV. Key Considerations for applications

- <u>Case-by-case</u> decision-making;
- For applications of synthetic biology intended for conservation goals, <u>evaluation of existing alternatives;</u>
- For applications of synthetic biology intended for purposes other than conservation, steps to ensure that such applications do not threaten biodiversity and its sustainable use;
- <u>Staged assessment of risks and benefits;</u>
- <u>Governance;</u>
- Knowledge gaps and research needs;
- Knowledge transfer and capacity building;
- Potential introduction of moratoria.

## Where are we now in the process?



# To develop a coronavirus vaccine, synthetic biologists try to outdo nature

By SHARON BEGLEY @sxbegle / MARCH 9, 2020



