Feedback control could be key to robust conservation management

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Mathematical algorithms used to control everyday household items such as washing machines could hold the key to winning the fight for conservation, a new study has claimed.

As part of an EPSRC research project, a team of UK scientists and mathematicians, including those from the University of Exeter, have shown how techniques commonly used in control engineering, could be replicated in the natural world to help restock declining populations.

The innovative new study suggests 'integral control' - in essence a built-in feedback control mechanism to maintain a constant – could be considered as a way of regulating populations by restocking populations as necessary.

The researchers believe that this novel approach could help conservationists in their quest to protect vulnerable species from forces such as habitat destruction or climate change.

Dr Chris Guiver, lead author of the paper and from the University of Exeter's Mathematics department, said: "Conservation is crucial to maintaining biodiversity and the survival of species in environments facing a range of pressures, such as habitat destruction, climate change, invasion and changing land use."

Integral control uses mathematical theory to design robust systems that react to changing situations and make the relevant corrections to

maintain the status quo. Its use can be found in everyday items such as cruise control for regulating a car's speed, as well as navigating super tankers across stormy seas or within the flight controls of a high-performance aircraft.

The new study investigates whether the theory behind this integral control can be transferred to aid conservation projects, and in particular managing declining populations. The collaborative study shows that using measurements of a population, such as a herd of elephants, to help inform conservation management strategies could prove an important factor in future ecological techniques.

Professor Stuart Townley, who lectures in Applied Mathematics at the University of Exeter's Environment and Sustainability Institute at the Penryn Campus, Cornwall, and principal investigator on the EPSRC project, added: "Integral control has not been considered as a technique for managing natural populations but our study shows that it may be highly relevant and could help boost world wide conservation efforts."

The study, called Integral Control for Population Management, is published in the *Journal for Mathematical Biology.*

Provided by University of Exeter