Saving small populations from extinction

The Institute's work is safeguarding some of the world's most vulnerable and threatened small populations.

In the face of unprecedented biodiversity losses, effective strategies for saving small populations from extinction are urgently required. Among conservationists there is almost universal agreement on the need for evidence-based management decisions and for science that supports conservation decision-making. However, management of small populations remains primarily based on the application of experience without careful evaluation of evidence.

For management to be truly evidence-based the science should seek to provide information that will help in choosing management actions. In general, science can support management by firstly predicting the consequences of management actions based on available evidence; secondly, reducing uncertainty around choices between alternative actions; and, finally, providing specialist tools to help select the best action for a given set of objectives.

Institute researchers aim to inform small population recovery in a variety of ways – for example, we have predicted the consequences of supplementary feeding (Ewen et al. 2015) and predator control (Maggs et al. 2015), reduced uncertainties around the effectiveness of disease management (Hudson et al. 2016) and helped select the best management option under risk aversion (Canessa et al. 2016). The evidence support we provide is frequently done in a highly collaborative way, embedding our science directly into management, working alongside local partners.

Hainan gibbon conservation in China

The Hainan gibbon (*Nomascus hainanus*) is possibly the world's rarest mammal, with only 25 individuals known in the wild. This level of rarity is important not only for the management of a species on the verge of extinction, but also because we have very limited knowledge of the species' ecology.

We are working with colleagues in China to provide the scientific information needed for informed conservation decisions. This includes improving estimates of the spatiotemporal requirements of Hainan gibbon social groups, suggesting that habitat availability may not be the current driver of poor population growth (Bryant et al. 2017). Through field monitoring using acoustic call playback methods, Bryant et al (2016a) discovered an additional small social group of Hainan gibbons. This amazing discovery increased the known number of breeding-age female Hainan gibbons from five to six individuals. Additional breeding individuals are critically important and provide more options for interventions to manage the extremely high rates of inbreeding and reduced genetic diversity also revealed by Bryant et al (2016b).

Hihi conservation in New Zealand

The hihi (*Notiomystis cincta*) is an endemic and threatened passerine of New Zealand. Institute researchers have been working with hihi for well over a decade, providing a substantial level of science and decision support to their continued recovery. From a low point of a single remaining population on an offshore island, the hihi is now found spread across this remnant island and in six additional reintroduced populations. Some of these reintroduced populations are on the mainland of New Zealand and are thus exposed to population establishment challenges linked to dispersal from protected areas.

Our research is showing how individual temperament predicts dispersal distances and can shape the probability that individuals recruit into establishing populations (Richardson et al. 2016). Importantly, all reintroduced hihi populations require substantial support, including supplementary feeding. Our most recent work shows that the benefits of supplementary food are equally strong even when hihi are released into mature and pristine forest (Doerr et al. 2017), a finding that continues to improve our understanding of their habitat needs and the beneficial roles supportive management can provide.

Wolf conservation in Europe

The science support we provide to management decisions is often closer to home. Carbon reduction is of growing environmental importance and Europe is addressing this by considering changes in how energy is produced. Wind farming is one attractive alternative, yet the infrastructure associated with wind farms can be damaging to small and threatened populations, including wide-ranging carnivores, such as wolves (*Canis lupus*). Institute research has provided a decision support framework offering an optimal trade-off between energy capacity and overlap with critical wolf reproduction habitat in Croatia (Passoni et al. 2017).

This work shows how science tools can help resolve complicated and often conflicted conservation objectives.

Science support for recovering small populations

Conservationists recognise the absolute need for evidence-based conservation action; however, the scientific support that provides this often fails to truly influence decisions. It is important we understand why this happens, and our work is providing leading insights on this issue. For example, Taylor et al (2017) investigated how well science supported management within reintroduction biology, finding that most research failed to clearly assist the choice among alternative management actions, which is the ultimate requirement of science support to conservation. Our research suggests that changes need to occur in *what* conservation science is done (developing a more holistic understanding of population recovery) and in *how* it responds to management needs (by directly embedding within decision-making).

Conservation science should target uncertainties that are relevant for management, explicitly comparing the expected outcomes of alternative actions, and managing adaptively rather than by trial and error. In doing so we stand to reap substantial rewards through the successful recovery of threatened species.

The Hainan gibbon is possibly the world's rarest mammal, with only 25 individuals known in the wild

Main image: *Institute researchers and their Chinese colleagues have discovered a new social group of rare Hainan gibbons.*
Below left: *the Institute has successfully reintroduced populations of hihi in New Zealand.* Below right: *wind-farming infrastructure is damaging wolf populations*

For further information, contact John Ewen: john.ewen@ioz.ac.uk

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