How should we decide which species to prioritise for conservation?

Pollution, population growth, the introduction of invasive species and habitat loss are causing the planet's sixth mass extinction. About 27 000 species are lost annually – 1000 times higher than the natural background rate. Protecting all species is impractical. A triage model, which weighs multiple prioritisation factors against cost to give a 'benefit per dollar' index, has emerged in light of the deficiency of traditional species prioritisation by a single factor. In the common ground, should we leave some species to die so that others survive? What factors are considered and why? Is triage a solution?

Some species are 'more equal than others'.

Crop wild relatives (CWR) are heat- or drought- tolerant and disease-resistant, making them economically valuable. Modern crops are interbred with CWRs to maintain stable food production, counter climate change and satisfy human population growth. The RHS Millennium Seedbank in Sussex is attempting to store seeds from 25% of the world's dryland flora by 2020.

The Zoological Society of London's EDGE scheme prioritises phylogenetically distinct mammals, which have long branches of evolutionary tree. 15 million years ago, three-toed sloths diverged from the rest; 1 million year ago, they developed into two species. Losing one implies losing 1 million years whereas losing both costs us 15 million years of evolutionary history.

The Rocky Mountains' whitebark pines, threatened by beetle outbreaks and rising temperature, are 'ecologically valuable' because they produce high-fat nuts, a major food source for grizzly bears in autumn and spring. This leads us to consider the 'biodiversity benefit' a species carries.

'Keystone species' maintain ecosystem-stability, safeguarding overall biodiversity. For instance, pollinators like bees and hoverflies are vital to food chains and plant genetic sustainability. Internationally, honey-bees contribute US$10-18 billion annually. Much current research towards colony collapse disorder seeks to investigate the rapid current decline in bee populations.

Saving 'umbrella species' is another approach. They have large range requirements which incidentally include many other species: by protecting old growth forest in California and British Colombia to preserve Northern Spotted Owls, molluscs and salamanders within the boundaries can also benefit.

Considering only 'value' and 'biodiversity' is inadequate. Take the case of the massive extinction of tropical amphibians: despite being good ecological indicator species, biological pest-controllers and nutrient recyclers, there has been little conservation effort as too many possible factors underlie amphibians' decline, from global warming, chytrid fungus, habitat destruction to new competitors – without getting to the root cause, conservation is impossible.

In triage, the likelihood of success of a project affects whether actions are taken. One assesses why a species is endangered, the severity of the threat and whether the species have a high biological potential to persist challenges; difficult-to-save species like rainforest frogs are opted out.

Theoretically, a 'triage index' algorithm combines 'value', 'biodiversity' and 'success rate' then divides the result over projected cost to produce a comparatively objective index of what should be saved.

One criticism is triage is only suitable for well-understood ecosystems. An incomplete picture of parasite-host, pollinator-plant or predator-prey relationships makes the determination of a species' ecological dispensability thorny. It is uncertain how much must be understood about the functioning of a multi-tiered ecosystem to make triage decisions.

Could the model survive sociopolitical realities? Driven by public interest or tourism related interest, for example, giant pandas attract the fifth largest fund for endangered animals. Is it justified that such an arguably ecologically unimportant ‘flagship species’ should divert a disproportionate amount of funding from saving less popular species? Conservation of many species of butterfly, for example, would be easier, cheaper and would bring more biodiversity benefits.

The New Zealand government has been first to incorporate triage. The country has natural areas where the calculated ecosystem service values are equal to their GDP. After evaluating the triage index of 710 species, a clear list of what to save, abandon or could be saved with a bigger budget was produced. Over five years, the conservation result has been positive: half again as many species have been saved from extinction with the same budget. The success of the explicit plan has made a strong case for more funds into conservation. Australia is the next to follow.

But the boundary between opportunity and lost cause is undefined. In 1987, the Californian Condor’s wild population was 22; with US$35 million, now it stands at 237. On one hand, the project is an ‘anti-triage’ success and saved the evolutionarily distinct genus *Gymnogyps*. On the other, its current status is still ‘critically endangered’ as expensive monitoring and captive breeding continues - many more species could have been saved with that money.

Anyhow, America’s Endangered Species Act, which states all non-pest species are eligible for protection, is irrational. Whether to prioritise is not of much debate but how we evaluate our current prioritisation strategy.

It is time to discount our emotions and accept that a rigorous triage index might be the best way to maximise conservation efforts. Whether we like the species is insufficient to justify its conservation. If hospitals are prepared to set priorities and follow a cost-effective analysis in treating patients, why not adopt the same rationale in saving species?

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