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Discussion Forum

Invasive Species – Friends or Foes?

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and
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Report by Matthew Shelley

Dr Niall Moore, who heads the GB Non-Native Species Secretariat, and Professor Chris Thomas, an expert in biological invasions based in the Department of Biology at the University of York, debated the impact of invasive non-native species. They were welcomed on behalf of the RSE by Professor Michael Usher OBE, who said they would be addressing a topic which has been of profound concern to biologists and ecologists for nearly a century. He pointed to the seminal 1958 work by Charles Elton, The Ecology of Invasions by Animals and Plants, *which explored the implications of sudden "explosions" of non-native species from viruses, bacteria, fungi, plants, birds or animals.*

Introduction

The evening was chaired by Dr Deborah Long, Conservation Manager of Plantlife Scotland. Dr Long said that Scotland is facing a continued loss of biodiversity and that invasive non-native species are among the causes. She said the speakers would look at the scale of the threat and what needed to be done.

Dr Niall Moore

Non-native invasive species were defined by Dr Moore as ones that have become established with the assistance of man and have a negative environmental, social or economic impact. An estimated 100,000 species have been moved round the world, including 12,000 in Europe, with 60 new ones arriving each year. In Great Britain there are 2,000 established non-native species, with up to a dozen new arrivals becoming established annually. The rate of movement has accelerated dramatically since around 1800. They should not all be "demonised", however, as many (85%) have no known negative impacts.

Superficially, the movement of species could seem positive, as it might break down isolation and add to local diversity. However, isolation is vital to promoting diversity, as it allows species to take distinctive evolutionary paths. New arrivals, such as the rodents which have invaded 80% of oceanic islands, can have a devastating effect on local species. Invasive species bear a great responsibility for the extinction and endangering of plants, birds and animals around the world. In Hawaii, there were 114 bird species when man arrived and began making new introductions. Some 56 native species are now extinct. About three quarters of threatened bird species on oceanic islands are at

risk due to invasive species. At a continental level, more than 100 bird species are threatened by invaders.

Severe impacts are not just confined to islands. Continents are seriously impacted too – to give just two examples:

- In the 1940s, 50 American beavers were introduced from North America into Tierra del Fuego in South America. There are now 200,000 and they have dramatically re-engineered the ecosystem by transforming large areas of southern beech forest into grassland.
- In Europe, the 1992 opening of the Rhine–Main–Danube Canal allowed the rapid spread of *Dikerogammarus villosus,* known as the “killer shrimps”, which are voracious predators and have had a devastating impact on ecosystems. Its fellow traveller has been the zebra mussel. Their combined impact has been hugely to the detriment of native species.

Dr Moore showed a series of British plants, insects and animals which have either vanished or are now severely endangered due to invaders. Since 1945, the red squirrel has been wiped out across 90% of its range.

There can be a huge time lag between the arrival of a species and recognition of a problem. Himalayan balsam was first discovered in the wild in 1855 and only in 2006 did the first paper come out showing a negative impact. Although man has been introducing species for millennia, the rate is accelerating – with 35% of established non-native species having only arrived since 1950 – so we do not know what harm they may yet do. New arrivals are increasingly from outside Europe; pre-1950, 56% were from Europe but since 1950, nearly 75% are from outside Europe. Whilst around 10% of new species from Europe have invasive qualities, the figure is nearly doubled for those from beyond.

Government does not demonise all non-native species – in fact, whilst there are 2,000 non-native species in Britain, Government efforts are focused on only about 25. Dr Moore said that there needs to be a new emphasis on early detection, risk assessment and action. Long-term control measures can then be taken where necessary.

The example of the ruddy duck in Europe shows what happens without early action. It was introduced to Britain from America and was allowed to escape and establish, as it was believed to have little local impact. However, through interbreeding and competition, it has become the biggest threat to the white-headed duck in Spain. Failure to anticipate the consequences and act at an early stage led to huge expense in trying to protect the Spanish duck and eventually in eradicating the ruddy duck, at a cost of £5 million, from Britain, where it had become widespread.

In view of the difficulties in eradicating species that have become established, Dr Moore said we need to do more horizon scanning, be alert to potential threats and respond more rapidly to them. Above all, we need to be precautionary, due to:

- Uncertainty. There is a huge uncertainty around the impact an introduced species will have;
- Irreversibility. Once a species is established, it is usually too late or too costly to remove it;
- Lag phase. Many species take many years, decades or even centuries to demonstrate their negative impacts.

Professor Chris Thomas

Whilst agreeing with most of what Dr Moore had said, Professor Thomas said he would largely "delete" his words about harm and damage. We are living in what he described as "an alien present". Biodiversity is not static, species move – all humans are from Africa. The human population has increased dramatically in recent decades and uses an increasing proportion of available resources, leading to a loss in global biodiversity. There is nothing on the planet unaffected by humans and so there is little which can truly be regarded as "natural".

Distributions of species have changed across the planet. Many of the species we regard as native in Britain are not living in the places they originated, but occur there due to man. Much of what we seek to preserve is actually the remnants of past agricultural practices which have become uneconomic. According to Professor Thomas, Europe has become "the zenith of habitat management". If it were not for humans, Europe would have elephants, rhino, bison and many other species that have been lost. There is nowhere left in a pre-human state; we are in the Anthropocene.

As species move and change, it makes no sense to think of native and non-native – there are simply species. And the level of human involvement makes it impractical to think in terms of whether movements are natural or not. Despite the fact that most species cannot be demonstrated to have done harm, he argued, there tends to be bad feeling towards them among conservationists. In Britain, virtually no plant species have gone extinct due to new arrivals; indeed, there has been a net gain in regional biodiversity, both at home and across much of the planet.

To try to decide what belongs where, on the basis of historical distribution, is nonsensical, as climate change is transforming habitats and changing where species can survive. The comma butterfly, for example, has responded to climate change by extending its range north from England to Scotland. In some cases, species cannot reach suitable new areas. Professor Thomas suggested that if we want to reduce extinctions we should actively consider moving them to new places where they can thrive. This could substantially reduce the number of climate change-related losses. In a further questioning of the basis on which we judge whether species are native, Professor Thomas said that some of those regarded as alien did in fact exist here in previous interglacial periods and were just driven out by previous ice ages.

Turning to reintroductions, Professor Thomas said that some conservation projects currently being pursued could be misplaced. For example, the efforts being made to bring back the Eurasian lynx can be criticised, as it remains one of the commonest cats in the world. By contrast, the Iberian lynx is the most endangered. But its ancestor used to live all over Europe and was here long before the Eurasian one "invaded" about 130,000 years ago.

"We cannot in the modern world police the distributions of species. It makes no biological sense and it would be a waste of money," he said. From a conservation perspective, it is essential to decide which are the really important fights and put the priority there. Beneficial changes should be facilitated, while resistance should be a rarity.

Questions:

Q: Professor Thomas was asked what species should be fast-tracked into new places.

A: He said a process was needed to make decisions, plus a set of assessments of what is globally, rather than locally, endangered. The Algerian nuthatch, reduced to just 1,000 individuals due to climate change, could potentially be given a new home in the Atlas mountains. Britain, he added, would be the logical place for the Pyrenean desman, a small semi-aquatic nocturnal mammal, which is at risk of being wiped out by climate change.

Q: Professor Thomas was asked to explain his suggestion that we should adapt to change and to the arrival of new species rather than resist.

A: He said he is worried that governments and organisations will waste money and resources on futile attempts to keep the world as it is rather than to mitigate harm.

A: Dr Moore said he believes that organisations are aware of the need to "pick their fights". He also said we need to distinguish between species which expand their range naturally and those introduced by human action – which is happening much faster and involves many more of them.

Q: Will there be a damaging impact from GM?

A: Dr Moore said this is an unknown.

A: Professor Thomas said there is a concern that people could use GM maliciously; however, most species have undergone some hybridisation, so we know it need not cause harm.

Q: Can each speaker identify a non-native species which is a friend and one that's a foe?

A: Dr Moore pointed to crops and livestock as valuable and said that some aquatic plants like water primrose are causing real harm.

A: Oxford Ragwort was Professor Thomas' favourite, which came from Italy and has spread through the railway system, generating new hybrids along the way and thus increasing biodiversity. He pointed to the release of the grey squirrel in Italy as likely to lead to the expunging of red squirrels from large areas of Europe and therefore potentially harmful.

Q: What has the role of humans been in species movement and has it changed?

A: Dr Moore said it has changed dramatically. A century ago there were societies dedicated to finding new species and bringing them to other countries. These days it tends to be accidental.

A: Professor Thomas claimed that we do not know how most species get to new places.

Q: How should Japanese knotweed be dealt with?

A: Dr Moore said the priority needs to be on looking ahead and identifying what the "next knotweed" will be and dealing with it before it becomes a problem.

A: Professor Thomas added that Japanese knotweed is largely an economic and social issue at present. However, we only have one gender in Britain and efforts are needed to stop the other arriving, as this could cause its very rapid breeding.

Q: Do we have big cats in the wild?

A: Both speakers agreed that we would know if there was a wild big cat population.

Q: Should biological control agents be used to combat invasive species?

A: Dr Moore agreed that when shown to be safe these are a good idea, but that they often do not hit the target species hard enough to be effective.

A: Professor Thomas believes it can be a good idea and that the risks of them backfiring by attacking other species as well can be kept low.

Q: Dr Moore was asked what preventative measures should be used to resist invasive species.

A: First, we need to analyse the pathways and then take action on those most likely to bring invaders.

Q: If we think of human impact on species movement as unnatural, are we taking humans out of nature?

A: According to Professor Thomas, this is one of the reasons why we should not look at things in terms of whether humans made it happen.

A: Dr Moore described humans as a “super-part” of the environment and said that we need to minimise our negative impact.

The evening concluded with a Vote of Thanks by Professor Michael Usher OBE FRSE.