Understanding species distribution

Tools for predicting where species occur
Understanding species distribution - tools for predicting where species occur

The limitations of species data need to be well understood by conservation planners.

It could help prevent inaccurate estimates for local species extinctions.

In the past, these were not based on actual recorded species absences.

They used confirmed presence of species data. This often looked like a lack of survey effort.
Understanding species distribution - tools for predicting where species occur

Knowledge of species distributions and how they were changing was important.

For example, even if a species had a wide range it was worth modelling its distribution.

This was in case it was declining fast and was at risk of extinction, according to the IUCN Red List.
Understanding species distribution - tools for predicting where species occur

We could use distribution modelling to look for the endangered Edwards's Pheasant.

This species was last seen in Vietnam in 2000, when poachers seized the last wild individual.

The species with highest likelihood of extinction were often the most poorly known.
The very limited available information on Edwards's Pheasant was drawn together to identify places where future surveys had the best chance of finding any remaining populations.

This was among the first deliberate efforts to apply these methods to species.
Understanding species distribution - tools for predicting where species occur

In some cases, species were only known to inhabit a few locations.

It was possible to see how climate change or habitat loss affects species occurrence:

- with the right tools for understanding species distributions
- by overlapping geographical and physical datasets
Understanding species distribution - tools for predicting where species occur

Distribution modelling helped land managers and conservation planners.

It predicted where species occurred to get distribution over a large area.

This was especially useful if our surveys and resources limited us.

Protected areas, for example, usually contained more forested land.

This was not always desirable for some species that prefer other habitats.
Often protected areas were only designated where it was cheapest to do so.

This was not necessarily based on where species actually lived.

Edwards's Pheasant and the Himalayan Quail belong to an order of birds known as Galliformes.

There are some 300 species, living mainly in forests but also in grasslands and deserts.
Understanding species distribution - tools for predicting where species occur

Worldwide, 25% of Galliformes were under threat from global extinction.

In the Himalayas, more than 80% of land important to Galliformes did not have any legal protection.

Protected land, though representative, was not enough to conserve species of concern.

Areas with large populations of Galliformes needed to be in protected area networks. There needed to be better management of areas already protected.
Understanding species distribution - tools for predicting where species occur

To prevent extinctions, we needed a combination of:

- modelling distribution of species
- improving their management to prevent extinctions

The 300 Galliformes have importance in maintaining ecosystems they thrive in.

Questions remain about whether some species are more important for ecosystems than others.
Species were going extinct at faster rates than the background extinction rate.

Significant scientific and political debates looked at where we should prioritise action.

Some thought that we should allow no species to go extinct.

Others felt that effort should be quite targeted, which would mean some species lose out.

Others felt that we should prioritise species that performed important ecosystem functions.
Understanding species distribution - tools for predicting where species occur

Tropical rainforests depend on bird species for dispersing seeds of fruit trees.

These are Frugivores, a name that refers to all fruit dependent species.

This included the Rufous-necked Hornbill (Aceros nipalensis).

It's a valuable species marked on the Red List as vulnerable. It's known by its large distinctive horn bill.

It's extinct in many of its former native habitats, namely Nepal and many parts of Thailand. The hornbill had an important role in spreading the seeds of rainforest trees.
Understanding species distribution - tools for predicting where species occur

It was dependent on large trees for feeding and nesting. That made it vulnerable to deforestation.

Logging, shifting cultivation and clearance for agriculture led to its habitat destruction.

Scientists began to wonder whether we needed all Frugivores for habitats to persist.

Would the habitat survive the extinction of some frugivore species?

And was it possible for other animals to disperse the seeds of the same species of trees?

These were questions jointly asked by:

- ecologists
- policymakers
- conservationists
- citizen scientists
- land managers
- planners
Key points for conservation and policy

- Make tools for modelling species distribution easier to use. Make public data for them available.
- Understand that species distribution models often have built-in assumptions and limitations.
- Know the limitations of your data to understand size of populations and distribution.
- Species that inhabit other terrestrial environments outside of forests need protection also. These include those that live outside the periphery of protected areas.
- Create formulas for predicting where species' distributions are. This is if you don't have large surveys available.
- Collate satellite information with environmental data and record species sightings. This helps identify habitats for red-listed species.