

Helen  
Roy

# Encounters with aliens

## Invasive species – they're here!

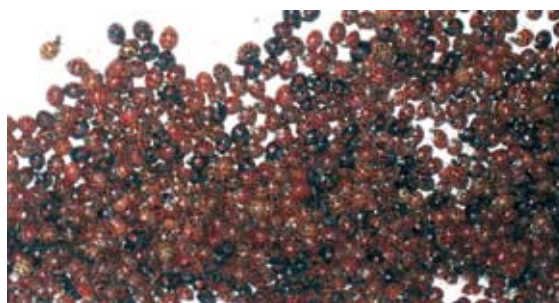


**Key words**  
biodiversity  
alien species

*Over the last century there has been a dramatic increase in the movement of so called alien species around the world as a consequence of international trade and travel. Invasive alien species, alongside climate change and habitat destruction, are considered to be one of the main drivers of biodiversity loss. Helen Roy asks: what are alien species and what threats do they pose?*

Alien (or non-native) species are ones which are introduced by humans, intentionally or unintentionally, to a new region of the world. For example, the harlequin ladybird (*Harmonia axyridis*) is native to Asia but alien to Europe and America.

It was introduced to these continents by humans to control pest insects such as aphids (greenfly). Only ten percent of alien species will survive and reproduce in their new locality. If they do they are termed 'established'. The harlequin ladybird reproduces prolifically in Britain and so is an established alien. Only one percent of alien species will cause problems and this small but significant subset is termed 'invasive'. The harlequin ladybird poses a threat to biodiversity because it not only eats pest insects but also some the native species such as other ladybirds. See the Box for a definition of biodiversity.



Shirley Taylor

Harlequin ladybirds – prolific breeders

### Alien impact

We live in a dynamic world. If we were to travel back in time and arrive in the Jurassic period the landscape would look very different to the one we experience today; the component species of Jurassic ecosystems are obviously not the same as recent times. So why does it matter if the species we see today comprise those we consider native and those we consider alien? To some extent it doesn't. Many of the alien arrivals are undoubtedly exquisite additions to our biodiversity. However, the rate of change is worrying.

The number of alien species arriving in countries around the world has escalated dramatically and is showing no signs of slowing. So in 1800 there were about 600 alien plant species in Europe, in 1900 about 1000 alien plant species and by 2000 a staggering 2500 alien plant species. Some consider the arrival of alien species a simple evolutionary process but this recent escalation is not on a time scale we would conventionally think of as evolution.

The invasive alien arrivals are only a small percentage of the total alien population but this not reflected in the magnitude of the problems they cause. Some species cause economic problems. *Buddleia* (butterfly bush) is costly to the railway network because it has to be cleared from the tracks. Rabbits are thought to cost the Australian economy \$200 million a year. Others cause ecological problems. The Chinese mitten crab damages riverbanks and so threatens habitats. The large and aggressive signal crayfish not only out-competes native white-clawed crayfish but also carries a disease which has devastated white-clawed crayfish populations in Europe. Most invasive alien species cause both economic and ecological impacts.

### Biodiversity

The official definition is:

Variability among living organisms from all sources, including, among other things, terrestrial, marine, and other aquatic ecosystems, and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems

This means it is made up of

- genetic diversity
- species diversity
- ecosystem diversity

### Looking at ladybirds

The harlequin ladybird is an invasive alien species that I know well. I jointly lead the UK Ladybird Survey, in collaboration with scientists from the University of Cambridge and Anglia Ruskin University, and have been monitoring the harlequin ladybird since it arrived in England in 2004 through an online public participation survey.

The survey has received more than 30,000 records of the harlequin ladybird, and particularly notable are the very large numbers of the beetle which are commonly reported in the autumn each

You can find Helen's survey at [www.ladybird-survey.org](http://www.ladybird-survey.org).



year, when this species enters buildings to locate suitable overwintering sites. From the data we have received we have calculated that the harlequin ladybird has spread at a staggering 100 km per year. We also know it has up to three generations a year in Britain (many native ladybird species have only one generation per year).

**Invading ladybirds breed up ecological storm for UK species**

*Guardian, 30th June 2009*

**Harlequin ladybird threat to 1000 species**

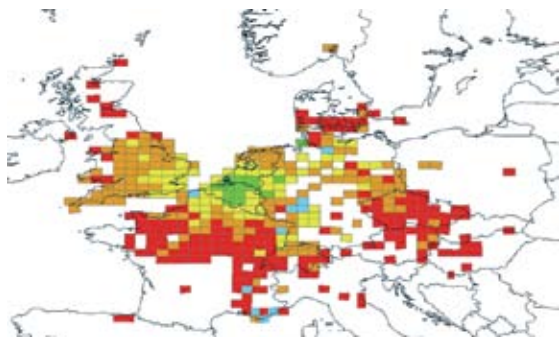
*Daily Mirror, 30th June 2009*

**Beware the plague of smelly ladybirds**

*Daily Express, 27th October 2009*

The harlequin ladybird has generated considerable press coverage. But what is the story behind these headlines?

The harlequin ladybird was introduced into continental Europe in the 1980s as a biological control agent of scale insects and aphids. It was never intentionally introduced into Britain, but arrived in the county of Essex in 2004. It remains abundant in the south east of England, but there are many records from central and northern England, Wales and also a few records from Scotland, as far north as Orkney.



We know that this species has the potential to threaten native biodiversity because we have carried out lots of laboratory experiments which show that the harlequin ladybird will eat many different types of insect, from other ladybirds to butterflies.



A harlequin ladybird larva eating eggs of noctuid moths.

Not much eats the harlequin in return! It is protected by an impressive cocktail of distasteful chemicals and its larval (immature) stage is very spiky. Laboratory studies give us a glimpse of potential problems and allow us to assess the risks but to get a picture of the extent of these problems in the wider countryside we have to head outside, away from the laboratory. We do this through carefully designed field surveys but the Ladybird Survey team can only look at a few habitats in a few locations across Britain. That is where you come in. People from all over Britain send in their ladybird observations using the on-line survey form on the Ladybird Survey website [www.ladybird-survey.org](http://www.ladybird-survey.org) or text "ladybird" to 83040 to complete the survey form. It doesn't take long.

So what is happening in the parks and gardens where you live?

- Are harlequin ladybirds very numerous or do you see lots of other ladybirds?
- Have you ever seen a harlequin ladybird eating something? What did it eat?
- Have you ever seen another predator or perhaps a parasite attacking the harlequin ladybird?

In the winter time, window frames and attics often harbour large groups of harlequin ladybirds and also 2-spot ladybirds. You could send in photos of the ladybirds you see in your house or school this winter. How many harlequins are residing in your house? How many 2-spots?



Harlequin ladybirds overwintering in the author's house alongside native 2-spot ladybirds.

**Invasive aliens: the one-percent problem**

In conclusion, non-native species are often thought of negatively but actually it is only one percent of them that are actually known to be problematic (although we could argue that the introduction of non-native species is part of the large impact humans are having on the Earth typified by climate change). The harlequin ladybird is reported as an invasive alien species with far reaching ecological impacts, and there is no doubt that it has the potential to threaten biodiversity. However, it is critical that we gather more evidence to enable us to have a thorough understanding of the extent of any effects this invasive alien species will have on other species. Records from people across the UK are essential in helping us to assess the threat of the harlequin ladybird to British wildlife.

*Dr Helen Roy is a research scientist at the NERC Centre for Ecology and Hydrology in Oxfordshire, UK*



On the back page Helen introduces some other non-native species which have made their homes in the British Isles.

# Meet the aliens

There are approximately 3500 non-native species in Britain but only a very small proportion (about 1%) cause ecological and economic problems and are therefore termed invasive alien species. The notable ones include:



NNS5

Grey squirrels have displaced native red squirrels through much of England and Wales. They damage trees by gnawing young bark and are also predators of birds' eggs and chicks.



FERRA

Citrus longhorn beetles have occurred sporadically in England since 2005. The immature larval stages of this beetle create tunnels in host trees through feeding and make trees susceptible to diseases and wind damage.



NNS5

Creeping water primrose is known from only a few British sites. It has been introduced to Europe as an ornamental and water garden plant but causes severe negative impacts because it out-competes native species and clogs waterways.



FERRA

Chinese mitten crabs are large crabs that have characteristic dense mats of hair on their claws. They are very good predators and have large appetites and so compete with native species leading to impacts on fish populations and other aquatic species. Chinese mitten crabs burrow into river banks causing erosion and collapse of river banks.



NNS5

Muntjac are small deer which were introduced into Britain early in the twentieth century. They have become widespread because people have deliberately released them. Where muntjac deer occur in high numbers they cause damage to plants of conservation interest particularly in woodland.