Metabolic flexibility and immune defences may influence species spread, study suggests

June 24 2016, by Alan Williams

Credit: University of Plymouth

Wide-ranging species may have different levels of bacterial immunity than their rarer relatives, new research suggests.

The study, conducted by Plymouth University PhD student Rebekah Cioffi and supervised by the University's Dr John Moody, Professor

David Bilton and Dr Richard Billington, examined the physiological and immune properties of Deronectes diving beetles, species of which are found living across Europe.

Scientists collected samples of widespread and restricted species and then assessed temperature tolerance, metabolic flexibility and immunity.

The results showed that while variation in how widespread a species was, and how northerly it was distributed, were explained in part by temperature tolerance, aspects of metabolic plasticity and immunocompetence also appeared important.

Rebekah, who has previously completed both undergraduate and masters courses at the University, said:

"The distribution of many animals is likely to be set by physiological parameters, and thermal tolerance relies on an organism's ability to maintain cellular function under stress. But by investigating their metabolism and immune systems as well, we can see whether more thermally tolerant species also have higher metabolic plasticity and defence capabilities. This may be vital in widespread, more northerly distributed species, but no work to date has explored whether this differs between widespread and restricted species. Our paper points to factors which should be considered in future work."

For the study, scientists in Plymouth and at the Department of Ecology and Hydrology at the University of Murcia in Spain, compared metabolic plasticity and immunocompetence across closely related species of Deronectes which differ in geographical range size and position.

They then combined these data with thermal tolerance, dispersal ability and phylogenetic history, to explore their relative importance in shaping

distribution.

The paper adds:

"As species distributions respond to climate change it is vital we understand the mechanisms shaping geographical ranges. Despite the inclusion of additional variables, thermal physiology was still clearly related to biogeography. However, other aspects of an organism's physiological niche may be related and although widespread species have broader thermal tolerances to cope with more variable climates, they also appear to have different energetic strategies and immune trade-offs to endemic species."

Provided by University of Plymouth