Anatomical analysis puts insects in their place

October 1 2013

Fossil of Sanctacaris uncata, which the study suggests is a putative ancestor of modern spiders and horseshoe crabs. Credit: David Legg

(Phys.org) —A study by an Oxford University researcher has shed new light on the origins of modern animal groups including insects and spiders.

The paper shows that insects evolved from a marine crustacean ancestor, while spiders evolved from a trilobite-like ancestor.

Based on analysis of more than 750 anatomical features in over 300 species, more than 200 of which are fossils, the results support previous hypotheses on the evolution of arthropods produced using molecular techniques such as DNA sequencing. Until now, molecular techniques and anatomical data had often resulted in widely divergent hypotheses.

Lead author Dr David Legg, who recently joined the Oxford University Museum of Natural History as a research fellow, said: 'Using our data set, which is the largest of its kind, we have been able to resolve the discrepancy that has existed for many years between the molecular evidence and the anatomical evidence.

'We show that, for example, everyday insects such as flies and wasps are closely related to prawns, crabs and lobsters, which backs up the majority of molecular evidence.

'This is the first time the controversial molecular results have been verified using anatomical information – thanks to the inclusion of fossils. The fossils also give us a better understanding of how these creatures evolved and what their ancestors looked like.'

The study, which was carried out at Imperial College London and the Natural History Museum in London, suggests that the reason for the previous discrepancy between hypotheses is down to the 'deep divergence time' of arthropods, the phylum of invertebrate animals characterised by their external skeletons, segmented bodies and jointed appendages.

Dr Legg said: 'These groups of animals originated and diverged between 600 and 500 million years ago. They displayed massive diversification in a relatively short period of time, which means that many of the features and characteristics that evolved so quickly are lost to us today.

'That could explain the previous disagreement between molecular and anatomical evidence.

'We have also demonstrated that although these groups originated in a very short period of time, known as the Cambrian Explosion, there was a "long fuse" of anatomical adaptation that preceded their modern

diversity.'

Dr Legg added: 'In order to understand the process of evolution you need to know where creatures came from and how certain traits developed.

'Arthropods are the most diverse, disparate and ubiquitous group of animals on Earth. There are currently over 1,000,000 described species and they can be found almost everywhere, from the slopes of Mount Everest to the depths of the Marianna Trench – they are even living on our bodies in the form of mites.

'Our study means that people working in arthropods now have a much clearer picture of how this important group evolved.'

The study is published in the journal *Nature Communications*.

More information: www.nature.com/ncomms/2013/130 … full/ncomms3485.html

Provided by Oxford University