Creepy crawly cockroach ancestor revealed in new 3-D model

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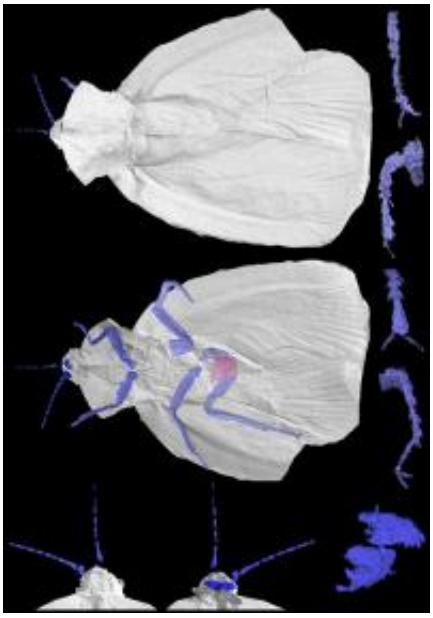

An image of the Archimylacris eggintoni. Credit: Imperial College London and the Natural History Museum.

(PhysOrg.com) -- An early ancestor of the cockroach that lived around 300 million years ago is unveiled in unprecedented detail in a new three-dimensional 'virtual fossil' model, in research published today in the journal *Biology Letters*.

Scientists at Imperial College London have made a comprehensive 3D model of a fossilised specimen called *Archimylacris eggintoni*, which is

an ancient ancestor of modern cockroaches, mantises and termites. This insect scuttled around on Earth during the Carboniferous period 359 - 299 million years ago, which was a time when life had recently emerged from the oceans to live on land.

The study reveals for the first time how *Archimylacris eggintoni*'s physical traits helped it to thrive on the floor of Earth's early forests. The fossils of these creatures are normally between 2cm and 9cm in length and approximately 4cm in width.

The lead author of the study, Mr Russell Garwood, a PhD student from the Department of Earth Science and Engineering at Imperial College London, says:

"The Carboniferous period is sometimes referred to as the age of the cockroach because fossils of *Archimylacris eggintoni* and its relatives are amongst the most common insects from this time period. They are found all over the world. People joke about it being impossible to kill cockroaches and our 3D model almost brings this one back to life. Thanks to our 3D modelling process, we can see how *Archimylacris eggintoni*'s limbs were well adapted for all terrains, as it was not only adept in the air but also very agile on the ground."

The researchers created their images using a CT scanning device, based at the Natural History Museum in London, which enabled them to take 3142 x-rays of the fossil and compile the images into an accurate 3D model, creating a 'virtual fossil' of the creature, using specially designed computer software. The scientists used the models to visualise the *Archimylacris eggintoni*'s legs, antennae, mouth parts and body, which had never been seen by human eyes before.

Scientists had previously known that *Archimylacris eggintoni* had wings, which suggested the bug could fly. However, very few limbs of this

species - or other roach-like insects from this era - have been preserved in fossils, making it hard for scientists to glean insights into their way of life.

In the new study, the researchers' computer model reveals that *Archimylacris eggintoni* had sticky structures on its legs called euplantulae. The researchers believe the euplantulae enabled *Archimylacris eggintoni* to stick to smooth surfaces such as leaves as they climbed across them, which may have helped them to lay their eggs above the ground in safer locations away from predators.

In addition, the scientists also discovered that *Archimylacris eggintoni* had claws at the base of its legs, which helped it to climb rough surfaces like trees, so that it could perch above the forest floor for safety or find alternate sources of food higher up.

The 3D model also reveals how *Archimylacris eggintoni*'s legs could help it to run fast. The team noted that the legs were at a low angle to the body and fairly long, which they believe helped it to move quickly even when the terrain was difficult or uneven.

The scientists also reveal *Archimylacris eggintoni*'s mouthparts, called mandibles, which helped it to grind up its food. The team say the mandibles are similar in appearance to modern day cockroach mandibles, suggesting they ate similar food, munching on decaying leaf and insect matter as it scurried from place to place.

Mr Garwood adds: "We now think this ancient ancestor of the cockroach spent most of the day on the forest floor, living in and eating lots of rotting plant and insect matter, which was probably the bug equivalent of heaven. We think it could have used its speed to evade predators and its climbing abilities to scale trees and lay eggs on leaves, much in the same way that modern forest cockroaches do today."

In the future, the researchers will use their computer modelling technique to study other fossilised creatures from the Carboniferous period. They plan to learn more about spider-like creatures called the harvestmen and another species called Camptophyllia, which has yet to be classified by scientists.

More information: "X-ray micro-tomograph of Carboniferous stem-Dictyoptera: new insights into early insects" Biology Letters Journal, April 2010 issue.

Provided by Imperial College London