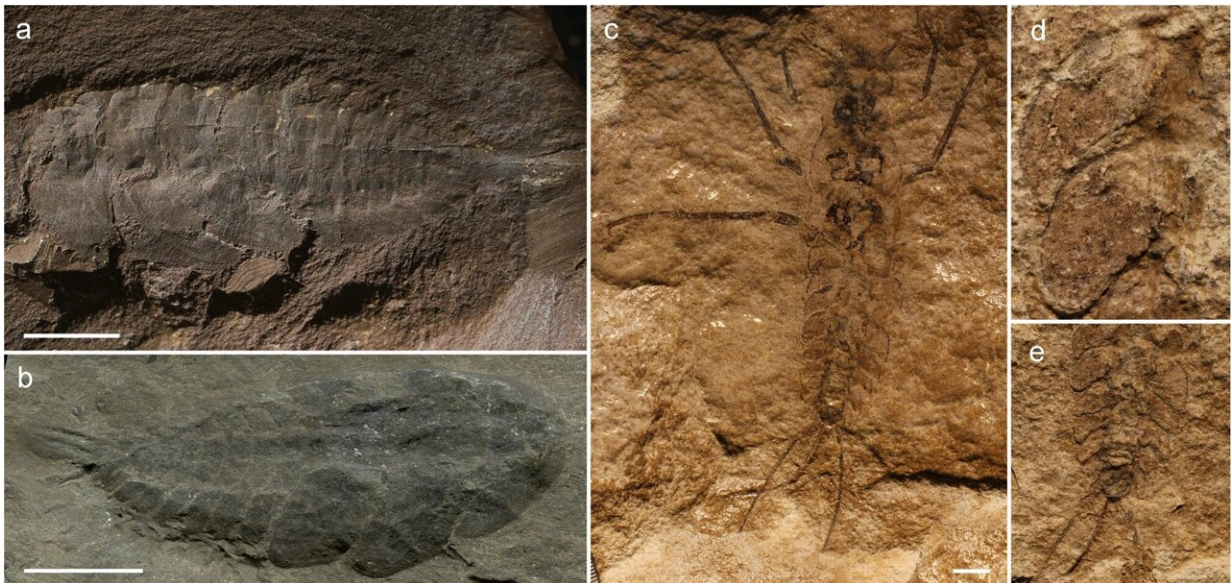


# New evidence that insect wings may have evolved from gills

January 4 2024



Habitus, thoracic and abdominal outgrowths of larvae of Palaeodictyoptera and Carbotriplurida. **a** *Rochdalia parkeri* (Palaeodictyoptera), habitus in dorsolateral view, No. MM L.11464 Manchester Museum coll., UK; **b** *Idoptilus* sp. (Palaeodictyoptera), habitus in dorsolateral view, GLAHM A.2680a Hunterian Museum, University of Glasgow, UK coll.; **c–e** *Carbotriplura kukalovae*, habitus in dorsal view, Museum of Czech Karst coll. Beroun, Czech Republic; **d** detail of thoracic lateral outgrowths, **e** detail of abdomen with lateral outgrowths. Scale bars are **a**, **b** = 5 mm; **c** = 10 mm. Credit: *Communications Biology* (2023). DOI: 10.1038/s42003-023-05568-6

How did insect wings originate? This is a question that represents an

unsolved mystery of insect evolution. Despite many years of research, it is still not entirely clear from which body structure insect wings actually evolved and what their original function was when they were not yet efficient enough to perform active flight.

Scientists from the Biology Centre of the Czech Academy of Sciences (BC CAS) were also involved in looking for answers to these questions in newly discovered prehistoric fossils of an ancient group of insects.

There are various hypotheses regarding the origin of [insect wings](#). To some extent, they depend on the fact whether the [common ancestor](#) of winged insects lived in an aquatic or terrestrial environment. While several studies connect the origin of wings with the gills of some representatives of aquatic insects, the support of the terrestrial origin of winged insects is currently more prevalent.

New evidence is provided by an international team of researchers with the participation of entomologists from the Biology Centre in a study just [published](#) in the journal *Communications Biology*.

Czech scientists, together with their German colleagues, found in a quarry in Lower Saxony new Paleozoic fossils of the larvae of an ancient group of insects named Palaeodictyoptera from the Carboniferous period (extinct at the end of the Paleozoic). With their body structure, these larvae resemble a hypothetical winged insect ancestor and thus provide new clues to resolving this evolutionary mystery.

In the fossils, scientists have discovered several adaptations for life in an aquatic environment, most notably several pairs of flattened projections on the sides of abdomen, that probably functioned as gills.

In the larvae, they also observed three pairs of future wings on the thorax, the detailed structure of which is very similar to the

aforementioned gill plates on the abdomen. It can, therefore, be assumed that these so-called wing pads also participated in the intake of oxygen from the aquatic environment.

"Although our fossils certainly do not represent the ancestor of winged insects—they are larvae, and the adults of this group already had fully functional wings, it is still a relatively ancient group of insects. Given the fact that the [larvae](#) of other ancient insect taxa such as mayflies and dragonflies are also aquatic, it supports the possibility that the [aquatic environment](#) played an important role in the very beginnings of the evolution of winged insects," suggests Pavel Sroka from the Institute of Entomology, BC CAS.

"The first forms of flattened projections on the thorax, which gave rise to later wings, could thus have arisen as organs for breathing, functionally similar to what we see with the wing pads on our fossils," says Pavel Sroka.

**More information:** Jakub Prokop et al, Thoracic and abdominal outgrowths in early pterygotes: a clue to the common ancestor of winged insects?, *Communications Biology* (2023). [DOI: 10.1038/s42003-023-05568-6](#)

Provided by Biology Centre of the Czech Academy of Sciences

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