NOTA DE PRENSA

Aquatic animals preserved in amber have fossilized underwater

- **The scientific team, led by Viktor Baranov from the Doñana Biological Station – CSIC, has described three amber pieces containing fossils of aquatic insect larvae.**

- **Amber is formed by tree resin. Therefore, a preservation of animals living in water in amber may appear surprising. After a detailed study, the researchers conclude that these larvae must have been undoubtedly captured by the resin underwater.**

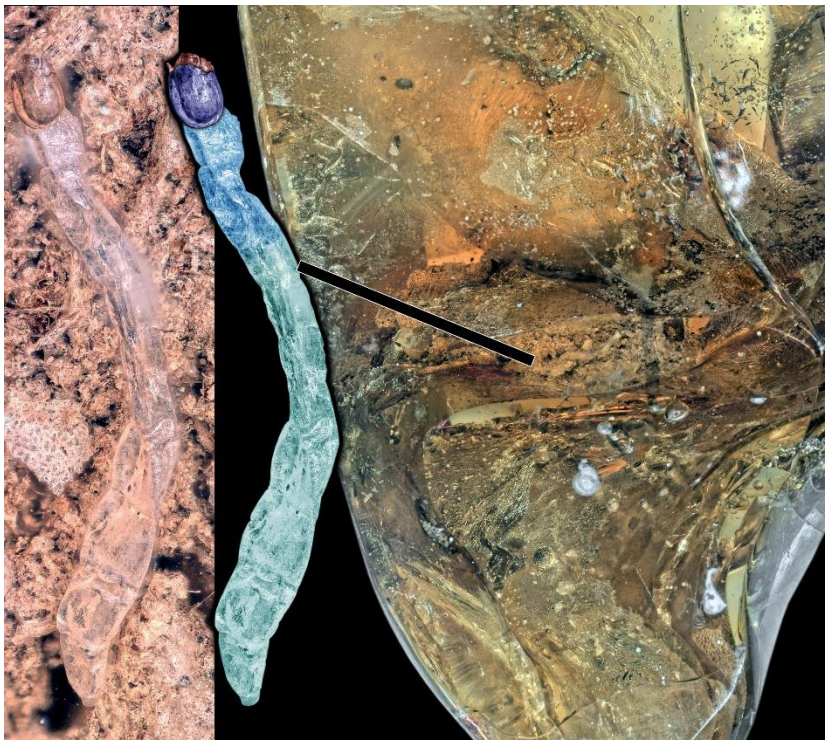
Detail of a larva of caddisfly preserved in one of the amber pieces analysed in the study.

Sevilla, 2nd October 2023. Amber is formed from the tree resin in terrestrial habitats. However, in recent decades, animals living in water were increasingly found preserved in amber more often than expected. How is this possible? Did these animals somehow come out of the water and were trapped by the resin at that time? Did the water body in which they lived in desiccate? Or were they entraped underwater? This is what a scientific team led by Viktor Baranov, a scientist from the Spanish National Research Council (CSIC) at the Doñana Biological Station, wanted to find out. The results of the study were recently published in the scientific journal *Palaeontologia Electronica*.

To find the answers to these questions, the researchers analysed three unique amber pieces. The most spectacular one, found at the Yantarny mine in Kaliningrad (Russia), included several fossil aquatic larvae preserved together. Each of the other two pieces, also found in the Baltic region, included a single larva of a caddisfly (*Trichoptera*), a group including species closely related to moths and butterflies that live as larvae in water. They used optical imaging and, especially, µCT microtomography, a technique used to scan specimens and create 3D images, akin to medical CT-tomography, to facilitate the identification of fossilized specimens. With this technology, they were essentially able to digitally dissect the animals, which were otherwise invisible due to amber opacity or being hidden by larval cases.

Caddisfly larva morphotype.

“Inside the largest amber piece, two of the caddisflies were still bearing their cases. However, if the animals had escaped the water bodies and become entrapped *ex situ*, these cases should not have been present”, explained Viktor Baranov. Caddisflies start their life as a larvae living in water within protective cases, they make for themselves. In many other caddisflies preserved in amber, these cases are not present, so it had been suggested that they might have reacted to the desiccating of the water body they lived in, leaving their cases behind and coming out, where they would have been entrapped. But the fossils analysed still had their cases, so this hypothesis cannot explain all the caddisflies larvae present in amber. In addition, there are some cases where the larvae of these species abandon their cases underwater for other reasons. “Moreover, one of the larvae still bearing their cases was preserved with additional caddisfly larvae, as well as a larva of a seemingly aquatic non-biting midge. These findings further support the *in situ* preservation of aquatic animals in amber”, adds the researcher.



Detail of a non-biting midge larva.

In fact, studies carried out in the wet forest in Florida by professor Alexander Schmidt (not involved in the present study), showed how submerged parts of tree trunks also secrete large flows of resin, which stay viscous within the water for days and even weeks. For this reason, it is possible that tree resin fell directly into the water where it trapped the study specimens.

This study provides the first indications that non-biting midges (Chironomidae) can possibly have commensal relations with caddisflies, meaning that this fly larvae are living on the caddisfly cases for protection and getting morsels of food from the larger host.

These results are new steps towards a better understanding of the evolutionary history of caddisflies, and their relations with other aquatic animals, such as Chironomomidae. This understanding gained from the fossils is crucial (quite ironically) for the conservation measures aimed at preserving these interactions. This work also opens new avenues for studying plant resin behaviour in water.

Reference:

Unique fossils of caddisfly larvae from Baltic amber and in situ amber formation in aquatic ecosystems

Viktor Baranov, Jörg Hammel, Carsten Gröhn, and Joachim T. Haug

Paleontological Society: https://doi.org/10.26879/1278

Contact:

outreach@ebd.csic.es