

Genome reconstruction reveals previously uncharacterized parasite in fish worldwide

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Red lipped Blenny, a tropical marine species in which the researchers discovered the ichthyocolids. Photo: François Libert

Using genome reconstruction, scientists unveiled a once "invisible" fish parasite present in many marine fish world-wide that belongs to the apicomplexans, one of the most important groups of parasites at a clinical level. However, it had gone unnoticed in previous studies. The parasite is geographically and taxonomically widespread in fish species

around the planet, with implications for commercial fishing and oceanic food webs.

An international research study led by scientists at the Rosenstiel School of Marine, Atmospheric, and Earth Science of the University of Miami, the Institute of Evolutionary Biology (IBE), a joint center of the Spanish National Research Council (CSIC) and the Pompeu Fabra University (UPF) has characterized a new parasite in the red-lipped blenny, a fish that lives in tropical reefs. The international team has also revealed its presence in fish around the world.

Published by [*Current Biology*](#), the research used an innovative method to reconstruct part of the parasite's genome from sequencing data obtained from its host, and be able to detect its presence in other fish using genetic "barcodes" (DNA barcoding).

An 'invisible' parasite has been unveiled

Despite its presence in fish worldwide, the parasite had not been properly characterized until now. The genomic data of the study reveals that this parasite belongs to a group of organisms previously uncharacterized and have been named ichthyocolids, from the Latin "fish dweller."

"Although it had been previously identified by microscopy, we had not been able to separate the genomic signal from the host fish and the parasite until now. For the first time, we have been able to identify them through their DNA, and place them within the well-known group of apicomplexan parasites," said Javier del Campo, lead of the study and principal investigator at IBE in the Microbial Ecology and Evolution group and at the Rosenstiel School in Miami.



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Red lipped Blenny, a tropical marine species in which the researchers discovered the ichthyocolids. Credit: Philippe Guillaume.

The parasite is present in fish around the world

Beyond allowing the description of an entirely new group of apicomplexans, the genome reconstruction has allowed researchers to identify a series of genes that can be used to detect the presence of this organism in other genomic or microbiome samples as if it was a "barcode."

"Once we found ichthyocolids in the red-lipped blenny, a tropical fish, we wondered if it would also be part of the microbiota of other fish," says Anthony Bonacolta, a Ph.D. candidate in [marine biology](#) and ecology at the Rosenstiel School and first author of the study.

The team compared the DNA of these apicomplexans with public databases of the microbiomes of hundreds of species of freshwater and marine fish. The results showed that these parasites appear associated with the majority of marine [fish species](#) analyzed and are present in all oceans. It would therefore be one of the most widespread parasites among marine fish, with potential implications for commercial fishing and oceanic food webs.

"Future studies could help us better understand the impact of parasites as prevalent as ichthyocolids in marine ecosystems," del Campo says.

A new member of apicomplexan parasites

The Ichthyocolids belong to Apicomplexa, a large group of parasites including the ones that cause malaria and toxoplasmosis. However, these

parasites do not pose a direct risk to human health, but are important to study for the health of the oceanic ecosystems and for more context on the evolution of those human parasites.

The discovery of the ichthyocolids adds more context to this evolution. For the first time, they are placed as a sister group to well-known coral inhabitants, the corallicolids, also recently described as apicomplexans.

"Studying ichthyocollids not only reveals more about the evolution of major [parasites](#), but also the other basic traits of apicomplexans which may be important in a clinical sense. They may use similar infection mechanisms (as they are also a blood parasite) or have other similar biology which can enlighten our understanding of other apicomplexans," said Bonacolta.

More information: Anthony M. Bonacolta et al, A new and widespread group of fish apicomplexan parasites, *Current Biology* (2024). [DOI: 10.1016/j.cub.2024.04.084](https://doi.org/10.1016/j.cub.2024.04.084)

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