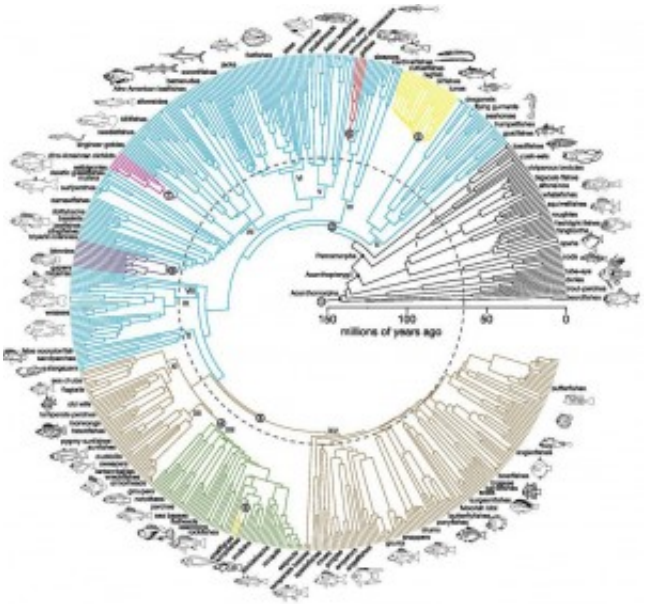
A new species of Cretaceous acanthomorph from Canada

February 15 2016, by Sarah Gibson



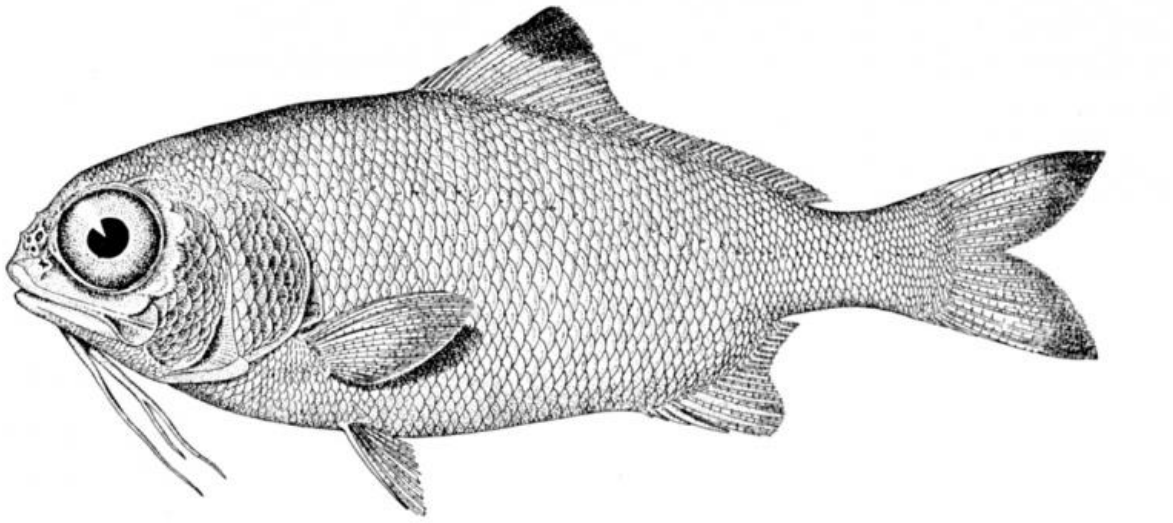
Figuring out fish relationships is no small feat. Credit: Near et al. 2013

For being one of the largest groups of vertebrates, and having one of the richer fossil records among organisms, the relationships of fishes are still hotly debated. Humongous datasets are being compiled that involve molecular (both nuclear and mitochondrial) data, compared and contrasted with thorough morphological analyses. (I'm not going to get into all of it here, simply because of its sheer complexity.)

What I am going to get into, however, is the fossil record of one subset

of fishes, the acanthomorphs. Acanthomorphs are teleost fishes that possess true fin spines: a set of prominent, sharp, unsegmented spines in the front portion of their dorsal and/or anal fins, followed by a portion of pliable, segmented, "softer" looking rays. This is not a small subset of living fishes, as almost half of all living fishes (so, around 14,000 living species) is an acanthomorph. These spines can be retracted to sit flush along the body, helping the fish swim faster by reducing drag, or they can be extended completely out to act as a defense mechanism, in case you are a predator looking for a quick bite.

Near the base of the Acanthomorpha phylogenetic tree is a small group of fishes, Polymixiiformes, comprised of a single living genus, Polymixia, more commonly known as the beardfish. This innocuous fish seems harmless, but according to many ichthyologists, Polymixia is just one key to understanding acanthomorph relationships. Unraveling the evolutionary relationships is difficult with a single living genus, but thankfully, polymixiiforms have a fossil record dating back to the Cretaceous, containing an increasing number of taxa as new discoveries are being made, particularly in deposits in North America, where fewer acanthomorph fossils are known compared to the more-studied Eastern Tethys Ocean deposits in Europe.



The stout beardfish, Polymixia nobilis. Credit: Wikipedia

One such new species was recently described by Alison M. Murray in the Open Access journal Vertebrate Anatomy Morphology Paleontology (VAMP). The paper, which was published this past week, describes in great morphological detail, a new mid-Cretaceous acanthomorph, named Cumbaaichthys oxyrhyncus, from Lac de Bois, Northwest Territories, Canada.

As Murray describes in the paper, getting to the localities is no easy task. The site is in a remote area of the NWT, and only two fossil-collecting trips have been made since the discovery of the site in 1968: 1969 and 2010.

"There were only four of us in the 2010 field party, Steve Cumbaa and Rick Day from the Canadian Museum of Nature, and Rob Holmes and me from University of Alberta," Murray told me via email. "We were

dropped off by float plane on the lake close to shore, and spent the next three weeks collecting. Our only link with civilization was the satellite phone…and an airplane that passed far overhead several times a week, maybe on its way to Alaska or Asia. We also had a visit from a pilot with his helicopter who took us around the area to search for other fossil sites."

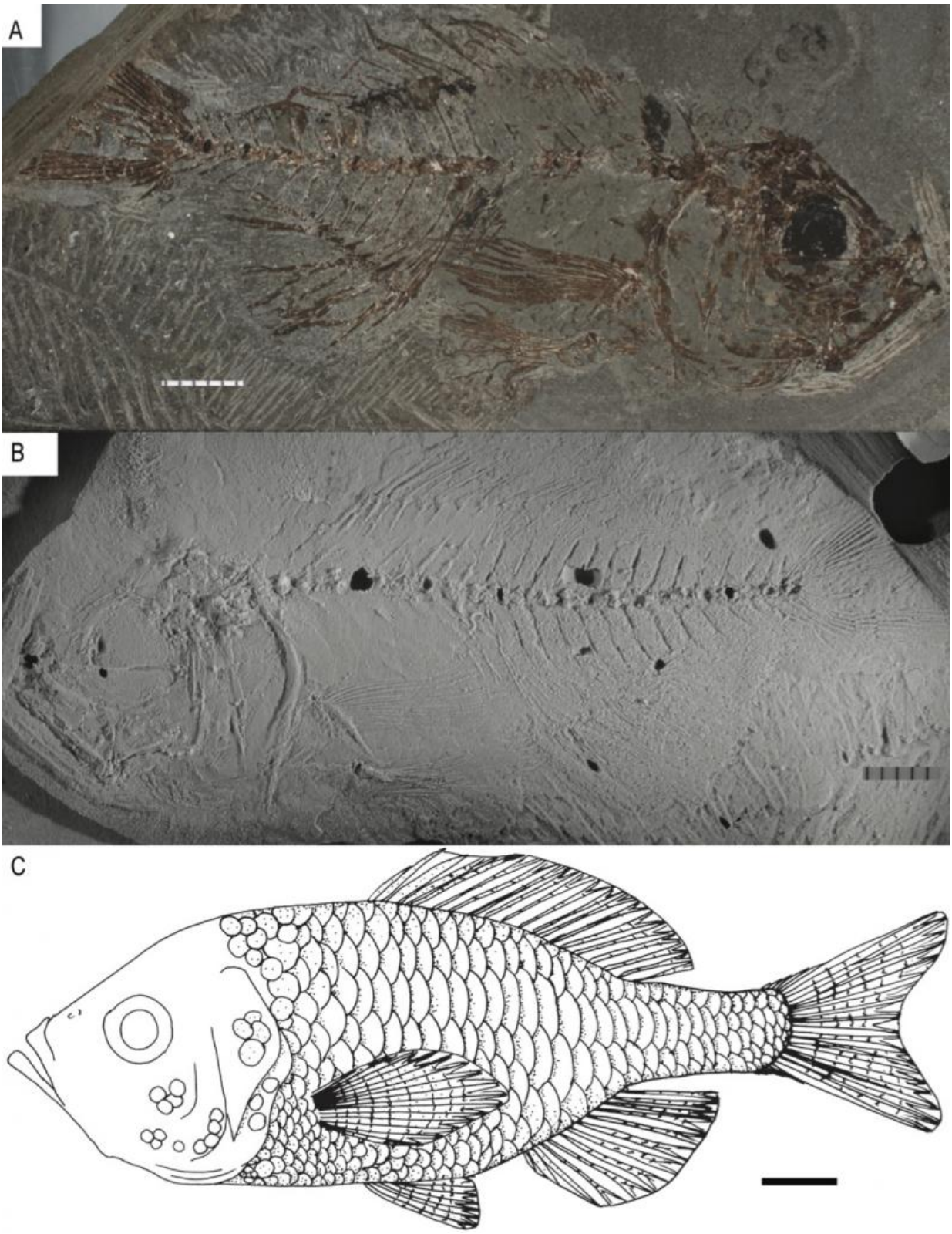
Rob Holmes “fishing” along the lakefront…for fossils. Credit: Alison Murray

"Most of the best fossils, including Cumbaaichthys, came from the little

quarry on the lake shore. While Rick and Steve measured the section and prospected, Rob and I sat at the waters' edge and lifted the slate up in chunks, looking for fossils.

Cumbaaicthys is beautifully preserved and illustrated in Murray (2015), instantly noticeable by its large head in relation to its body. It's actually a rather small fish, only around 55 mm in length from the tip of the snout to the base of the tail fin.

With one single living genus, Polymixiiformes and thus Polymixiidae, are monotypic. However, when taking the fossils into account, Polymixiiformes actually contains several families in addition to Polymixiidae, including the families Dalmatichthyidae, Dinopterygidae, Pycnosteroididae, and Boreiohydriidae. Each of these families themselves is monotypic, with the exception of Polymixiidae, which includes the extant genus and several extinct genera. Where does Cumbaaichthys fit into all of these different groups? It's a bit perplexing for Murray, as several characters could place Cumbaaichthys in separate families, with the greatest similarity to Polymixiidae. Murray concludes that a more comprehensive analysis of the many Cretaceous polymixiiforms, and other acanthomorphs, is needed before she is confident in placing the new taxon, and thus leaves it incertae sedis.



Cumbaaichthys oxyrhynchus, UALVP 56113. A, Photograph of the complete

specimen under polarized light; B, a silicone peel of the specimen coated with ammonium chloride; C, reconstruction of the whole fish including squamation; the true shape of the tail cannot be determined. Scale bar equals 5 mm. Credit: Murray 2015

"Polymixiiforms have so many fossil members and very few living members, as well as a very long history, which makes it difficult to resolve their evolutionary history," Murray said. "There are currently a number of people working (in different teams and from different angles) on the problem, so what needs to be done [to help resolve acanthomorph evolutionary relationships] is exactly what is being done!

"We need to get more data, describe more fossils, find better fossils, and get DNA data and add it all together. I think this is a problem that may well be resolved by these researchers in the next few years."

This study is a clear example of why paleontological work is relevant to other biological sciences. Polymixiiformes is just a single example of a group that, with just living forms taken into consideration, is throwing a wrench into many a molecular or morphological analysis, and leaves many ichthyologists shrugging their shoulders. This is a group where the history is almost purely in the past, with clearly a greater abundance and diversity leading all the way back into the Cretaceous Period.

Fossils like this are also key in understanding the age of modern taxa, and thus crucial as fossil calibration points. Likewise, they help us fill in the blanks in terms of biogeographic history.

"Cumbaaichthys, and the other polymixiiform from the same site, Boreiohydrias dayi, are very far north and show that acanthomorph fishes were spread throughout the Western Interior Seaway, as well as

being in the Tethys, pretty much from the time they are first showing up in the fossil record," Murray told me. "I think we have many more fossils to find!"

More information: Mid-Cretaceous acanthomorph fishes with the description of a new species from the Turonian of Lac des Bois, Northwest Territories, Canada. ejournals.library.ualberta.ca/ … cle/view/25439/20021

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