Abstractions

FIRST AUTHORS

There's an evolutionary gap between two kinds of primitive bony fish — it separates the sarcopterygian (lobe-finned fishes) from the actinopterygian (ray-finned fishes). Many early sarcopterygian fishes were covered in a hard tissue known as cosmine, which is unknown in any living vertebrates. This tissue has a structure similar to the mammalian tooth (with its pulp cavity, dentine and hard enamel) and the layers are shot through with a network of small canals. Early actinopterygians lack cosmine.

Now, a group of palaeontologists has found fossils that bridge the gap between the two types of fish and explain how they might have evolved. They also illustrate how the enamel structure was formed and eventually progressed to include pore channels. Min Zhu of the Chinese Academy of Sciences and Xiaobo Yu of Kean University, New Jersey, explain what they found from their specimens.

Where and how did you find the fossils?

We found this fish, dubbed *Meemannia eos*, during 2001 and 2002 field excursions in east Yunnan, in southwestern China. During the expeditions, we had to find the correct rock layers, and use hammers, picks and chisels to split them. Usually we found a mixture of different fossil fish parts. Sometimes, a very bizarre fish immediately caught our attention; at other times we realized the novelty and significance of a find only when preparing it for the lab.

Your paper mentions controversies about the biology of cosmine. What are they?

They include questions about how cosmine arose evolutionarily, and what occupied the cavities of the pore–canal network.

How does your paper help resolve some of these questions?

Our paper shows how the pore network could have been constructed. *Meemannia*'s cosmine suggests that the depth of a pore cavity grows with the deposition of each successive layer of enamel.

What's next?

We expect to find out more about the morphology of *Meemannia* using further fossils from the site. Its unusual combination of primitive characters suggests that it is close to the common ancestor of the lobe- and ray-finned fishes. We predict that *Meemannia* will have several other features that reduce the gap between early sarcopterygians and actinopterygians.

Together with materials from ongoing work by palaeontologists in other parts of the world, we are confident that a more complete understanding of the evolution of these major vertebrate groups will emerge. The different pieces of this enticing puzzle are starting to make sense. ■

MAKING THE PAPER

Anna Qvarnström

Is the female flycatcher a material girl?

A small bird about the size of a sparrow, the collared flycatcher is something of a celebrity among ecologists and evolutionary biologists. Every autumn, the bird leaves the Baltic island of Gotland, east of the Swedish mainland, to travel to Africa. It returns to its nordic home in May to mate and breed, making it possible for researchers to track the bird's life history from generation to generation.

"The special thing about these birds is that they migrate such a long way and then come back to almost the same spot," says Anna Qvarnström of Uppsala University, who has studied the birds during their mating and nesting season every year for the past ten. "They are very nice to study too," she says. "Some birds get nervous if you try to touch them, but you can handle flycatchers quite easily."

Qvarnström's lab has been using the flycatcher (*Ficedula albicollis*) as a model for studies of sexual selection. Sexual selection drives the evolution of certain traits that will help an animal (usually a male) to attract a mate. Often the traits are very elaborate and conspicuous — take the peacock's tail. But how do mate preferences evolve? In other words, why would an animal (usually a female) spend time and effort on deciding who to mate? One theory suggests that females are looking to get 'good genes' out of the mating game.

Qvarnström set out to test the underlying assumptions of this theory using flycatchers in the wild. Male flycatchers have a white patch on their foreheads, the size of which renders them either more or less desirable to the opposite sex. If females like to mate with males with a larger patch and this mating provides good genes to offspring, then patch size and an affinity for large-patched males should evolve hand in hand.

But the study, published on page 84 of this issue, finds that this is not the case.

Taking advantage of data collected during the past 24 years by her lab and others at the university, Qvarnström and her colleagues examined the inheritance of patch size, female mate preference and fitness in 8,500 flycatchers. "If you look at all these aspects together, there is no correlation between the inheritance of mate preference and ornament," she says.

The challenging part of this study was getting enough data for the pedigrees and good estimates of fitness, adds Qvarnström. "Many birds die during the migration so we needed data from many years."

So what is driving the females' love of a large white patch? If the flycatcher female is not choosing her mate for his good genes, she may have other motives. "Females may be discriminating among potential mates in order to obtain suitable resources, such as a nice nest-site, rather than suitable genes," points out Qvarnström.

She plans to continue her yearly visits to the birds as the lab explores different aspects of sexual selection. "It is nice to mark them as chicks," she says, "then see them again the next year as adults and know that they have been all the way to Africa." ■

QUANTIFIED **REVIEWS**

A numerical perspective on *Nature* authors.

Nature publishes two kinds of review article: Review and Progress. Both survey recent developments in a topical area of scientific research, rather than providing comprehensive literature appraisals. Progress articles focus particularly on papers of outstanding interest that are setting new standards.

Nature also commissions themed collections of reviews and related material; these are published as Insights several times a year (see www.nature.com/nature/supplements/insights). All such articles are peer-reviewed.

On page 39, Elizabeth Weatherhead and Signe Bech Andersen present a Review article that assesses ozone trends. They ask whether the changes seen indicate recovery of the ozone layer since ratification in the late 1980s of the Montreal agreement to cut our use of ozone-depleting chemicals.

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49 Insights have been published since the programme launched in 2000.

78 unsolicited review-type articles have been submitted to *Nature* this year (<2% of all submissions).

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