Researchers find bone resorption and body reorganization result in transfer of toxic metals in anguillid eels

May 14 2019, by Bob Yirka

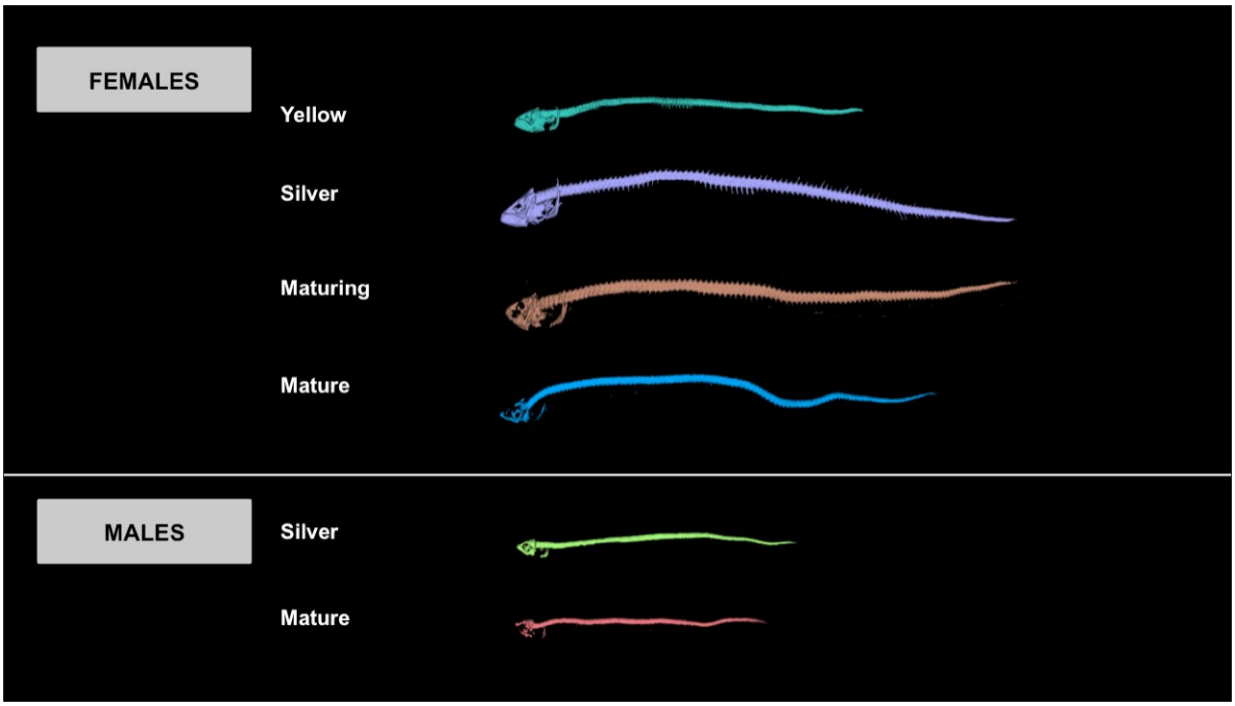
An underwater picture of a swimming, yellow-stage European eel. Credit: Marko Freese

A team of researchers from several institutions in Germany and one in

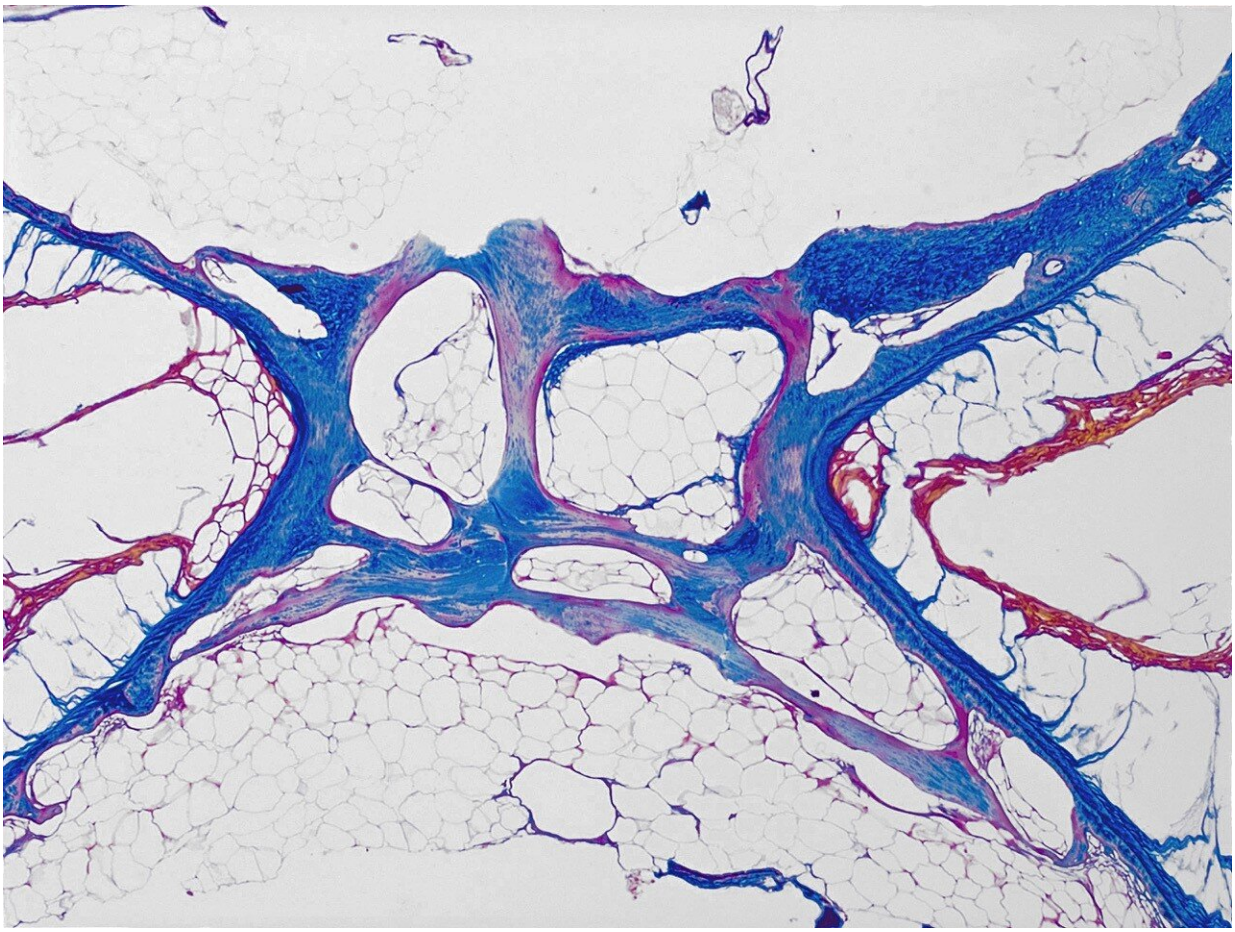
Belgium has found that as female anguillid eels undergo body reorganization prior to spawning, they transfer toxic metals to their ovaries. In their paper published in the *Proceedings of the National Academy of Sciences*, the group describes their study of the eels and what they found.

Prior research has shown that anguillid eels (Anguilla anguilla) are diminishing in numbers worldwide—the European species has been rated as critically endangered. In this new effort, the researchers sought to learn more about the eels to discover the underlying reasons for their declining populations. To that end, they captured several specimens and studied them in the lab.

European anguillid eels live their early years in inland European coastal waterways and then make a 6000-mile journey across the ocean to spawn in the Sargasso Sea in the western Atlantic Ocean. But before they do so, they undergo a type of body reorganization called silvering. They change in color from yellow to silver, their eyes grow larger and their fins longer. And when they embark on their once-in-a-lifetime ocean swim, they stop eating. To better understand what happens to the eels as they swim such great distances, the researchers simulated the trip in the lab.

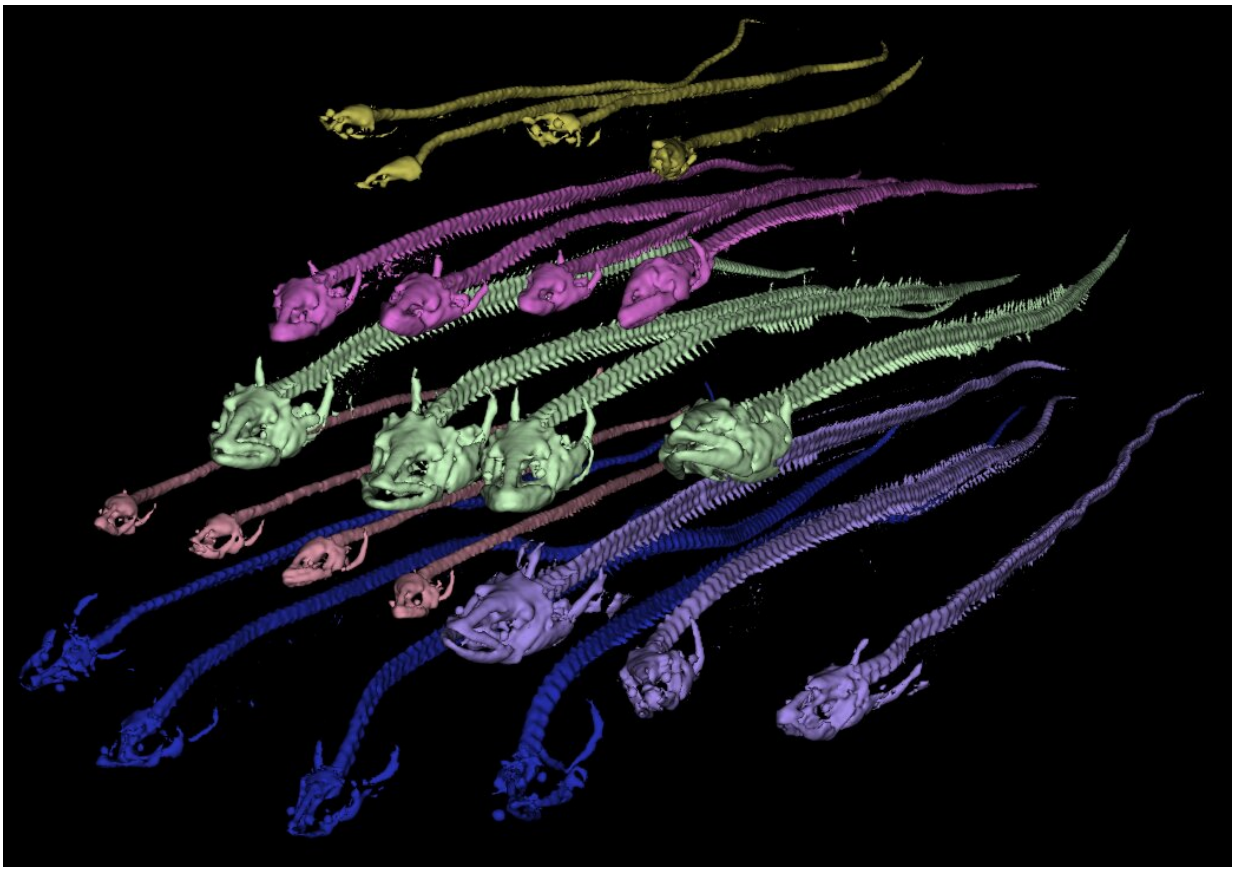


A side view on computed tomography scans of female and male eels in different maturation stages displaying successive loss of bone with progressing maturation Credit: Larissa Yokota Rizzo and Marko Freese

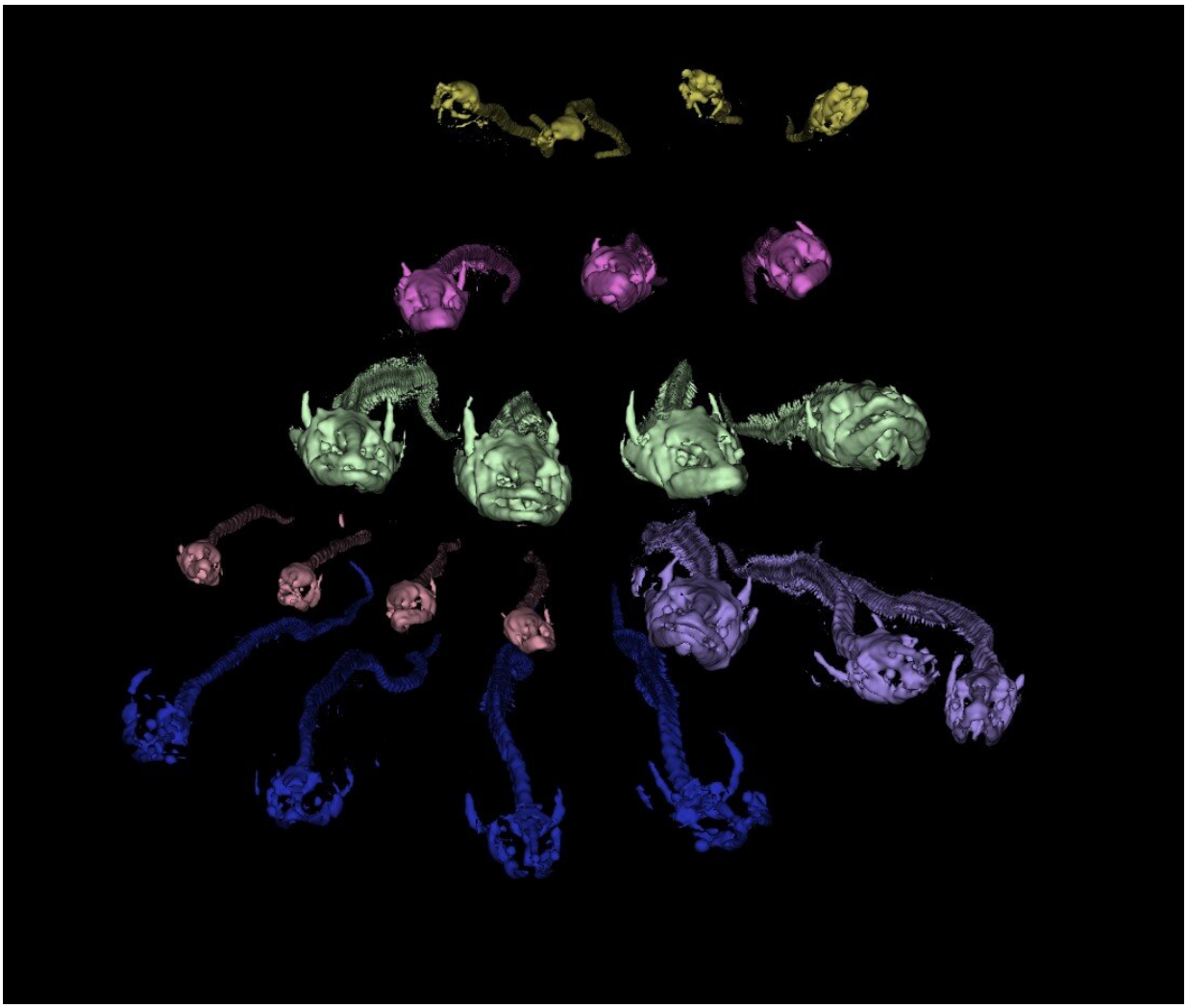


A histological cut of an eel vertebrae showing microstructural changes in bone tissue as a result of artificial maturation Credit: Paul Eckhard Witten

A closeup of the head and the enlarged eye of an artificially matured European silver eel Credit: Marko Freese



Computed tomography scans of female and male eels in differently coloured maturation stages displaying successive loss of bone with progressing maturation. Credit: Larissa Yokota Rizzo and Marko Freese



A frontal view on computed tomography scans of female and male eels in different maturation stages displaying successive loss of bone with progressing maturation Credit: Larissa Yokota Rizzo and Marko Freese

The researchers found that during different stages of their journey, the eels lost body mass but also built up their gonads. But perhaps more importantly, they also slowly broke down their own skeletons, which provided them with the minerals they need to survive such a long journey. They also found that the females suffered more bone loss than

the males, likely because they needed to provide their eggs with necessary stores. Interestingly, the researchers also found that the eels transferred several metals (mercury, copper, cadmium and manganese) to their ovaries along with the minerals.

The researchers note that the introduction of such metals into the ovaries could be preventing at least some of the eels from reproducing—perhaps part of the reason for the population decline. They note that prior research has shown that such metals generate toxic free radicals in the body, which could also be driving other health problems for the larvae that hatch and make their way back to European waterways.

More information: Marko Freese et al. Bone resorption and body reorganization during maturation induce maternal transfer of toxic metals in anguillid eels, *Proceedings of the National Academy of Sciences* (2019). DOI: 10.1073/pnas.1817738116