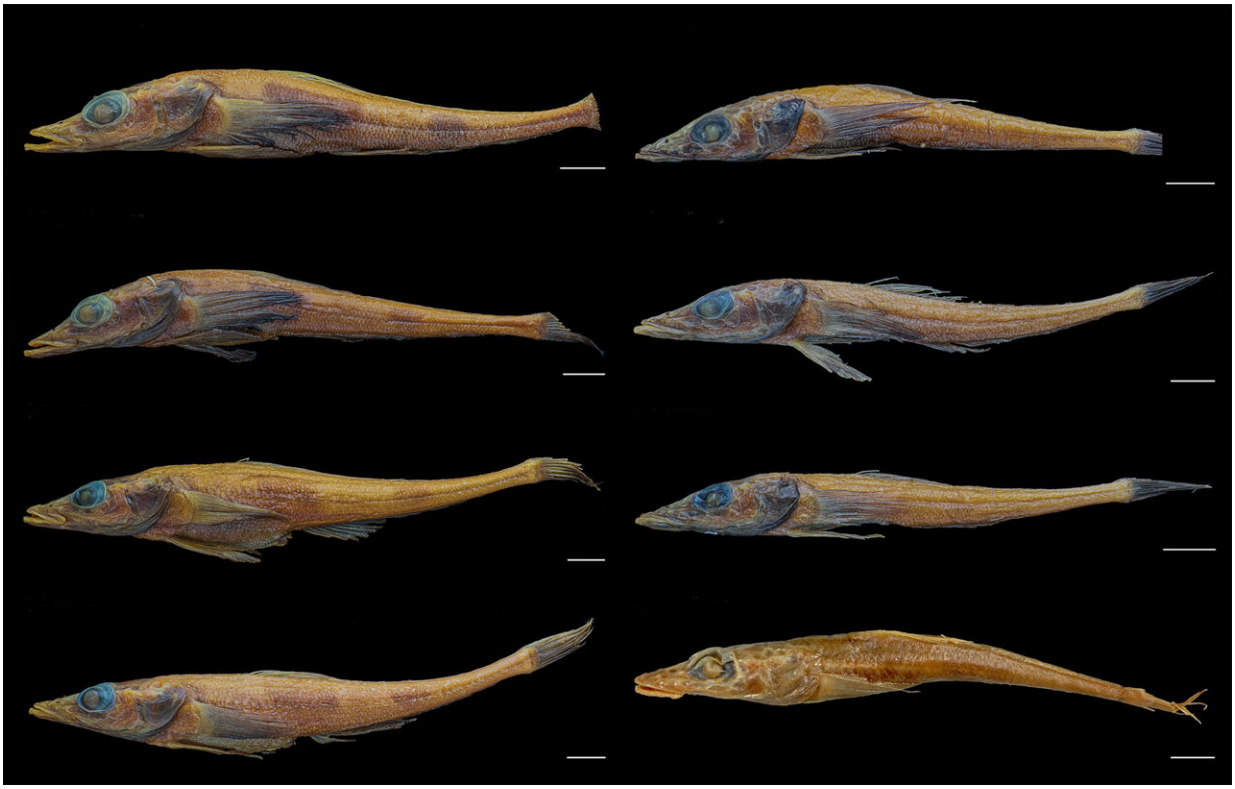
New species of Antarctic dragonfish highlights its threatened ecosystem

August 31 2024



Adult samples of *Akarotaxis gouldae* (left) compared to adult samples of *Akarotaxis nudiceps* (right) show subtle yet distinct morphological differences, including the presence of two bands on the bodies of *Akarotaxis gouldae* as well as a shorter snouts and jaws. Credit: Andrew Corso

A new species of Antarctic dragonfish, *Akarotaxis gouldae* or Banded

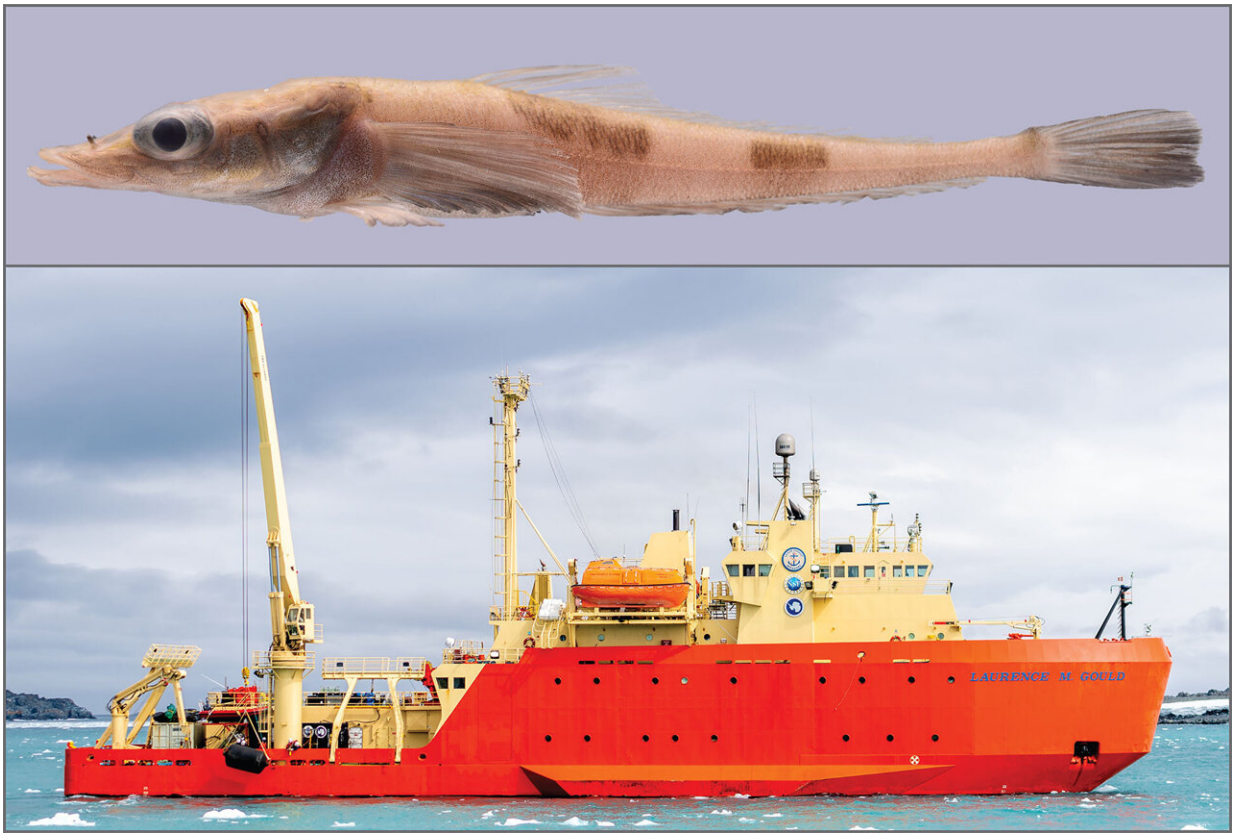
Dragonfish, has been discovered in waters off the western Antarctic Peninsula by researchers at William & Mary's Virginia Institute of Marine Science (VIMS). The species, named in honor of the recently decommissioned Antarctic research and supply vessel (ARSV) Laurence M. Gould and its crew, exemplifies both the unknown biodiversity and fragile state of the Antarctic ecosystem.

Described in the journal *Zootaxa*, *Akarotaxis gouldae* was initially identified through genetic analysis. Larval specimens collected off the coast of Antarctica while trawling for zooplankton were originally thought to be *Akarotaxis nudiceps*, a closely related dragonfish. However, after comparing their DNA to *Akarotaxis nudiceps* specimens housed in collections at VIMS, Yale University and the Muséum national d'Histoire naturelle in Paris, France, significant variations in mitochondrial gene regions suggested the larval samples were a species unto themselves.

Lead author Andrew Corso conducted the research while earning his Ph.D. at W&M's Batten School of Coastal & Marine Sciences at VIMS under faculty advisors Eric Hilton and Deborah Steinberg. Using the DNA evidence as their guide, Corso and his colleagues requested the examination of adult *Akarotaxis gouldae* samples from numerous ichthyology collections around the world. Morphological differences became apparent between the two species once the adult samples were compared.

"There are two distinct bands on the sides of adult *Akarotaxis gouldae* that are not present on *Akarotaxis nudiceps,* so we were surprised that the species already existed in collections but had been previously overlooked," said Corso. "In the world of fish taxonomy, it's becoming common to distinguish species with genetics alone. Genetic testing is an extremely valuable tool, but our discovery highlights the importance of early life stage morphology and natural history collections like those at

VIMS and other institutions."



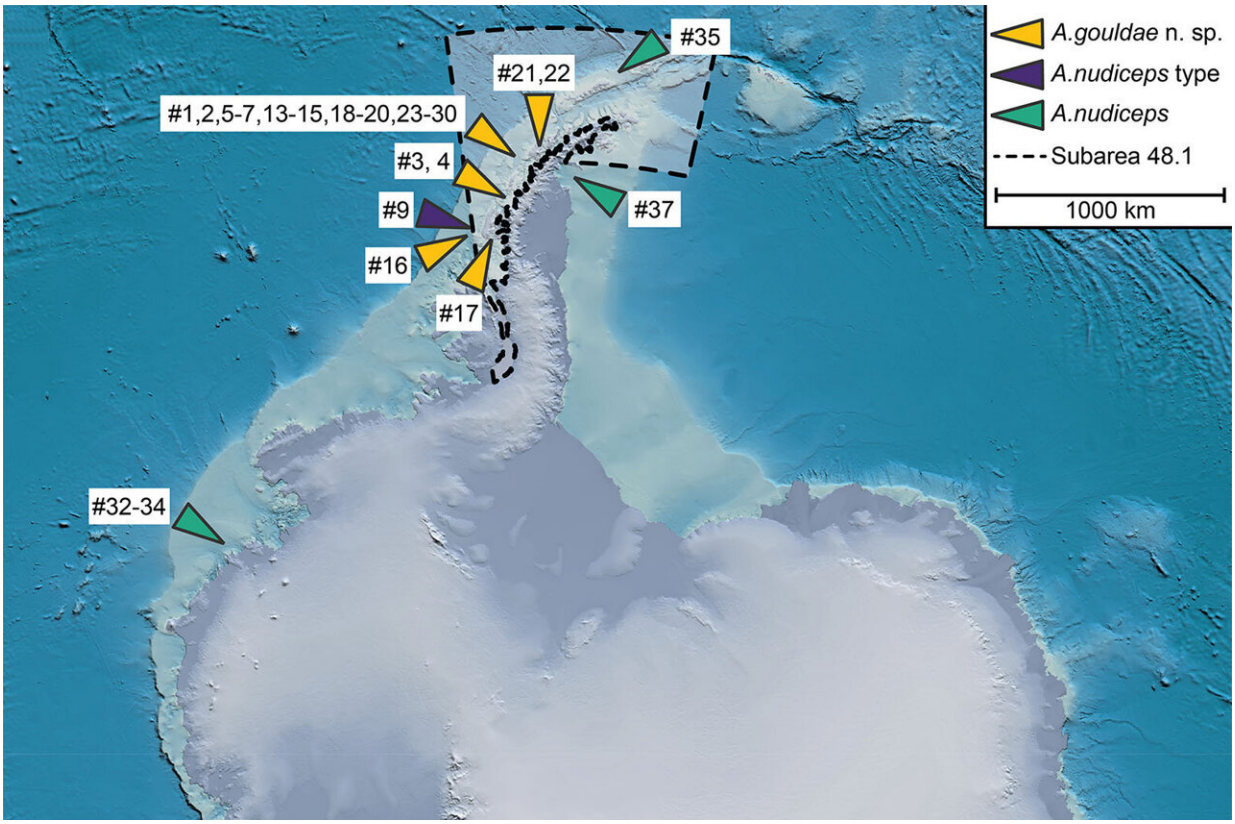
Akarotaxis gouldae, a newly discovered species of Antarctic dragonfish, was named in honor of the recently decomissioned Antarctic research supply vessel Laurence M. Gould. Credit: Andrew Corso

Genetic testing also revealed evolutionary clues. Using a process called time-calibrated phylogeny, Corso and co-author Thomas Desvignes from the Institute of Neuroscience at the University of Oregon estimated that *Akarotaxis gouldae* diverged as a separate species approximately 780,000 years ago. During this time, most of the Southern Ocean was covered in glaciers.

"This process essentially looks at the rate of genetic mutations as a guide for a species' evolutionary history," said Corso. "We hypothesize that a population of dragonfishes may have become isolated within deep trenches under glaciers, surviving on food pushed in by the moving ice. Once the glaciers retreated, this subpopulation had become distinct enough to be reproductively incompatible with *Akarotaxis nudiceps*."

Newly discovered, yet potentially threatened

Presently, Antarctic dragonfishes are poorly understood because they live in the remote Southern Ocean and spend most of their adult life in deep water. Prior research suggests these fishes engage in nest guarding in shallower coastal waters, and their offspring remain closer to the surface during their larval stage. Examination of female ovaries showed limited reproductive capacity. And while *Akarotaxis nudiceps* are distributed in waters surrounding the southern continent, analysis of larval sampling data suggests the distribution of *Akarotaxis gouldae* is limited to the waters around the western Antarctic Peninsula.



This map shows where larval samples of *Akarotaxis gouldae* (yellow arrows) were collected along the western Antarctic Peninsula. In comparison, *Akarotaxis gouldae* appear to have a much more limited range. Credit: Andrew Corso

Dragonfishes are important prey items for many species, including Antarctica's iconic penguins, whose populations have declined dramatically in recent decades. A 2022 study by Corso linked warming waters and reduced ice in the Southern Ocean to declines in Antarctic silverfish populations.

"*Akarotaxis gouldae* appear to have one of the smallest ranges of any fish endemic to the Southern Ocean," said Corso. "This limited range combined with their low reproductive capacity and the presence of early life stages in shallower waters suggest that this is a vulnerable species

that could be impacted by the krill fishery."

The waters surrounding the western Antarctic Peninsula are heavily targeted by the international Antarctic krill fishery, which is managed by the Conservation of Antarctic Marine Living Resources (CCAMLR). Commercial fishing vessels trawl for krill in waters between 0-250 meters deep, and CCAMLR emphasizes the difficulties in correctly identifying larval and juvenile finfish bycatch in these operations.

"Since we know so little about the biodiversity of this area, we feel caution should be taken in extracting resources until we have a better understanding of the impact to the greater ecosystem," said Corso.

The ARSV Laurence M. Gould was retired from NSF operations in April. It was one of two research supply vessels supporting U.S. Antarctic research. Cedit:

Kharis Shrage

Bringing attention to research while honoring a scientific legacy

The ARSV Laurence M. Gould was named after Laurence McKinnley Gould, the chief scientist on the first expedition to Antarctica. While most might assume *Akarotaxis gouldae* was also named in honor of the famous geologist, the researchers rather decided to honor the vessel for the significant scientific contributions of it and its crew.

The ARSV Laurence M. Gould supported the U.S. National Science Foundation's Antarctic Program from 1997 until the non-renewal of its charter in April of this year. It was one of two U.S. ARSVs dedicated to studying the Southern Ocean. While a replacement vessel is in the design phase, the U.S. National Science Foundation explained the Gould's charter was not renewed for economic reasons as well as shifting research priorities of the U.S. Antarctic Program.

The ARSV Laurence M. Gould and its crew provided significant support to Antarctic research carried out by VIMS and other institutions. Corso's advisor Steinberg conducts long-term studies focusing on the effects of climate change on zooplankton communities around the western Antarctic Peninsula and their impact on the marine food web. Such research relies on regular sampling intervals, which must be adjusted based on the availability of support vessels like the Gould.

"To me, the loss of the ARSV Laurence M. Gould marks a setback in the scientific study of the Antarctic region," said Corso. "Antarctica is warming faster than anywhere in the Southern Hemisphere, and there is untold biodiversity in the region that we're only beginning to understand.

By naming this fish after the ship, we hope to honor its scientific contributions while also bringing attention to the need for additional resources to study this unique ecosystem."

More information: ANDREW D. CORSO et al, Akarotaxis gouldae, a new species of Antarctic dragonfish (Notothenioidei: Bathydraconidae) from the western Antarctic Peninsula, *Zootaxa* (2024). DOI: 10.11646/zootaxa.5501.2.3

Provided by Virginia Institute of Marine Science

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