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DANTÉ FENOLIO'S LATEST BOOK

A LOOK INTO THE ABYSS

Life in the Dark is a fascinating and splendidly illustrated volume which - literally - sheds light on a mysterious universe where eerie creatures live in a world without light

A 1-meter long, bright blue caecilian *Caecilia* sp. from the Amazon basin, a fossorial amphibian with very long teeth. On the opening spread, a bunocephalid catfish - possibly *Xyliphius lepturus* - collected at a depth of 90 meters in the Amazon. Like many other species adapted to a life in the dark, it has no eyes.

The Common Fangtooth *Anoplogaster cornuta*, one of the deep ocean's most iconic fish due to its impressive (and very toothy) countenance.

TEXT AND PHOTOS
BY DANTÉ FENOLIO

Why was *Life in the Dark* produced and what is it? It is easier for me to start with what this book is not. This book is not and has never been about me. There is no ego involved – trust me, there are countless wildlife photographers out there with greater skills than I have. And I don't care about personal accolades, awards, or recognition. The emphasis of this book is and must be on wildlife and on the plight of our remaining wild places. This book has a single purpose: to kick-start a discussion about biodiversity everywhere. In homes, coffee shops, and around water coolers – across the world. Even if it is successful, I fear the conversation is 15 or 20 years too late…but better late than never. As Jane Goodall wisely said, *"There is still a lot left worth fighting for."* Let's also focus on the positive. For example, the Pope just made the environment a priority!

As a global society, we need to discuss the value of biodiversity (all living species on our planet). I'll argue our fate is irreversibly tied to biodiversity. I could say that biodiversity should be saved for its beauty alone – which I do believe. I could discuss the intricate connections between food webs around the world and explain how removing key elements of them will bring on devastating collapses and ripple effects that will ultimately affect all life on this planet, and that also is true. Regardless, there are more pragmatic reasons for saving biodiversity. Allow me to use amphibians as an example to explain why and how saving biodiversity is directly in our best interest. To do this, I need to explain a little bit about amphibians.

As a consequence of the incredible way in which they can breath, all amphibians share the ability to produce antimicrobial toxins, the sum of which represent a remarkable storehouse of compounds that comprise a pharmaceutical treasure chest for medical biochemists to harvest. While many species do have lungs, amphibians can also breath through their skin, which is moist and permeable. Air and water can pass through it freely, without the effort we expend in breathing—as long as they keep their skin moist. Dry skin ultimately leads to death in amphibians. Their moist, permeable skin was crucial in evolution, allowing them to leave a life in water to exploit recourses on the land. However, every advantage carries with it a disadvantage: skin that is always wet is a veritable feast for bacteria and fungi. The evolutionary defense in amphibians is present in every living species' skin: microscopic granular glands that secrete

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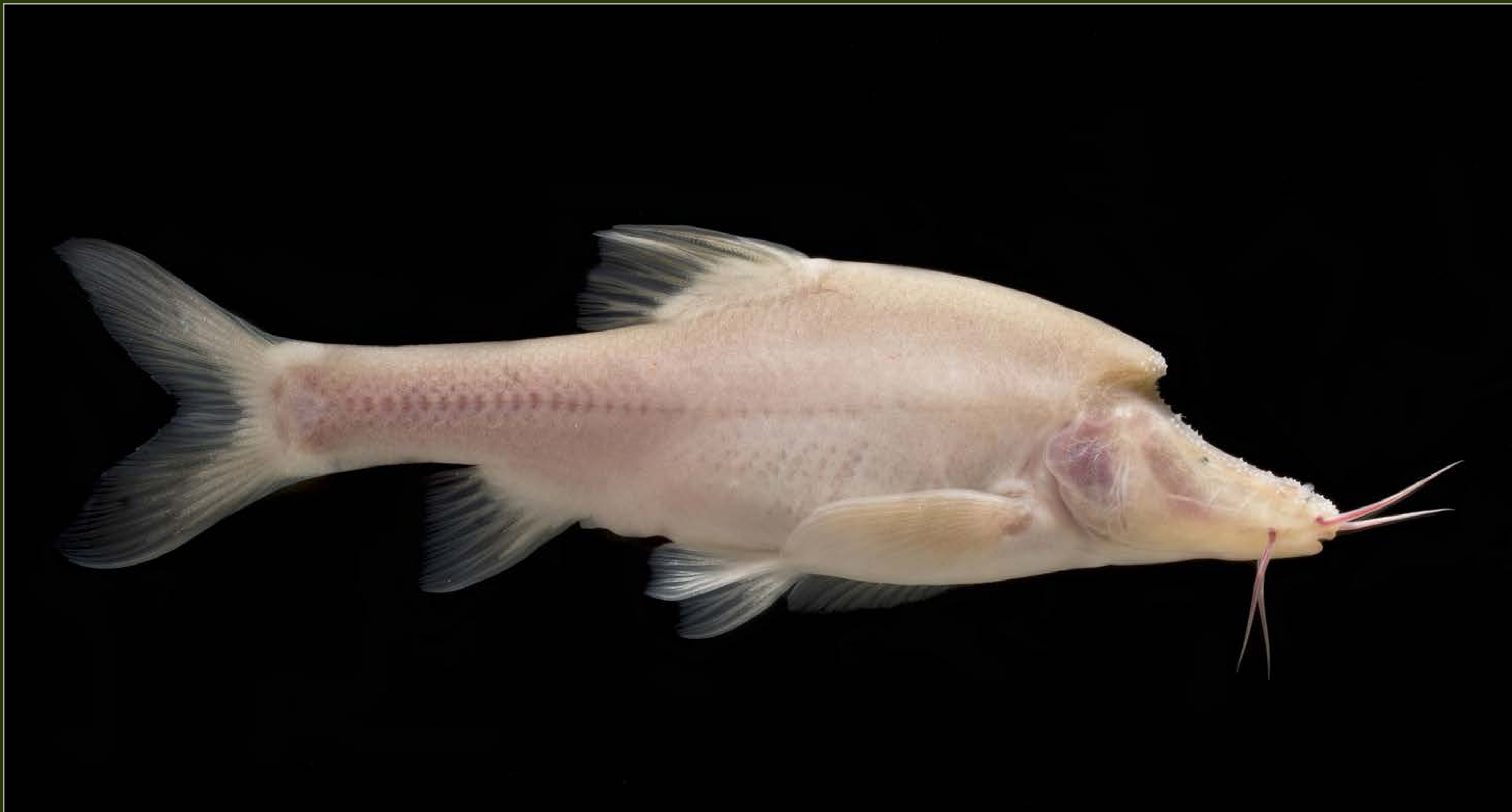
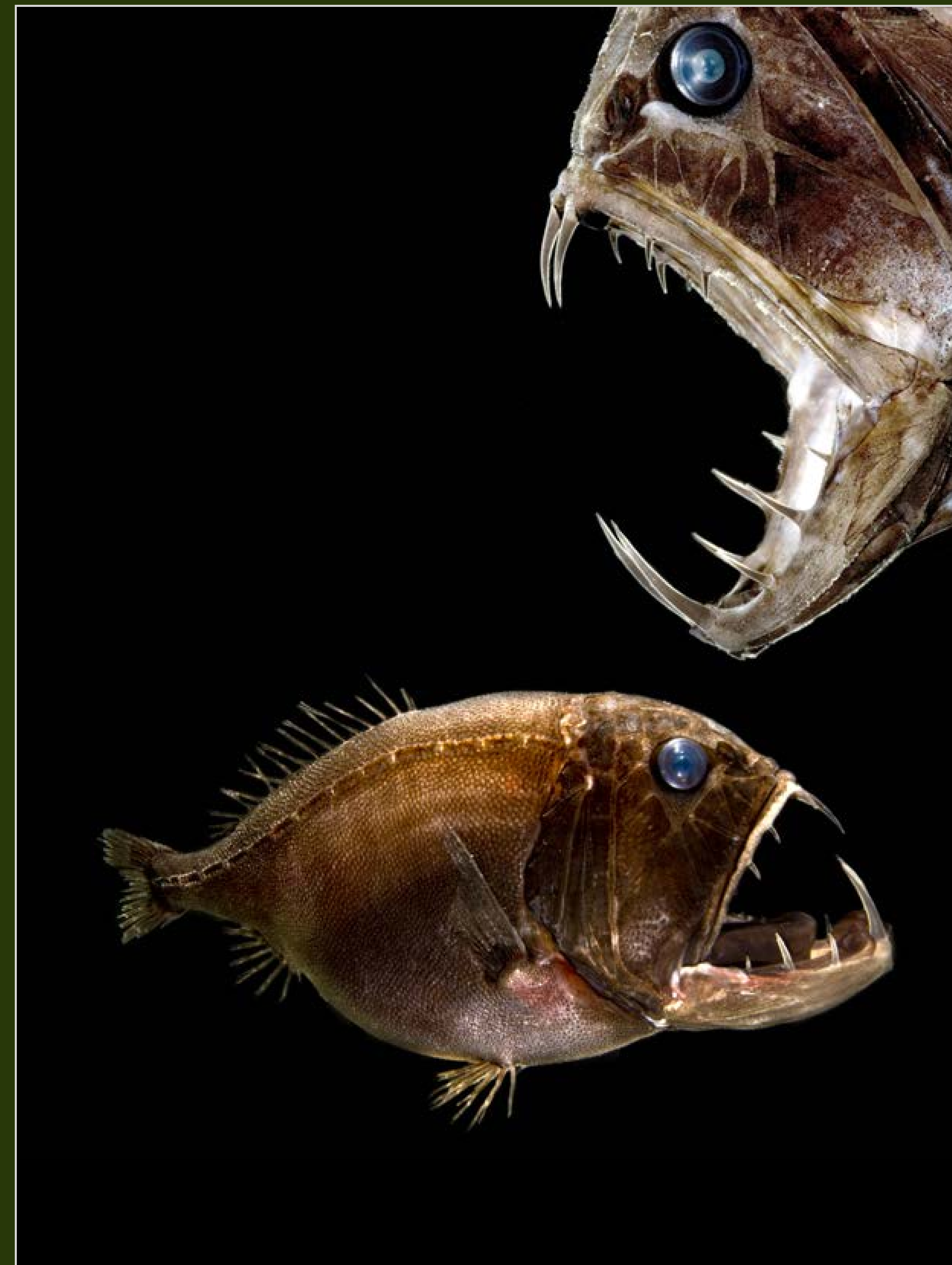


The Double-horned Golden-lined barbel *Synocyclocheilus bicornutus* is considered to be a top predator in the subterranean streams where it is found - in relatively small populations - in Xingren County, Guizhou, China. The conical spines on its snout indicate that this is a mature adult in breeding condition.

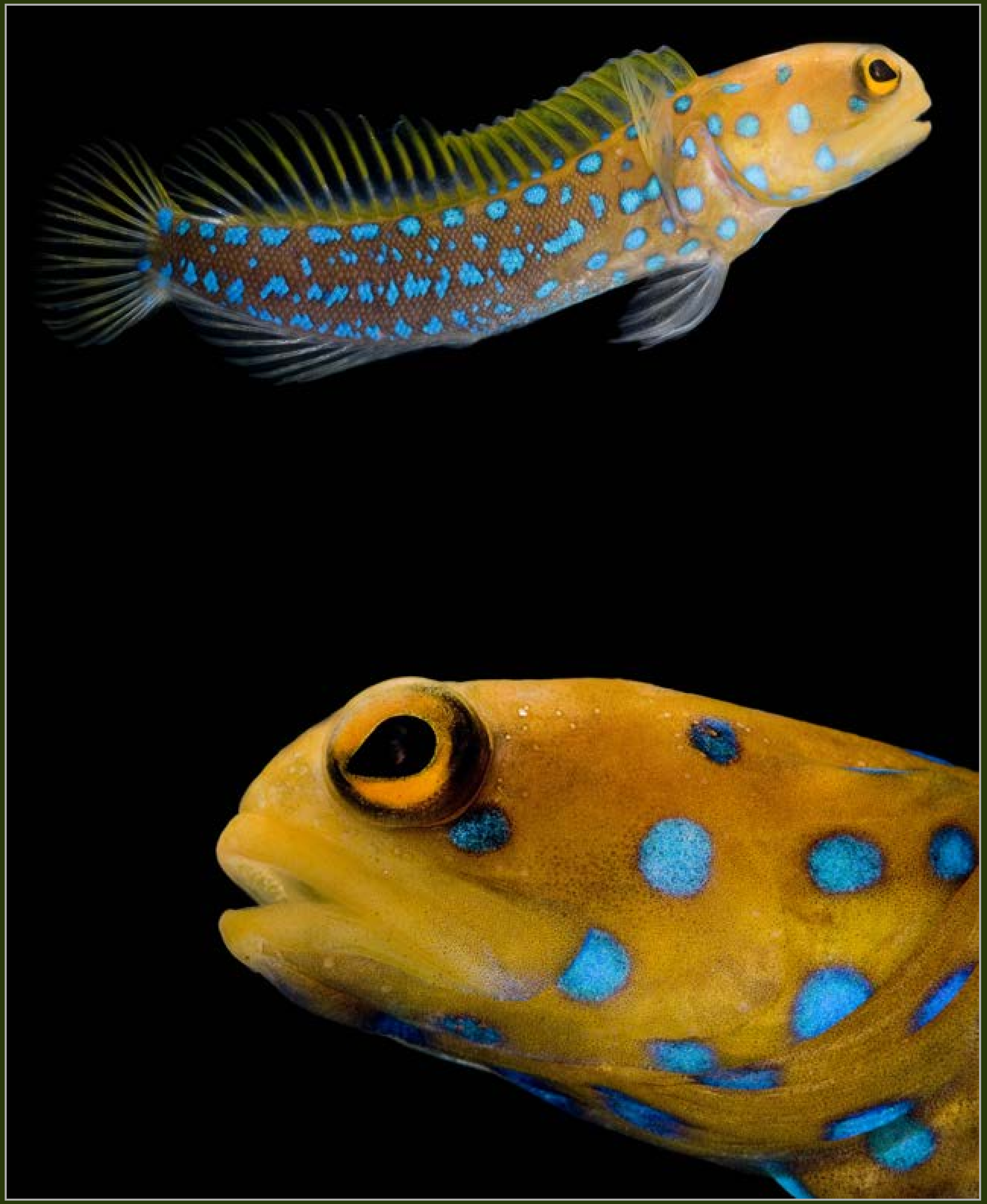
Dottybacks, Grammas and Firefishes are marine fishes found in the "twilight zone" at the depth where sunlight dims. Left, from the top, *Pichtichromis diadema*, *Pichtichromis dinar*, *Pseudochromis fridmani*, *Pseudochromis springeri* and *Gramma loreto*; right, from the top, *Nemateleotris decora*, D. *helfrichi* and D. *magnifica*.

Melanocetus johnsonii (top) and *Melanocetus murrayi* (bottom), two deep-water anglerfishes, both trawled from more than 1,000 meters deep.

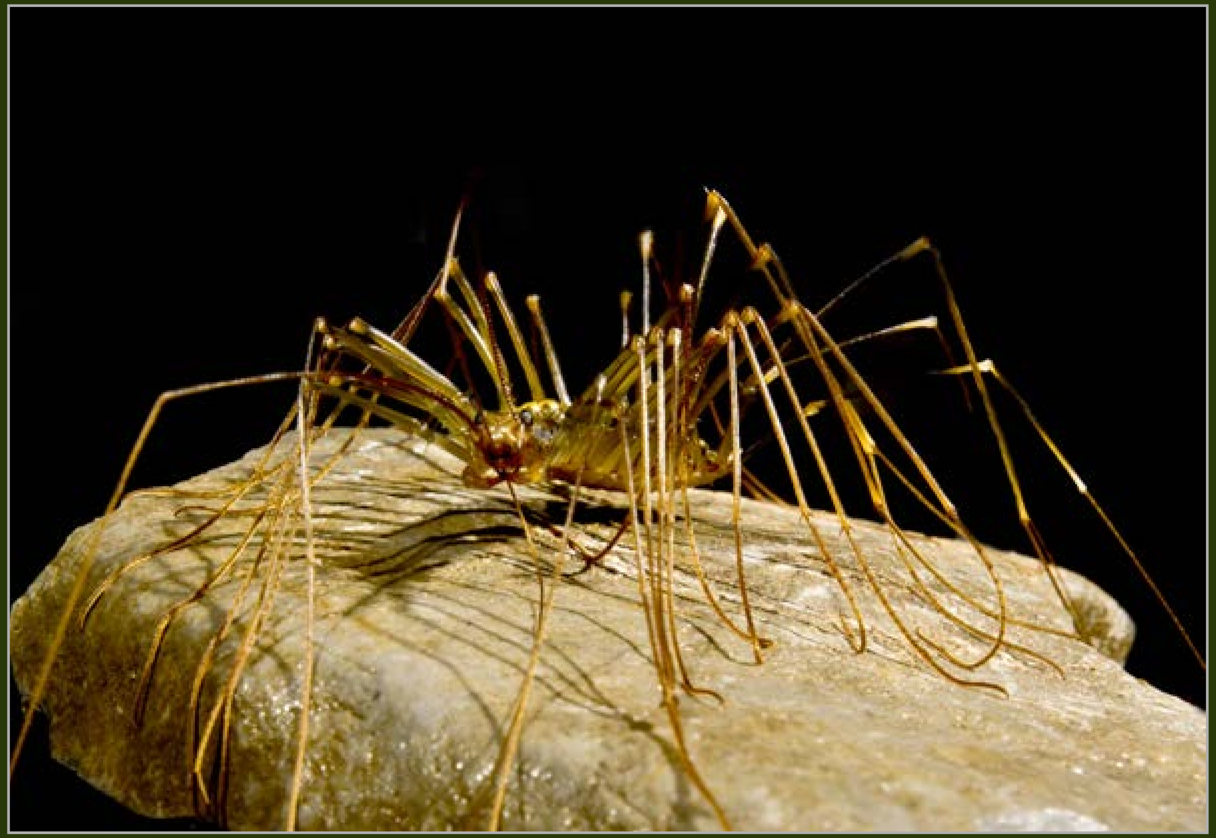


The Fangtooth *Anoplogaster cornuta* is a marine species which inhabits depths between 300 and 5,300 meters, where it lives in complete darkness.

Flashing Tilefishes *Hoplolatilus chlupatlyi* are commonly observed on Indo-Pacific rubble or sandy bottoms down to a depth of 55 meters.



The strikingly marked Blue-spotted Jawfish *Opistognathus rosenblatti* lives in burrows it digs on tropical coral reefs in the eastern central Pacific Ocean.



Top, a large house centipede, family *Scutigeridae*, from China; bottom, the endangered Ozark Big-eared bat *Corynorhinus townsendii ingens*.

toxins, keeping microbes at bay. Many species produce unique blends of antimicrobial toxins, currently unknown to medicine. And therein is one very pragmatic reason why humans should do everything possible to keep amphibians (and biodiversity in general) around - they are reservoirs for treating microbial diseases. Only a few of the myriad biochemically active compounds in amphibian skin secretions are now in the testing/trial phase. Many are potentially life-saving. These compounds are of such vital importance because our current treatments for microbial diseases are becoming ineffective. The problem is antibiotic-resistance. As we use antibiotics, more and more lethal bacteria become resistant to them. Humanity now has only a single antibiotic that is effective against antibiotic-resistant strains of *Staphylococcus*, the bacteria that causes staph infections. Resistant bacterial strains can be deadly. My father's best friend entered a southern California hospital with a bad case of poison oak and died days later with an antibiotic resistant staph infection that he got in the hospital. How did bacteria become immune to antibiotics that once killed them efficiently? In essence, we have created "super bugs." Sometimes people fail to follow prescribed medication regimes. They end treatments early, while some bacteria remain. The bacteria that remain are the strongest and the most resistant. These reproduce rapidly and spread. With each treatment that leaves bacteria, resistance increases. Bacterial forms evolve that are no longer killed by the medication that once would have eliminated them. As more and more bacterial strains develop resistance, more and more of us will die of simple bacterial infections. In short, we are running out of effective antibiotics. But all is not lost; amphibians (and greater biodiversity in general) may yet save the day. Skin secretions of dozens of amphibians have been demonstrated to kill antibiotic-resistant bacteria strains, and can provide blueprints for novel killers of other deadly bacteria. Likewise, amphibian skin secretions may be used to prevent or treat cancers, chronic pain, and other ailments. There is even an amphibian skin secretion that functionally inhibits the HIV virus from mucosal transmission. We know nothing about the skin secretions in the vast majority of the world's 7000+ amphibian species, but it is certain that there are thousands of unique compounds awaiting discovery. Are you willing to bet that any particular species considered to be "not worth saving" isn't the one with a skin secretion that could ultimately cure a human disease, treat a family member, or save your own life? But there is a huge problem, as much as half of the world's amphibians are either facing serious environmental problems, are in decline, or have gone extinct.

Here's a quick exercise to demonstrate just how many of our medicines come from natural sources. Open your

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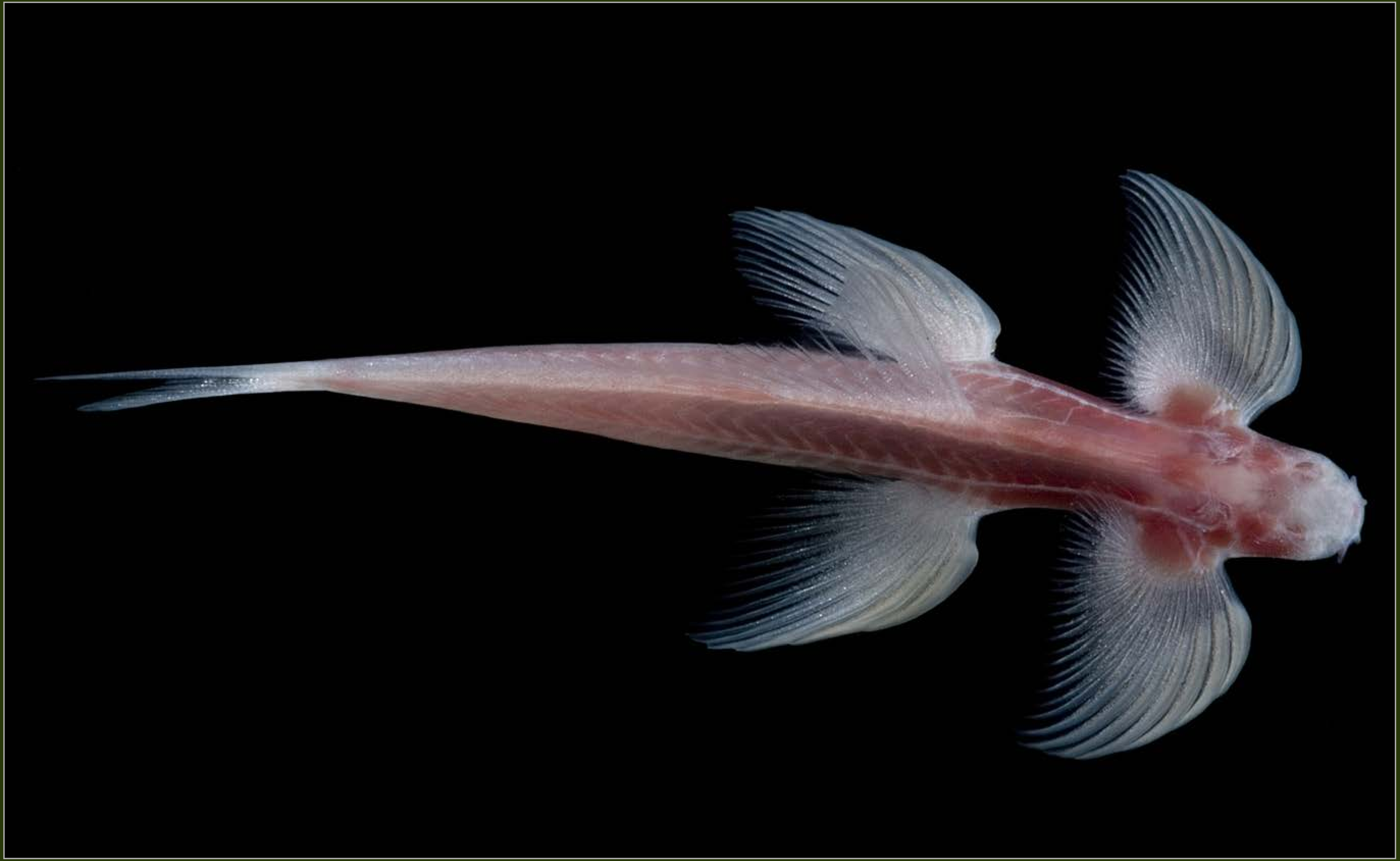
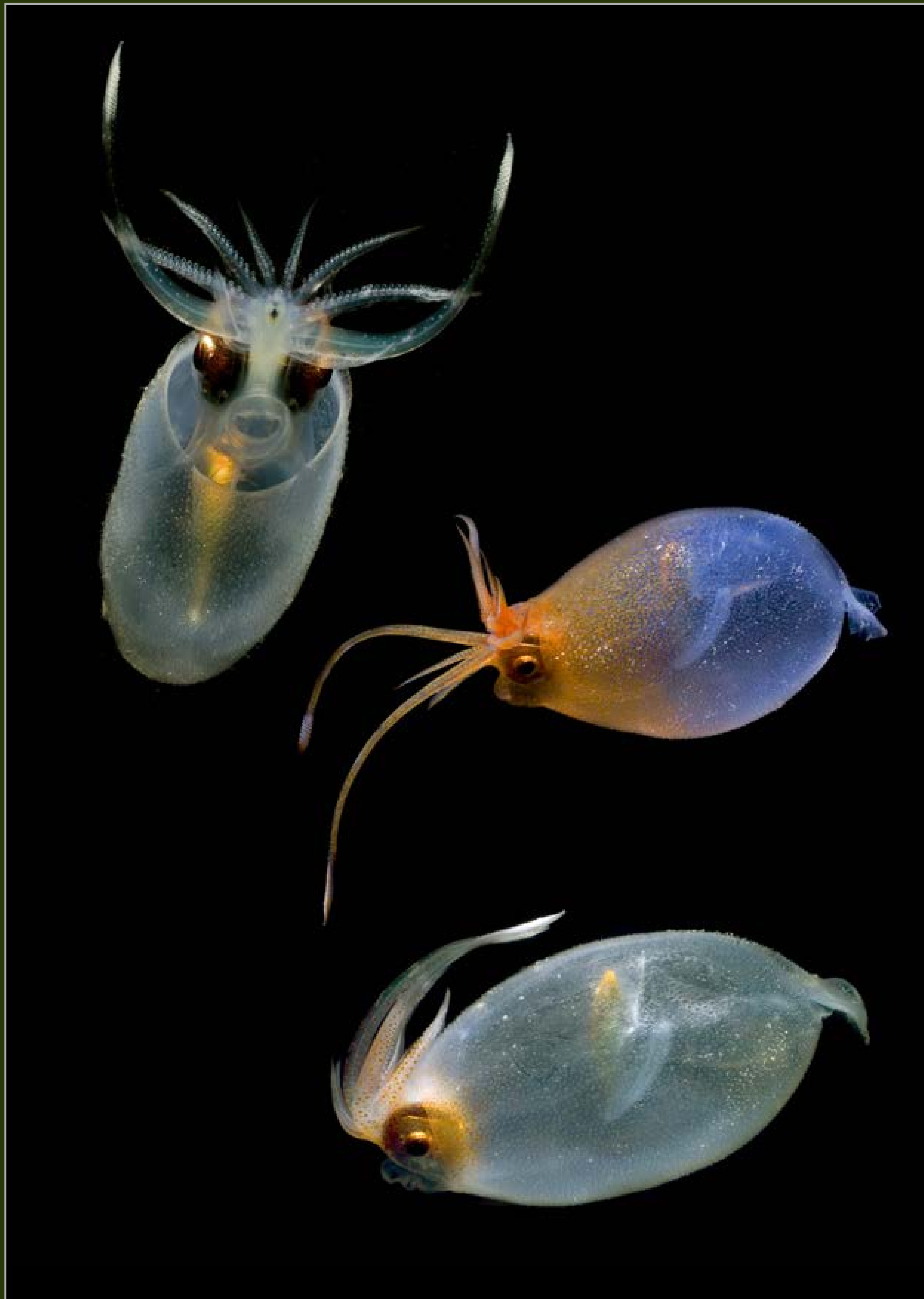


The extraordinary-looking Waterfall Climbing Loach *Cryptopora thamicola* is able to live for extended periods out of water, inhabiting $C0_2$-filled caves and crawling on its well-developed pectoral and pelvic fins out of the water to feed on bacteria growing on damp rocks. This specimen was photographed in northern Thailand.



This mesopelagic Cockatoo squid *Cranchia scabra* was captured in a trawl at a depth between 200 meters and the surface in the Sea of Japan.

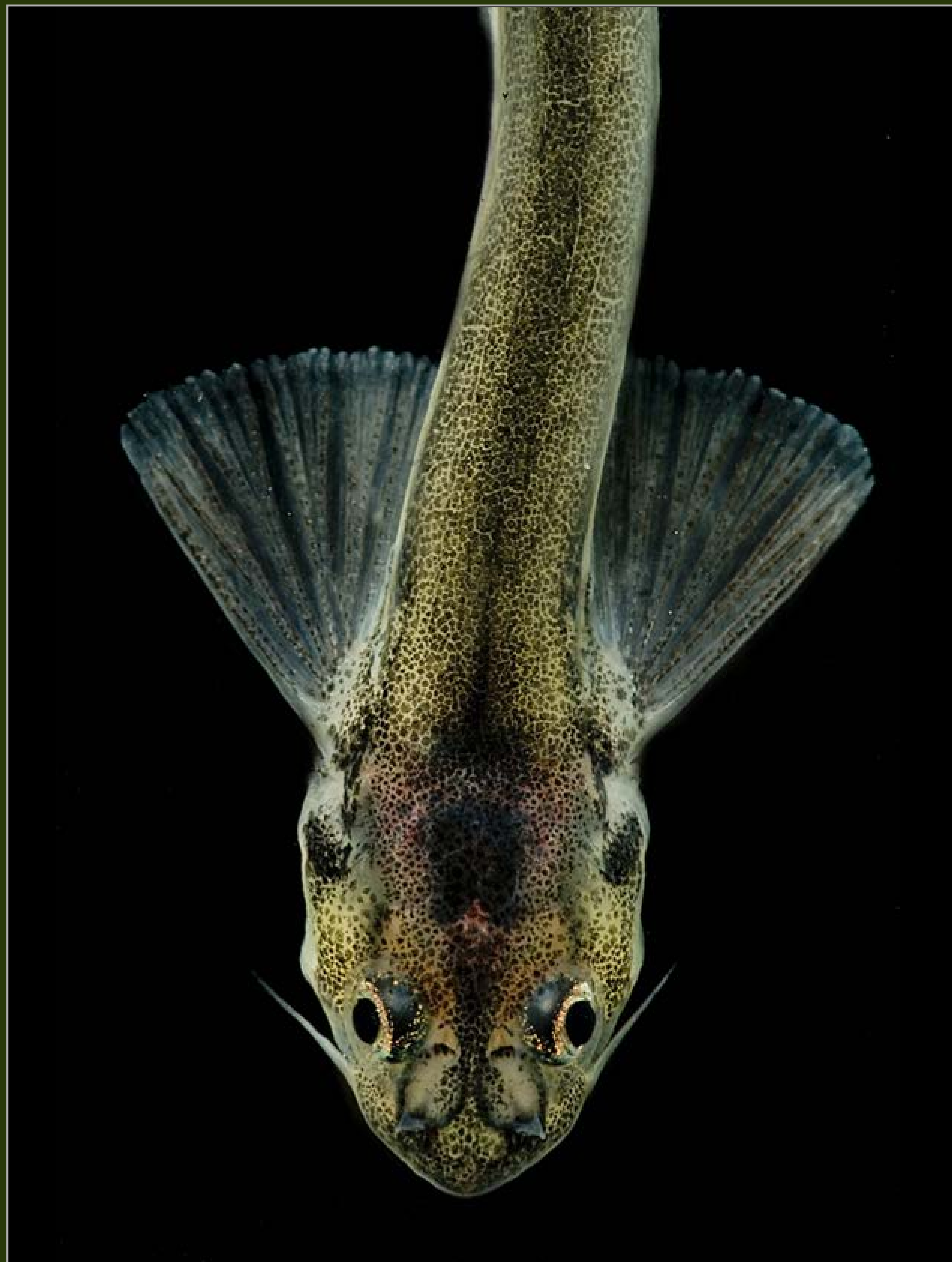
Amphipods are deep-water crustaceans closely related to crabs, lobsters and shrimp. They represent an important food source to many marine animals.

Gunther's Boafish *Stomias affinis* features photophores along its full length - this one was captured in the Gulf of Mexico between 200 and 400 meters.

Two knifefishes from South America: *Orthosternarchus tamandua* (top and middle) and *Compsaraia samueli* (bottom). Both can generate electric fields.

The Glass squid *Galiteuthis phyllura* (top) lives in northern Pacific waters; Black-eyed squids *Gonatus onyx* (bottom) are found in the Northern Pacific.

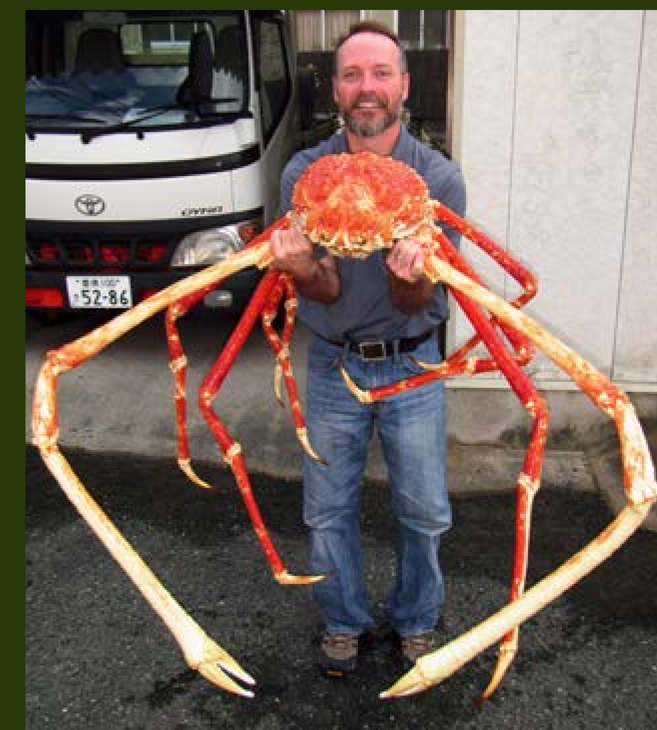
Barely the size of an almond, this larval (juvenile) octopus was captured in a trawl at a depth of 200-400 meters in the Gulf of Mexico.



The parasitic *candirù* or vampire fish *Vandellia* cf. *sanguinea* is a typical Amazonian basin species. This specimen was captured in the Rio Napo, Peru.

medicine chest. Make a written inventory. Go online and look into the origins of each medicine. You will be amazed at the number that came directly from nature. Think about the amphibian example I just provided and substitute any group of wildlife. So much of the world's biodiversity is in trouble that, more likely than not, the group you substitute will have a similar story. There is no telling where the next cure for a human disease will come from. Which species will provide a substance that conquers a cancer? Which animal will produce a chemical that treats heart disease? Is there an organism out there that produces a chemical that would eliminate particular addictions? While I hate to express the value of biodiversity to terms of human gain, it is the only argument some people will accept. Humanity simply cannot afford to turn its back on biodiversity. Our very future depends on it. But don't take my word for it. Look on the internet or read up on biodiversity... decide for yourself.

To be clear, the transition from a natural extract to a medicine is a lengthy and expensive process. Richard Conniff has published a great discussion of this process. For example, a particular chemical compound that is showing promise may be mixed in with dozens or even hundreds of other compounds. Isolating the important compound is difficult. Replicating it may be very costly and require a more efficient technology that will take time to develop. Nonetheless, if we don't conserve our biodiversity today, the future will hold no natural reservoirs from which we can draw. They will be gone...By celebrating the beauty of biological diversity here, it is my hope that some will be inspired to take a closer look, and to make environmental protection a priority. We have little time left. Do this for future generations. Please, act now.



Author Danté Fenolio (above, photo by W.W. Lamar) - zoologist, biologist and wildlife photographer - is vice-president, conservation and research, at the San Antonio Zoo, Texas.