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# Quest

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# The Incredible Larvae of Moray Eels

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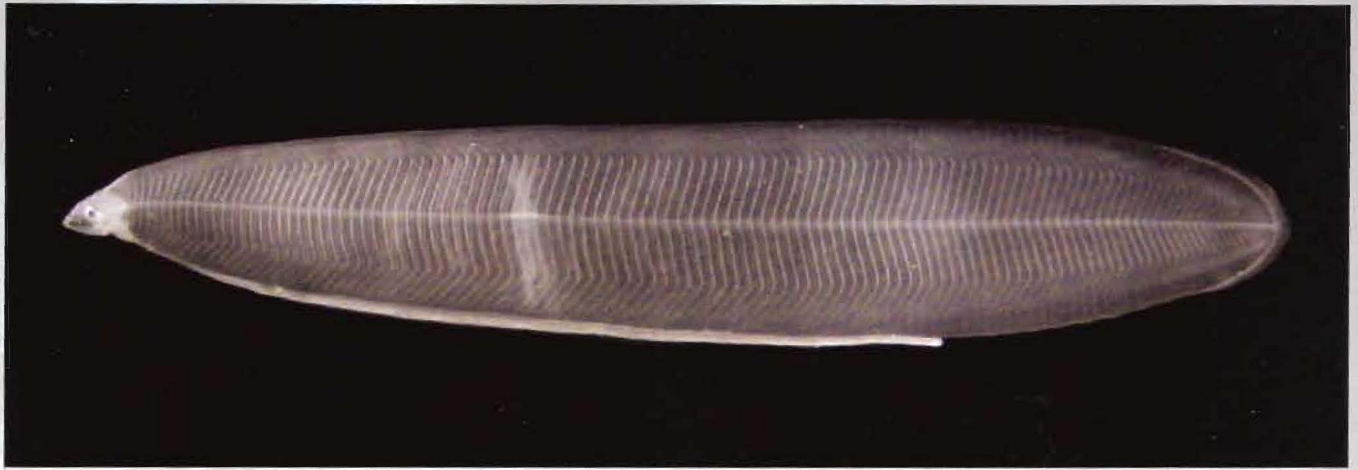
*Fimbriated moray (Gymnothorax fimbriatus)*

Many diving enthusiasts became such through an addictive fascination with the organisms seen underwater. While the beauty of light filtering through the water column, the feeling of neutral buoyancy, or the thrill of exploration cannot be discounted, few people can dive a tropical coral reef and not find its menagerie of life stunningly beautiful.

A closer look at underwater life often reveals unknown critters floating in the water column, disguised fish imitating algae or seaweed, and tiny bits of coral taking hold along the rocks and rubble. However, most people only see what they already know and can associate with a name. Prior to learning a little about corals, I viewed them as background for “important” things, such as colorful fish, sharks, octopuses, and sea turtles. However, as soon as I learned to differentiate among a few different types of

corals, I began seeing them everywhere. The more one knows, the more one sees and the more one *appreciates* what is seen. Towards that end, I would like to use this article to share a little bit about one of the more common things a diver might see on a tropical or subtropical reef dive.

Anyone who has been on a coral reef, most anywhere in the world, has seen or heard stories about moray eels. They are predatory eels, prominent on reefs, sticking their heads out and flashing rows of long, sharp teeth with the menacing opening and closing of their mouths. Next time one of these colorful, if frightening, fish comes into view, think for a few minutes about how that fish got there. Most coral reef fish do not move very far as adults. This is why dive masters at resorts know where to find that big angelfish or those cryptic frogfish. After they have

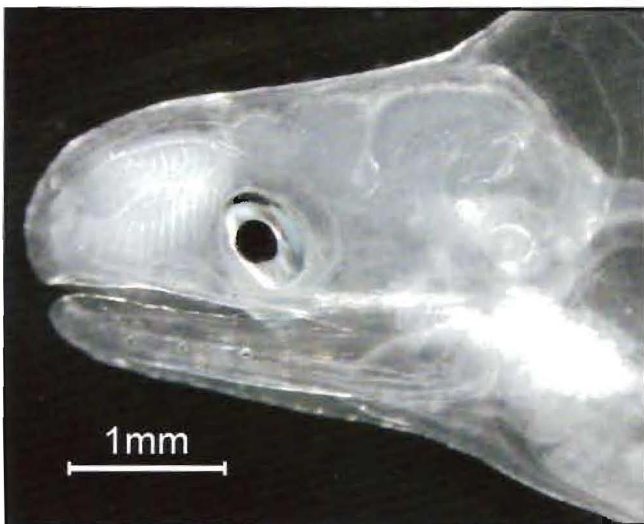


*Figure 1: A moray leptocephalus larva is pictured above. Note the leaf-like shape, transparent body, and small head size relative to the body (Courtesy of Michael Miller, Atmosphere and Ocean Research Institute, University of Tokyo).*

been found once, they don't move very far for their entire lives, which can be up to fifteen years for some species! Moray eels are the same way—some adults may spend their entire lives within an area of a few hundred square feet. So, whether in Bermuda or Hawaii, divers might find themselves wondering, if adult eels can't swim from island reef to island reef, how did they get there to begin with?

It is hard to imagine an adult moray eel swimming across the open ocean. The open ocean is a completely unsuitable habitat for most reef fish, and they have solved this problem by having a larval

form. Reef fish colonize remote reefs such as oceanic islands by spending the first few weeks of their lives as tiny larvae, drifting in ocean currents with the tides and oceanic gyres. While this is a common practice among most species of reef fish, moray eels are unique in a number of ways. Among vertebrates, the larvae of moray eels may be the simplest, longest-lived larval form that procures its own food. Their entire body wall can be just a few cells thick. They can range in size from less than one centimeter to about ten centimeters (around four inches). They have a tube from their mouth to their anus, but few other identifiable digestive enzymes, no curves or evaginations of the intestines or the gut—just a tube. They are completely transparent except for their eyes. Most reef fish larvae are big enough to eat plankton from the water column, but the larvae of morays and their relatives are so unique physiologically that they feed on detritus-like particles called marine snow, including the excrement and shed exoskeletons of plankton. That's right—some adult moray eel species can grow to twelve feet long, weigh well over one hundred pounds, and fill the role of top predator, but they all start out eating plankton poop!

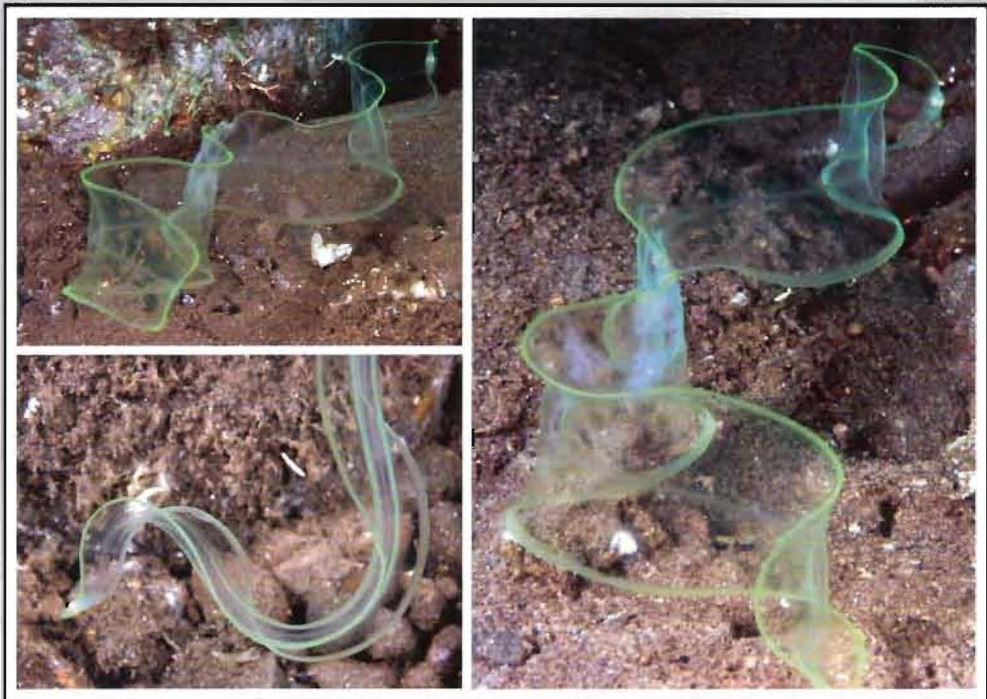


*Figure 2: Photograph of the head of a late-stage moray eel leptocephalus. Note the enlarged nasal region with visible olfactory organs. These organs are thought to develop towards the end of the open-ocean period of the larval phase, as they are sensing out suitable habitat for recruitment and metamorphosis into the juvenile form (Courtesy of Michael Miller, Atmosphere and Ocean Research Institute, University of Tokyo).*

Despite humble beginnings, their leaf-like shape and ability to sustain themselves on simple nutrients enable moray eel larvae to survive in the water column longer than most other reef fish studied to date (see Figure 1). Most reef fish survive in the open ocean as dispersing larvae for fifteen to thirty days, while moray eel larvae can spend more than ninety days at sea. Some other types of eel species may be able to survive for two years as larvae. They spend this time swimming and drifting in the open ocean, modifying their buoyancy chemically (they lack anything as sophisticated as a swim bladder at this point), possibly taking advantage of deep and shallow water current systems, like a multi-tiered transit system, until they sense a suitable habitat (note the enlarged olfactory glands in the photograph of a late-term larvae in Figure 2). When they reach coral reef areas, they will metamorphose into their juvenile form (see Figure 3).

This aspect of their biology and life history—the ability to disperse as pelagic (open-ocean) larvae for exceedingly long periods

of time relative to other reef fish—gives morays a number of special qualities. They are among the most cosmopolitan of reef fish and can be found in every temperate to tropical ocean basin. There are over two hundred species globally, and they have enormous geographic range sizes for individual species. Several species have populations that are distributed across the entire Indian and Pacific Oceans, approximately two-thirds of the planet and more than thirteen thousand miles! Many groups of coral reef fish have species that are restricted to single islands or archipelagos, but no moray eel species is so restricted. In a recent scientific study, researchers used DNA sequences to demonstrate that moray eels exchange genes between populations throughout their range more frequently and over larger distances than has been described for any other reef fish (or at least for any other reef fish that doesn't move around as adults). Their DNA shows that even within species, populations exchange migrants over enormous geographic distances (<http://jhered.oxfordjournals.org/content/101/4/391.abstract>).

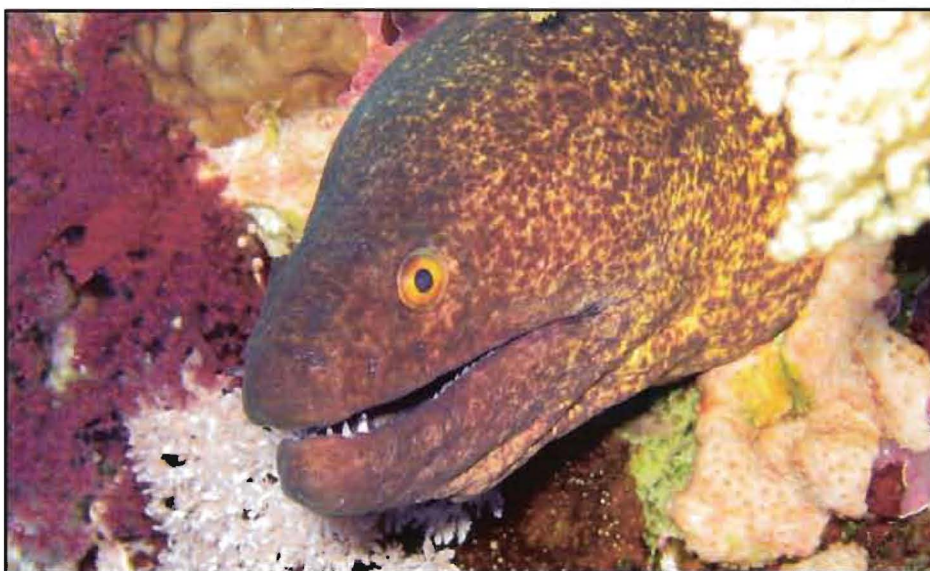


*Figure 3: A metamorphosing moray eel larvae, photographed in Indonesia, published in the article "Observation of a Large Metamorphosing Leptocephalus in Coral Reef Habitat in Sangeang Island, Indonesia," in Zoological Studies*

So, whenever divers visit a tropical reef dive and see a large moray eel chomping his jaws in their general direction (coincidentally, this is just the way that they breathe and is not meant to be a threat), they should take a moment to think about the hundreds or even thousands of miles that this eel has swam as a few centimeters-long, transparent, and leaf-like larvae before settling down on that reef to live out its life.

Also, take note of its features and try to look up the species for identification on websites such as [www.eol.org](http://www.eol.org) or [www.fishbase.org](http://www.fishbase.org). There are over two hundred species of moray eels globally, more than eighty of which can be seen in the Hawaiian archipelago alone. Divers might find that knowing a little something about moray eels will make them just a little more interesting to observe.

As a final note, all marine life should be respected and given its distance, but this is especially true for moray eels. They are not aggressive unless provoked, but they can inflict tremendous damage if provoked to bite, so keep that admiration at a safe distance.



*The adult form of most moray eels barely resembles their larval form. The yellow-margined moray eel (*Gymnothorax flavimarginatus*) pictured here was studied genetically and shown to disperse as larvae across its entire range, which includes most of the Indian and Pacific Oceans and covers about two-thirds of the planet (Courtesy of Wikimedia Commons).*

