

Worms Discover a Feast in Watery Depths

By KENNETH CHANG

When whales die, they too become worm food.

It turns out that at least two species of primitive worms evolved to feast exclusively on the bones of dead whales. Researchers describe the discovery in the current issue of the journal *Science*, placing the unusual worms in a new genus, *Osedax* - Latin for "bone-devouring."

"In the deep sea, we continue to find extraordinary new things," said Dr. Greg W. Rouse of the South Australian Museum, lead author of the *Science* article (see abstract below).

Scientists at the Monterey Bay Aquarium Research Institute in California found the worms in January 2002 on the carcass of a gray whale that had fallen dead to the bottom of Monterey Bay, nearly two miles down. But they had trouble figuring out what they had found.

The *Osedax* worms look more like plants than animals. They have no mouth, no gut, no eyes. Their bodies consist of transparent tubes one to two inches long, with feathery reddish plumes that extend outward - gills that allow the worms to breathe.

They also have greenish root like structures that burrow into the whale bones, and the roots are filled with a particular type of bacteria that, living in symbiosis, breaks down fats and oils in the whale marrow, producing food for the worms. "That's very, very bizarre for an animal," said Dr. Shana K. Goffredi, a marine biologist at the Monterey institute.

Perplexed, Dr. Goffredi and a colleague, Dr. Robert C. Vrijenhoek, consulted Dr. Rouse, an expert on marine worms.

"None of us knew for a while what it was," Dr. Rouse said. Finally, the scientists determined that the whale-eating worms were cousins of giant tube worms that live on the deep ocean floor near volcanic vents.

As Dr. Rouse dissected the 50 or so worms on the whale rib that he had been sent, he made another strange finding: every worm he had examined was female.

At first he thought the worms were reproducing by budding, essentially cloning themselves, but he could find no connections between the roots. Then he noticed specks within the female's transparent tubes. Those, it turned out, were the male *Osedax*. Each female attracts her own harem of live-in dwarf males vying to fertilize a stream of eggs she sprays into the water. Some larger females contained more than 100 males.

The male *Osedax*, Dr. Rouse said, "look like the babies of the close relatives," even still

carrying around some of their egg yolk. The yolk appears to be the only food they ever have. The males appear not to be able to feed themselves, and the females appear not to provide any nourishment for them.

The researchers believe that the worm larvae start sexless. If one lands on a whale bone, it turns female; if it lands on a female, then it turns male. Once the worms colonize a whale carcass, they probably spend their lives churning out larvae that float with the currents until they fall on the next dead whale. The scientists said it appeared that the worms were unable to eat anything else.

However the *Osedax* manage to survive solely on dead whales in the vast oceans, they appear to have been doing it for a long time. From the genetic differences between the two species, Dr. Goffredi estimated that they diverged about 42 million years ago. That suggests that whale bone-devouring worms have existed almost as long as whales, which first evolved about 50 million years ago.

To better understand the worms' life cycles, the scientists have placed fresh whale bones on the bay bottom, hoping the worms will have colonized those, too, when they revisit the site in September. They also plan to sample water around the whale carcass in hopes of catching some of the newborn larvae.

Abstract of the Science Article

Science. 2004 Jul 30;305(5684):668-71.

Full text article at
www.sciencemag.org

***Osedax*: bone-eating marine worms with dwarf males.**

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We describe a new genus, *Osedax*, and two new species of annelids with females that consume the bones of dead whales via ramifying roots. Molecular and morphological evidence revealed that *Osedax* belongs to the Siboglinidae, which includes pogonophoran and vestimentiferan worms from deep-sea vents, seeps, and anoxic basins. *Osedax* has skewed sex ratios with numerous dwarf (paedomorphic) males that live in the tubes of females. DNA sequences reveal that the two *Osedax* species diverged about 42 million years ago and currently maintain large populations ranging from 10⁽⁵⁾ to 10⁽⁶⁾ adult females.