Discover

CORPSE ECOSYSTEMS

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Corpses as ecosystems? No jokes! Don't think of human corpses – think decomposition. When a large animal like a wild buffalo, sambar, giraffe or zebra dies in the forest, or cattle dies on the road, their carcass (dead bodies) becomes an ecosystem – the starting point for new sets of food chains and food webs, but with a difference. The process of decomposition sustains this ecosystem.

It's easy to imagine this on land, but in oceans? The process of corpse decay in oceans has a special name – Whale Fall. When whales die, they either get washed onto the shore or sink to the bottom of the ocean. When the latter happens, it offers a feast to the community of invertebrates and microbes that live at depths of 300-900m below the ocean surface.

Scavengers, like hagfish, sleeper sharks, rattail fish and amphipods, are the first to feed on the meaty part of the carcass. They devour the muscles, visceral organs and blubber of the whale corpse, leaving behind only its skeleton. Does this signal the end of its potential to feed other life forms? No! Marine biologists, led by Dr Craig Smith, have found that depending on its age, a whale skeleton can hold anywhere between 2-2.4 metric tonnes of oil in its bones. This is yummy energy for hordes of polychaete worms, molluscs and unusual crustaceans that descend on the whale's bony remains.

Of these – the bone-eating worm leads the show, while others feed on the sediments around the whale skeleton. The Osedax or the bone-eating worm has no mouth, stomach or gut, no eyes and no legs. If this isn't unusual enough, the male is a tiny fella residing within the female. Females, on the other hand, have beautiful red plumes and root-like appendages. These appendages harbour many lipid-digesting symbiotic bacteria. When a female bone-worm encounters the skeletal remains of a decaying whale, it uses these appendages to bore through the bones and reach the marrow. Once they reach the marrow, the symbiotic bacteria break down the lipids in the bone oil, releasing energy that the worms use. Varying with the size of the whale, this process can take at least two years.

Some examples of bone-eating worms

(a) Most female bone-worms have long, graceful "palps" that wave in the ocean currents.

(b) The female of an as-yet un-named bone-worm species in the genus Osedax, which has been carefully removed from the whale bone.

Credits: Greg Rouse, Scripps Institution of Oceanography, UCSD, USA. URL: [illegible]. License: Copyrighted (used with permission)

Chemoautotrophic whale-fall community

Bacteria mats, (vesicomyid) clams in the sediments, (galatheid) crabs, polynoids, & other invertebrates.

Credits: Craig Smith, University of Hawaii. URL: [illegible]. License: Copyrighted (used with permission)

WATCH bone-eating worms in action in this video from the Monterey Bay Aquarium Research Institute (MBARI), CA, USA – https://www.youtube.com/watch?v=[illegible]

The holes drilled by the Osedax act like open gates to a procession of bacteria that move into these remains. The first bacteria to enter are anaerobic. These are followed by yellow mats of chemosynthetic sulphophilic bacteria that cover the bony remains of the whale. About 200 different sulphophilic bacterial species have been found feeding on whale bones!

Marine biologists from Monterey Bay Aquarium Research Institute report that the last-stage whale-fall community is extraordinarily diverse, with as many as 190 different species of macroscopic communities feeding on a single corpse! Many of these species are not only unique to whale-fall, they are also constantly forming new ecological niches, with organisms that scavenge, prey on them, or form symbiotic associations with them! What's more – some of these communities last quite long – even as much as 50 years!

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