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Sulfide-oxidizing bacterial ectosymbiosis in the gills of Mytilidae associated with wood falls

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Several morphotypes of mussels (Bivalvia: Mytilidae) associated with sunken woods were collected between 300 and 1800 meter depths during the Panglao cruise in the Bohol sea (Philippines) in May 2005 and from Vanuatu island during the SANTO BOA cruise in October 2006. The functioning of wood-associated marine ecosystems is not yet understood, and might involve symbiotic associations between animals and thioautotrophic bacteria due to the presence of H_2S as a product of wood degradation.

Results from our study demonstrate the existence of bacterial symbionts in the lateral zone of the gill filaments of all specimens examined. Extracellular bacteria are located between microvilli at the apical surface of the cells all along the lateral zone of each gill filament. Bacteria were never observed intracellularly conversely to most of the mytilids known to harbor sulfide-oxidizing gill symbionts. Based on TEM observations, these gram negative bacteria do not resemble methanotrophs; they lack stacks of intracellular membranes in their cytoplasm. Moreover, based on FISH experiments, some of these bacteria strongly hybridized with Bthio-193, a probe targeting sulfide-oxidizing symbionts in several mussel species. Preliminary phylogenetic investigations show that bacteria are related to sulfide-oxidizing, gammaproteobacterial mussel symbionts based on 16S rRNA. Furthermore, these ectosymbionts possess a gene encoding APS reductase, an enzyme found in most bacteria involved in the sulfur cycle.

Our study points out the importance of chemosynthetic symbiosis in wood-fall

tecosystems. Ongoing work includes colonization experiments on artificially sunken woods in various environments such as shallow water (mangrove swamp, seagrass beds) and deep sea (cold seeps, hydrothermal vents). Results will provide more data about biogeography and establishment and biodiversity of wood-associated chemosynthetic fauna.