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21—Hydrothermal Vent Fauna of Escanaba Trough (Gorda Ridge)

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Biota of the NESCA Site, Escanaba Trough

Hydrothermal vent communities on Gorda Ridge were discovered and documented during 1988 field programs using the deep-diving submersibles *Alvin* and *Sea Cliff*. Venting was associated with large sulfide mounds that comprise the NESCA site in the Escanaba Trough of Gorda Ridge (41° 00′ N; 127° 29′ W; 3,200 to 3,250 m). Details of the geological setting are presented elsewhere in this volume.

Within the study area, we identified five principal habitats: (1) active hydrothermal venting associated with massive sulfide deposits (temperatures ranged from a few degrees above ambient to a maximum of 220°C); (2) a low-temperature site associated with soft sediment deposits at the base of sulfide mounds; (3) "inactive" sulfide mounds; (4) nonvent soft sediment; and (5) nonvent basalt lava.

The fauna of active hydrothermal vents associated with sulfide deposits was lush, dominated by slender vestimentiferan tube worms in the family Ridgeiidae. Tube worm tubes were heavily fouled by paralvinellid and ampharetid polychaetes. We noted local differences in the composition of macrofaunal species associated with different tube worm clumps: at some sites, the distal ends of the tube worm tubes were ornamented with one or two white-bodied anemones with pink-fringed tentacles. Some clumps of tube worms were colonized by abundant lepetodrilid limpets and small, coiled gastropods; in other clumps, these mollusks were rare or absent. At the vent site designated 6X, three arthropod taxa were abundant within the tube worm clumps. Pycnogonids of all size classes, including gravid females and juveniles, were found attached to tube worm tubes; red copepods were found in mucous and washings of tubeworm clumps; large tanaid crustaceans encased in thin mud tubes also fouled tube worm tubes. The tanaids belong to the family Neotanaidae and represent, to our knowledge, the first recorded collection of a vent-associated tanaid species. Tanaids of all size classes were collected, from small, ~3-mm juveniles to large, ~1.5-cm adult males. Polynoid polychaetes were common but not abundant in all clumps of tube worms. Copious mucous secretions by paralvinellid polychaetes at the base of tubeworm clumps appeared to form a matrix within which filamentous bacteria thrived. Populations of paralvinellid worms were also observed in tubes within sulfides adjacent to active vents where tube worms were absent. Disklike sponges (1–2 cm diameter) were abundant on sulfides surrounding areas of hydrothermal venting. A sample of fossilized worm tubes embedded in iron oxides near a 110°C vent was colonized by dense populations of small ampharetid polychaetes and aplacophoran mollusks. Small vestimentiferan tube worms, anemones, limpets, pycnogonids, and folliculinid protozoans also colonized this substrate. Galatheid crabs reached their greatest densi-

ties in the vicinity of active venting on sulfide mounds.

One site of low-temperature venting in soft sediment was observed at the base of a sulfide mound. The area (<10 m²) was colonized by elongate vesicomyid clams identified as *Calyptogena phaseoliformis* by R.D. Turner. Live clams were oriented half-buried, with their long axes at about 45° angles with respect to the sediment surface. The exposed anterior ends of live clams were often colonized by anemones. A number of empty valves lying on the surface of the sediment were noted, but no obvious explanation for mortality was observed. Qualitative samples of the sediment at this site contained large populations of undescribed species of orbiniid, ampharetid, and spionid polychaetes.

"Inactive" sulfide mounds were often colonized by remarkably dense concentrations of suspension-feeding deep-sea fauna. This fauna included aggregations of large, solitary tunicates plus brisingid seastars, crinoids, sponges, anemones, and brachiopods. While these organisms are common elements of the local nonvent fauna (Carey, this volume), their unusual abundance on sulfide mounds suggests that there may be some low-level venting of hydrothermal fluids at these "inactive" sites that supports chemosynthetic production within the overlying water column, or that the acid-labile sulfides are mobilized by microbial activity to support primary prodution. Alternatively, the topographic relief of the sulfide mounds may modify the local flow regime, concentrating suspended particulates on which the biota feed.

Nonvent soft sediments were heavily bioturbated. Echinoderms, including asteroids, ophiuroids, holothurians, and urchins, were conspicuous elements of the megafauna, as were xenophyophores and anemones. Occasional pennatulaceans and galatheid squat lobsters were also observed. The infauna of the sediments was dominated by several small species of polychaetes and an isopod.

Fauna of nonvent basalt substrates included sponges, brachiopods, and sabellid polychaetes.

Faunal Affinities

Specific identifications of most of the Gorda Ridge biota remain to be confirmed by taxonomic specialists. Nevertheless, we can consider the general nature of the fauna and relate it to the fauna of vent communities described from other oceanic spreading centers. Not unexpectedly, the fauna of NESCA hydrothermal vents most closely resembles that of Juan de Fuca and Explorer Ridge vent communities. The Northeast Pacific assemblage of Tunnicliffe (1988) can be extended to embrace the Gorda Ridge fauna. Ridgeiid vestimentiferans, lepetodrilid limpets, paralvinellid, polynoid and ampharetid polychaetes, pycnogonid arthropods, and the small coiled gastropod are important components of this assemblage. Common and abundant faunal types present at vents on Juan de Fuca and Explorer Ridges but so far characterized as absent or rare at the NESCA site on Gorda Ridge include maldanid polychaetes and ostracods. The majid crab, *Macrooregonia macrochira*, while not strictly a vent-associated species, was not observed at NESCA, though it is common at Juan de Fuca and Explorer vents. Tanaid crustaceans occur at the NESCA site but have not been noted at Juan de Fuca or Explorer Ridge vents.

The fauna of the low-temperature soft-sediment site at NESCA, dominated by *Calyptogena phaseoliformis*, is not part of Tunnicliffe's Northeast Pacific assemblage. The same species of clam is known from cold-water seeps in soft sediment off Japan (Metivier et al., 1986; Juniper and Sibuet, 1987) and was recently identified from sites in Monterey Canyon off California (R.D. Turner, personal communication). Soft-sediment vent fauna is best known from Guaymas Basin (Gulf of California), where the clam *Vesicomya gigas* (previously identified as *Calyptogena pacifica* and reclassified by R.D. Turner on the basis of additional material) is abundant (Grassle et al., 1985). Guaymas sediments are infused with petroleum hydrocarbons formed from high-temperature cracking of recent organic material (Simoneit and Lonsdale, 1982); an odor of petroleum was detected in Gorda

vent sediment, but it was neither as strong nor as pervasive as that of Guaymas material. The single, qualitative sample of Gorda vent sediment shares no common infaunal taxa with the samples of vent sediment from Guaymas Basin, and the extensive bacterial mats associated with the sediment surface at Guaymas are absent at the Gorda soft-sediment vent site.

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