Variation in mineral precipitates in the gill chamber and digestive tract of *Rimicaris* from Kairei and Edmond fields, Central Indian Ridge

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The alvinocaridid shrimp genus *Rimicaris* is dominates hydrothermal vent ecosystems of the Atlantic Ocean, the Indian Ocean, and the Caribbean Sea. *Rimicaris* harbors numerous strains of episymbiotic bacteria in its gill chamber. Some shrimps are clearly brownish in color even from the exterior, and from previous research it is known that epibionts of *R. exoculata* from the Mid-Atlantic Ridge are associated with brownish ferrihydrite deposits. On the other hand, there are also individuals with black colored precipitates in the gill chamber in some other vent sites, the association of such black deposits and epibionts have not been investigated to date. In addition, it is known that *Rimicaris* also possess mineral deposits in their digestive tracts, though the relationship with those in the gill chamber remains unclear. To understand such relationships, and reveal the origin of mineral precipitate in the gill chamber and digestive tract, we investigated epibionts and minerals in the gill chamber and the digestive tract of both brown and black individuals of *Rimicaris kairei* from Edmond and Kairei fields in the Central Indian Ridge using Raman spectroscopy, SEM, SEM-EDX and XRD.
Filamentous and rod-shape bacteria were observed on the inner surface of the branchiostegites (in the gill chamber) in both types of individuals from both sites; which suggests that coloration and site had little influence on the microbial community in the gill chamber. In brown individuals, the brownish precipitate were aggregations of mineral particles 1 μm or less in diameter, which covered the overall inner surface of branchiostegites. Conversely, the black precipitates in the black individuals, which mainly contained phosphorous and sulfur, was colloidal rather than particulate in nature and enveloped the surface of filamentous bacteria growing from branchiostegites but not the surface of branchiostegites themselves. In the digestive tract, iron oxides, sulfur [S], pyrite [FeS_2], marcasite [FeS_2], chalcopyrite [$CuFeS_2$], and sphalerite [(Zn,Fe) S] were detected in specimens from the Edmond Field; while Anhydrite was additionally detected in specimens from the Kairei Field. The metal sulfides decreased in density through the digestive tract from the mouth towards the anus in specimens from Edmond, and for Kairei specimens a trend of decreasing Anhydrite and increasing sulfur was found throughout the digestive tract.
To summarize, we revealed that gill chamber precipitates differed in *Rimicaris* specimens obtained even from the same site; while mineral compositions in the digestive tract differed between the sites. These results indicate that gill chamber precipitates likely depend on microhabitats of *Rimicaris* within a vent field, while the composition of digestive tract minerals are likely controlled by chemical compositions of vent fluids which is consistent within each site but differ among different sites.

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