

InterRidge Working Group on Seafloor Mineralization

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Seafloor hydrothermal vents, once the purview of scientific research alone have now become a prime target of commercial marine mining interest. Hydrothermal vent systems host metal-rich seafloor massive sulfide (SMS) deposits often in the form of chimneys, collapsed edifices and mounds with a mineralized stockwork zone at depth. SMS deposits are typically rich in metals ranging from copper and zinc to gold and silver. The recent revitalization in seafloor mining interest has been driven partly by the rapid increase in the price of metals such as copper, zinc, gold and silver, which have hit all time highs over the past few years. Fueling this exuberance have been small nations such as Papua New Guinea (PNG), Fiji and Tonga who have put their marine Economic Exclusive Zones (EEZ) up for exploration lease for metallic minerals. In response to these factors, several small commercial marine-mining oriented companies have recently attracted major investment from larger multinational mining companies to begin exploration and to develop practical strategies to extract seafloor metallic mineral deposits. Intimately linked to this exploitation is the potential impact on the unique biological habitats and wide range of fauna that are also present at these hydrothermal areas. The population connectivity and endemism of biological communities are important considerations that will need to be factored into any development of SMS resources.

It is expected that commercial mining companies will focus on inactive systems as they are less problematic than active systems in terms of the technology required for mineral extraction and may also have less biological diversity, biomass, etc, although this latter point is far from a known quantity. It is also likely that the number of extinct and inactive deposits outnumber the active systems by a factor of 10 or more, although again, this is a relatively unknown quantity. This lack of basic information makes it critical that a sound scientific basis be established for characterizing SMS deposits and the processes that form and preserve them along with their biologic content so that informed decisions can be made on whether to proceed with development or not and to assess the impact of such activities. Science research has focused on the active systems to date and relatively little is known about inactive and extinct sulfide deposits. While active and quiescent deposits are relatively easy to detect, the occurrence and distribution of extinct (non-actively venting) hydrothermal mineral deposits away from the volcanic axis is much harder to define. Many questions surround these mature deposits ranging from the processes by which such SMS deposits are buried and preserved, to potential metal enrichment through zone refinement and other biogeochemical processes, to the role of microbes and the potential for reactivation through tectonic and off-axis volcanic activity.

Partly because of the difficulties in detecting these extinct systems but also because of the focus on active systems little to no work has been done on the frequency of occurrence and fate of these extinct vent deposits away from the axis of volcanic activity. The primary scientific objective of a *Working Group on Seafloor Mineralization* would be to look at these questions of SMS deposit distribution, maturation and evolution and to investigate the processes that are responsible for their formation and preservation. The biological role in the mineralization process is likely to play a fundamental role notwithstanding the basic biologic habitat that is likely to be provided by these sites. A sound scientific base of knowledge would both advance science but also inform the commercial and political world of the importance of these multi-faceted resources and encourage responsible development.

It should also be recognized that the InterRidge organization can play an important role in providing the scientific basis to support the development of regulations, guidelines and best-practice through governing bodies such as International Seabed Authority (ISA) and individual country regulations when it comes to seafloor mineral exploitation. A Working Group on Seafloor Mineralization would provide input to the InterRidge steering committee on these policy issues.

Objectives of a Working Group on Seafloor Mineralization:

Encourage projects focused on determining the processes involved in the formation and preservation of extinct SMS deposits in the seafloor geological record, their extent and frequency of occurrence and on promoting the development of techniques to detect such deposits. There are also logical links that could be made with the working group on Biogeochemical Interactions at Deep Sea Vents. This task could be accomplished through the form of an IR Theoretical Institute.

Provide information to InterRidge Steering Committee members on seafloor mineralization processes and biologic interactions that would be impacted by marine mining activity of seafloor deposits towards the development of guidelines and policy recommendations that could be established through the governing bodies of such activity including the ISA and individual member countries.