Summer 7-1-2020

CARBON AND NITROGEN ISOTOPE RATIOS OF CHEMOSYNTHETIC BIOTA FROM THE ACTIVE COLD SEEP SITE OF, K-G BASIN, BAY OF BENGAL

Tanojit Paul

ABSTRACT

The study area in the K-G basin is a cold seep ecosystem and contains shallow methane gas hydrates (2-3 mbsf), discovered for the first time in the Indian Exclusive Economic Zone (EEZ) which is associated with methane gas flares in the water column. This methane rich gas is released into the surrounding environment which supports an extensive range of endemic organisms and plants, and it continues to be one of the most extravagant ecological system of the seabed. The methane released from the seep site reacts with the overlying seawater and over time they form carbonate rocks which is an important indication of the formation of gas hydrates in the seep region. Chemosynthetic bearing bivalves were identified from the cold seep site of our study area, in our present study we have examined the stable isotope composition of two species namely Bathymodiolus belonging to (family: Mytilidae, Subfamily: Bathymodiolinae) and Acharax (family: Solemyidae). The Bathymodiolus mussels and the Acharax live in symbionts with the methanotrophic/ or thiotrophic bacteria and derive vast majority of their nutrition from these symbionts. These organisms have the specialized ability to survive in these extreme conditions wherein they use the chemical energy for their metabolic activities. The growth and development of these species in these extreme environmental conditions depends on the continuous supply of methane and hydrogen sulfide gases from the seeps. The chemosynthesis organisms have been reported for a long time now since the discovery of the first cold seep site in the 1980. The stable isotopes of carbon and nitrogen in the tissues (mantle, gill, and foot) of the two species gives an insight of the biogeochemical processes and helped us to understand the metabolic pathways of these organisms in the cold seeps. δ13C analysis of the Bathymodiolus tissues which holds methanotrophic endosymbionts, is used to recognize the carbon fixation pathways whereas Acharax which harbor thiotrophic endosymbionts uses Dissolved Inorganic Carbon (DIC) as the carbon source. The low values of δ13C (mean = -66.05 ‰, n=59) in the Bathymodiolus

tissues at the seep site of our study area indicate that biogenic methane is the dominant carbon source fueling the system whereas the thiotrophic endosymbionts in the Acharax indicate the presence of hydrogen sulfide (H2S) along the seep site. The range of δ15N values for Bathymodiolus (δ15N = +2 ‰ to +5.7 ‰) and Acharax (δ15N = - 1.9 ‰ to 2.7 ‰) at the study area is significantly low which may be the which may be a resulting action of the autotrophic bacteria.