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Two new species of *Sympagella* (Porifera: Hexactinellida: Rossellidae) collected from the Clarion-Clipperton Zone, East Pacific

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Abstract

Two new Hexactinellida species from the Clarion-Clipperton Zone (CCZ) in the East Pacific Ocean are described. They are the first described representatives of the genus *Sympagella* in this region. The new sponges were collected in 2013 during the ABYSSLINE Project's first cruise, AB01, on board the RV *Melville*. The CCZ is known for its polymetallic nodules but megafaunal biodiversity is still poorly understood. Our findings suggest that the poriferan fauna of the eastern CCZ is both species rich and inadequately known, and that substantially more sampling and taxonomic studies of the CCZ sponge fauna are required to establish a megafaunal biogeography and evaluate potential extinction risks resulting from polymetallic-nodule mining.

Introduction

The Clarion-Clipperton Zone (CCZ) in the tropical eastern Pacific Ocean may be the first region in Areas Beyond National Jurisdiction (ABNJ) to be mined for metallic resources (Halbach & Fellerer 1980; Wedding *et al.* 2015). Already, 16 exploration contract areas within the CCZ have been approved by the International Seabed Authority to mine for polymetallic nodules, each up to 75,000 km² in area (<https://www.isa.org.jm/>). Nonetheless, the characterization of all size classes of the benthic and pelagic fauna inhabiting the region is still in the early stages. Without accurate baseline knowledge of the CCZ ecosystem, effective regional management of deep-sea mining cannot be undertaken (Wedding *et al.* 2015).

The limited baseline surveys that have been undertaken in the eastern CCZ indicate that megafaunal metazoan species are diverse and abundant when compared with other abyssal habitats (Amon *et al.* 2016, 2017a,b; Leitner *et al.* 2016; Vanreusel *et al.* 2016). Furthermore, it was shown by Amon *et al.* (2016) that over half of collected megafaunal species were undescribed, with many genera also previously unknown (Lim *et al.* 2017). The majority of CCZ megafaunal species are also sessile and reside on polymetallic nodules and the other limited forms of hard substrate (Amon *et al.* 2016; Vanreusel *et al.* 2016).

Porifera biodiversity in the CCZ is particularly poorly known, with only 25 species recorded in this area, which is approximately the size of the continental USA (Lim *et al.* 2017; Kersken *et al.* 2018a,b; Wang *et al.* 2018). Within the ~58,000 km² UK-1 exploration contract area, no described Porifera species had been reported. However, image surveys in the UK-1 exploration contract area during the ABYSSLINE Project in 2013 and 2015 yielded at least 38 megafaunal poriferan morphospecies (Amon *et al.* unpublished data).

Mining and resultant sediment plumes will likely have severe consequences for CCZ fauna, with sponges being particularly susceptible. This is because sponges are sedentary (individuals would be unable to move away from areas impacted by mining) and are filter feeders living in a habitat characterized by very low suspended sediment concentrations; mining plumes thus are expected to foul respiratory and feeding structures, dilute suspended food particles, and impair other physiological functions (Becker *et al.* 2001; Sharma *et al.* 2001; Tjensvoll *et al.* 2013; Bell *et al.* 2015; Lim *et al.* 2017). Additionally, physical extraction of nodules, and nodule