**Exploration of the Vema Fracture Zone, tropical Mid-Atlantic Ridge.**

**Contact Information**
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**Willing to Attend Workshop?**
I would like to, but have a conflicting commitment that week in another state.
**Target Name(s):** Mid-Atlantic Ridge
**Main Feature(s)/Area(s) of Interest:** Vema Fracture Zone
**Geographic Area(s) of Interest within the North Atlantic Ocean:** South Central
**Relevant Subject Area(s)**
Biology, Geology, Chemistry, and Physical Oceanography
**Description of Topic or Region Recommended for Exploration**
Brief Overview of Area or Feature.

The Mid-Ocean Ridge system is the largest continuous geological feature on the planet. The Vema Fracture Zone (VFZ), centered at about 11° N, 42° W, is one of the largest transform faults of the Mid-Atlantic Ridge (MAR) in the North Atlantic. It displaces the axis of the ridge by 320 km. The fault has a prominent valley, up to 5200 m deep. The fracture zone appears to be a major deep-sea corridor connecting the abyssal West and East Atlantic Basins. Its role in north-south biogeography has not been investigated, nor has small-scale biological and geological variability in the VFZ.

Brief Summary of Current State of Knowledge.

The Dec 2014-Jan 2015 Vema-TRANSIT expedition of the German RV Sonne examined bathymetry and benthic macrofauna at a few stations within the VMZ during a trans-Atlantic passage (Figure 1). Methods included multi-beam bathymetry and biological sampling using a camera-epibenthic sledge. The primary goal was consideration of the VFZ as a biogeographic conduit between the abyssal basins to the east and west. A recent special issue of Deep-Sea Research II included 16 papers on a variety of fauna and habitat characteristics, plus a general overview of the expedition. The 2018 Deep-Sea Biology meeting in September, Monterrey CA includes four additional presentations.

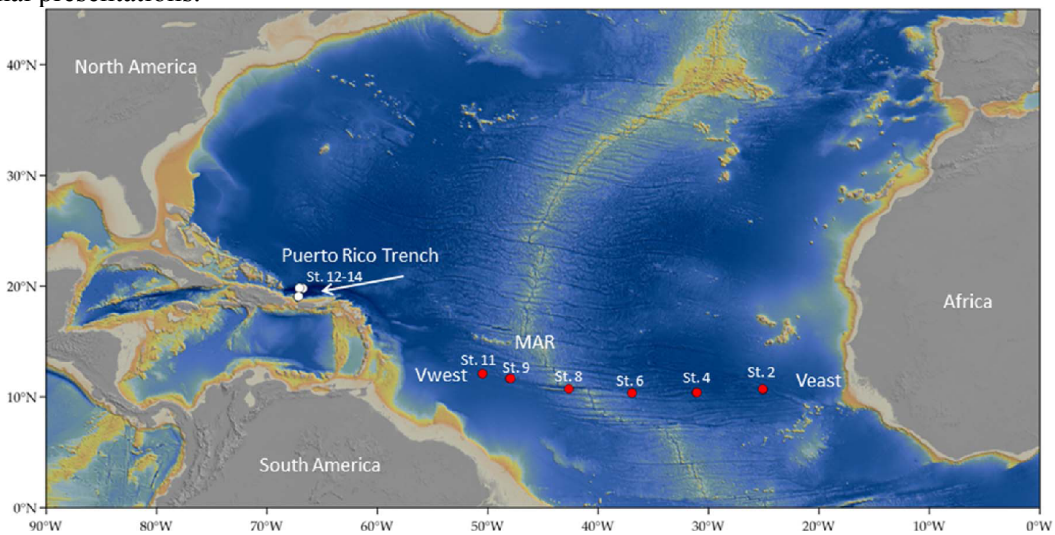

Figure 1. RV Sonne stations during the Vema-TRANSIT expedition (Brandt et al., 2018)

Additionally, published records of vesicomyid clams *A. southwardae* in the VFZ suggest the presence of reducing habitats in this area. The off-axis position of these records may indicate a new type of reducing habitats. Also, discrete-depth midwater sampling for zooplankton and micronekton was conducted east and west of the VFZ by the Census of Marine Zooplankton project of the Census of Marine Life.

Rationale for Future Exploration.

Recently, ecosystems of the Mid-Atlantic Ridge (MAR) have received increasing attention. On the MAR between the Azores and the VFZ, the International Seabed Authority (ISA) has approved 15-year exploration contracts for polymetalic sulphide deposits to Russia, France, and Poland (https://www.isa.org.jm/contractors/exploration-areas). Protection of the marine environment on the MAR under regulations of the ISA has therefore become a priority. The ISA works with experts on deep-sea ecology toward a Strategic Environmental Management Plan (SEMP) for the MAR based on the principles applied for the SEMP for manganese nodule fields of the Clarion-Clipperton Fracture Zone (ISBA/18/C/22). These include the principle that the network of protected areas should capture the full range of habitats and communities in the region. The northern MAR is predominantly a soft-sediment environment, ~94% of the ridge is flat or gentle slope (5°-30°). Fracture zones are not only important elements of the ridge structure, but they apparently provide a bulk of hard substrate habitats on the ridge. Biota of these habitats in tropical regions have never been explored in detail

In contrast with the very large-scale trans-Atlantic focus of the Vema-TRANSIT expedition, we propose to examine smaller-scale patterns using a strategy similar to that of the ECOMAR project on the Charlie-Gibbs Fracture Zone of the northern MAR. We want to examine locations north and south of the VFZ, both east and west of the MAR axis, in addition to comparative dives in the deep central valley of the VFZ. The project is aimed at revealing faunal changes and connectivity of benthic populations at the MAR segments offset by the VFZ. Specific objectives include (1) examination of hard substrate and soft sediment faunas inside the Vema transform fault and adjacent ridge areas, (2) detailed bathymetric mapping and investigation of the seafloor in the area of the Vema fault with assumed reducing habitats, and (3) exploration of the ridge structure in the tropical part of the MAR. As an adjunct to the primary benthic focus of this exploration, we propose to conduct standardized Okeanos midwater transects at the ends of some or all dives.

**Relevant Partnerships**

The following colleagues have expressed interest in participating:
Andrey Gebruk, P.P. Shirshov Institute of Oceanology, Russian Academy of Sciences.
Louise Allcock, School of Natural Sciences and Ryan Institute, NUI Galway.
Tracey T. Sutton, Rosanna Milligan, and Tamara Frank, College of Natural Sciences and Oceanography, Nova Southeastern University.
Kevin Boswell, Department of Biological Sciences, Florida International University
Additionally, Louise indicated that NERC might be interested. The German Ministry for Science and Education might also be interested as a follow-up to their Vema TRANSIT expedition and the International Seabed Authority may be interested for defining representative habitats for protection.

**References**


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Priede I.G., O.A. Bergstad, P.I. Miller, M. Vecchione, A. Gebruk, et al. 2013. Does presence of a mid-ocean ridge enhance biomass and biodiversity? *PLoS ONE* 8(5): e61550. doi:10.1371/journal.pone.0061550

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