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Late Neogene foraminifera from the northern Namibian continental shelf and the transition to the Benguela Upwelling System

Eugene W. Bergh, John S. Compton, Peter Frenzel



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4 **Eugene W. Bergh<sup>\*1,2</sup>, John S. Compton<sup>2</sup> and Peter Frenzel<sup>3</sup>**

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7 <sup>1</sup>Natural History Department, Iziko South African Museum, P.O. Box 61, Cape Town

8 8000, South Africa; <sup>2</sup>Marine Research Institute and Department of Geological

9 Sciences, University of Cape Town, Private Bag X3, Rondebosch, 7701, South

10 Africa; <sup>3</sup> Institut für Geowissenschaften, Friedrich-Schiller Universität Jena, D-07749

11 Jena, Germany

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13 **Abstract**

14 Middle Miocene to Plio-Pleistocene foraminifera provide insights into the  
15 palaeoenvironment on the northern Namibian continental shelf located at the far  
16 northern end of the present-day Benguela Upwelling System (BUS). Biostratigraphy  
17 and Strontium Isotope Stratigraphy (SIS) of the recovered basal olive-green mud unit  
18 indicate an age of 16 to 14 Ma. A sharp, erosional contact separates the basal mud  
19 from the overlying Plio-Pleistocene gravelly pelletal phosphorite sands. Grain size  
20 data, P/B ratios and benthic diversity indices indicate a change between the middle  
21 Miocene and overlying Plio-Pleistocene palaeoenvironments linked to the timing and  
22 conditions associated with the initiation of the BUS. The different lithological units  
23 and microfossil assemblages in the olive-green mud unit and the overlying pelletal  
24 phosphorite units support the late Miocene initiation of the BUS and the northwards  
25 migration of the Angola-Benguela Front. Planktic foraminifera indicate a shift from  
26 warmer surface water conditions to cooler conditions during the initiation of the BUS.  
27 Benthic palaeobathymetric ranges and P/B ratios are consistent with outer shelf water  
28 depths suggesting a deeper palaeoenvironment during the Mid-Miocene Climatic  
29 Optimum (MMCO) than today. Benthic foraminifera in the middle Miocene are  
30 dominated by large (>1mm) taxa and adapted to oligotrophic environments before the  
31 initiation of the BUS. The benthic assemblage composition indicates that bottom  
32 water conditions changed to eutrophic conditions during the Plio-Pleistocene under  
33 intensified upwelling conditions.

\*Email address: ebergh@iziko.org.za

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