Dissolved Oxygen across the Paleocene/Eocene Boundary at the Paleocene/Eocene global standard Stratotype-Section and Point

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Dissolved oxygen at the Paleocene/Eocene Global Standard Stratotype-section and Point, Luxor, Egypt are calculated based on quantitative analysis of the recorded calcareous benthic foraminiferal dysoxic, suboxic, and oxic indicators, in order to investigate the cause of the benthic foraminiferal turnover and extinction across the Paleocene/Eocene Thermal Maximum (PETM) interval. The studied interval comprises the El-Hanadi, Dababiya Quarry (DQBs 1–5), and the El Mahmiya Members of the Esna Formation. Ninety two calcareous benthic foraminiferal species (2 porcellaneous and 90 hyaline) are identified and classified into 46 genera (31 infaunal and 15 epifaunal microhabitats), 24 families, 15 superfamilies and 3 suborders. These 92 species are found within the size fractions 63 – 500 µm and concentrated within the size fractions 63 – 350 µm (High rate of calcium carbonate dissolution).

Taxonomic and quantitative analyses of the recorded calcareous benthic foraminifers reflect stressful environmental conditions at the seafloor across the DQBs, which are characterized by: 1) Low oxic condition (1.5009 ml/l O_2) at the uppermost 7 cm of the El-Hanadi Member, which is decreased upward into anoxic condition (0.0 ml/l O_2: Dissolved Oxygen Excursion Event) within DQB 1. These conditions may be caused by gradually increasing in temperature, which terminated within DQB 1 (PETM: > 50ºC) and in salinity (up to > 50‰: high rate of calcium carbonate dissolution), and by breathing of bacteria during decomposition of organic matter (DQB 1 is rich in organic matter). Accordingly, benthic foraminiferal species of relatively shorter oxygen, temperature, and salinity ranges of tolerance for survival were gradually move out or die and replaced by species of relatively longer oxygen, temperature, and salinity ranges of tolerance for survival until completely disappear within DQB 1 (Benthic Foraminiferal Extinction Bioevent). And 2) Dysoxic condition (0.0592 ml/l O_2) at the base of DQB 2, which increasing upward into suboxic condition within the DQB 5 (0.7180 – 0.9174 ml/l O_2) and at the basal part of the El Mahmiya Member (1.0918 ml/l O_2). These conditions may be caused by gradual decreasing upward of temperature and salinity and by aquatic plant and algae photosynthesis.