Numerical taxonomy applied to Upper Triassic Megalodontidae: first attempts on the genera Neomegalodon and Triadomegalodon

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Fossil bivalves of the *Megalodontidae* family are among the most distinctive and studied skeletal components of Upper Triassic shallow-marine carbonates. Well-known examples of these extinct bivalves come from the carbonates of the Dolomia Principale and Dachstein Limestone Formations (Vegh-Neubrandt, 1982). Megalodontids typically occur as dissolved moulds, given the metastable nature of the original aragonitic shell. Accordingly, taxa classification is primarily based on geometrical rather than shell features. In the last century, paleontologists have examined Megalodontids by means of objective parameters without a formally accepted and unique criterion (Allasinaz & Zardini, 1977; Vegh-Neubrandt, 1982).

This study aims at deepening the knowledge about *Neomegalodon* and *Triadomegalodon* by means of numerical taxonomy, rarely applied before. These genera share an almost identical cardinal formula, though differ for some morphological characters (Allasinaz & Zardini, 1977; Vegh-Neubrandt, 1982; Yao et al., 2012).

The studied dataset included 41 taxa: 33 species assigned to *Neomegalodon* and 8 to *Triadomegalodon*, described by 7 morphological parameters (Tichy, 1980; Vegh-Neubrandt, 1982), were imported into MATLAB. To ensure data consistency some taxa were excluded. A *MANOVA* test revealed that the currently accepted separation between the two genera is not statistically significant ($p>0.05$). To analyze potential inter-data relationships, a hierarchical clustering algorithm (*UPGMA*) was performed after z-score normalization. The output dendrogram highlighted that the selected specimens can be still effectively separated into two clusters. The produced clusters include both *Neomegalodon* and *Triadomegalodon* species and, thus, they are not genus dependent. An additional *MANOVA* test supports that the distinction between the latter two clusters is statistically significant ($p<0.0001$). As shown by scatter plots, one cluster includes specimens with normally higher shell length/shell height ratio, lower furrow width/shell thickness ratio, and a less developed lunule with respect to the other cluster.

This work provides new insights on *Megalodontidae* via the application of statistical analysis and set the stage for further and more in-depth studies at the family level.

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