MORPHOMETRIC DESCRIPTION OF COSMOPOLITAN EARLY CRETACEOUS INOCERAMID BIVALVES

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Inoceramidae (Bivalvia) was a diverse, cosmopolitan family of large Cretaceous bivalves which occupied a wide range of marine environments, and experienced high rates of speciation. For biological and taphonomic reasons inoceramid taxonomy has been based almost exclusively on only two characters: shape and ornament. These characters commonly display high degrees of intraspecific variability. Previous biometric studies, using linear and angular measurements (eg. shell length, umbonal angle), have successfully discriminated between closely related species, and have overturned earlier qualitative taxonomies. Even comprehensive linear and angular measurements suffer from several disadvantages. They are restricted by instrumental limitations, are time consuming to gather, and neglect much information inherent in outline shape. Hence, the present study attempts to quantify differences in inoceramid shape and ornament using outline shape analysis complemented by a few simple distance measures. A digitised outline can be exactly described by a set of elliptic Fourier coefficients, and sets of such coefficients are treated as variables in a multivariate analysis of shape.

These methods have been used to examine the cosmopolitan, morphologically highly plastic, and highly subdivided Albian species *Birostrina concentrica* (Parkinson) and related forms. Collections from New Zealand (southern high latitude), England (northern high latitude), and Switzerland (Tethyan) show significant differences in the shape and maximum size of individuals. Preliminary analyses, however, have shown that within any region it is difficult to identify distinct sub-groupings based on shape or ornament. Furthermore, the total volume of morphospace occupied by *B. concentrica* (*s.l.*) can be accounted for largely by changes in morphology through ontogeny. In other words, for example, the change in shape of an individual through ontogeny can exceed the morphological distance between described subspecies. Ongoing morphometric examination of populations from different stratigraphic horizons is helping to unravel evolutionary and biogeographic patterns which are otherwise difficult to demonstrate.

Shape analysis is a tool that is largely underexploited by macropalaeontologists, and is particularly useful for the description of taxa with few landmarks or easily defined characters.