

## A GLOBAL SPECIES DATABASE OF TRILOBITA: PROGRESS, RESULTS, AND REVISION OF THE *TREATISE*

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A comprehensive global species database of Trilobita includes 22,405 records of which 20,541 are valid species. The relational taxonomic database was compiled directly from the primary literature, and includes classification to traditional genus [compiled by Jell and Adrain (2003) with updates and corrections], subfamily, family, suborder, and order level. Stratigraphic information includes primary data such as formation, member, regional zone, stage, etc., and also assignment to a series of 37 global sampling bins from Lower Cambrian to Upper Permian. Geographic information is recorded as both modern geopolitical entities and tectonic elements. Data on type specimens are recorded. Historical published diagnoses are compiled for each taxon along with full synonymies, though this work is far from complete. Image fields will eventually include all published images of each species, but this task again has only just begun. An associated literature database includes over 5,400 systematic trilobite publications.

The compilation permits the first direct assessment of the performance of higher taxa as proxies of sampled species diversity. Trilobites have been proffered as an example of potential bias in this proxy relationship due to different amounts of taxonomic “splitting” in different time intervals, particularly in Cambrian versus post-Cambrian taxonomy. If the average number of species per genus changes non-randomly through time, higher taxic patterns might depart from species patterns. It is demonstrated that genera, somewhat surprisingly, are nearly exact proxies for sampled species diversity, but that families are very poor proxies and should probably not be used in paleobiological studies of summed diversity per unit time.

A temporally corrected species sampling curve reveals several features not previously apparent on curves derived from higher taxa (families and genera). Trilobites reached their peak species diversity much earlier during the Cambrian than previously appreciated. By the Late Cambrian, diversity had declined nearly to levels typical of the remainder of the Early Paleozoic. Further, the post-Cambrian peak in species diversity occurred during the Early Devonian, at which point trilobites were nearly as globally diverse as during the Late Cambrian.

Hierarchical cluster analysis (using Sorensen distance and flexible beta linkage) of all 165 trilobite families according to their species diversity in each of the 37 intervals reveals a striking pattern of six distinct evolutionary faunas. The Ordovician and post-Ordovician Ibex and Whiterock faunas of earlier

analyses (Adrain *et al.*, 1998, 2004), are confirmed by these much more detailed data. A further four Cambrian and Cambrian-Ordovician clusters are equally disjunct. All trilobite families belong to one of these evolutionary faunas, each with a unique pattern of temporal diversification.

It is anticipated that this database will form the foundation for the remaining revised trilobite volumes of the *Treatise on Invertebrate Paleontology*, for which I have agreed to serve as coordinating editor. While authors responsible for particular groups will (of course) be encouraged to adjust the classification and improve the database, the primary information has now been compiled for the entire group. It is hoped that the database can be made available to all as a web-based community resource. Funding avenues for further community-based development and for completion of the remaining *Treatise* volumes are being explored.

## REFERENCES

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