GEOLOGY POSTER 16

ECHINODERM PALAEOECOLOGY FROM FRAGMENTS: A TOOL FOR FACIES RECOGNITION IN MESOZOIC CARBONATE SEQUENCES

Aaron W. Hunter

Geoscience & Petroleum Engineering Department, Universiti Teknologi PETRONAS, Bandar Seri Iskandar, Tronoh, Perak, Malaysia
E-mail: aaron_hunter@petronas.com.my

Echinoderms such as crinoids (sea lilies), are a major component of the marine benthos from the late Palaeozoic onwards, where they occurred in such high number so as to be rock forming. On death echinoderms will typically disarticulate into many thousands of ossicles which are considered by many palaeontologists to be indeterminate (Benton and Simms 1995). Research into Mesozoic fossil crinoids has demonstrated that there is currently a lack of understanding of their environmental palaeoecology. This is in part due to taxonomy based soley on exceptionally preserved whole specimens. Thus it has become necessary to consider fragmentary ossicles in defining a more representative palaeoecology.

Bulk sampling (10 to 40 kg) of Middle Jurassic (Bathonian) carbonate and muddy sediments of England, where marine environments ranging from open shelf to lagoon are represented, has yielded numerous crinoid ossicles. Extensive work on exceptionally preserved Middle Jurassic crinoids from northern Switzerland and British Lower Jurassic has enabled identification of crinoid ossicles from the English Bathonian to generic level (Hess 1975).

Results indicate that the colonisation patterns of crinoids are strongly influenced by facies type, allowing the community structure of the crinoids to be clearly defined in ecosystems delineated by substrate type and degree of marine connection. Thus distinct crinoid communities, based on the presence and absence of generic indicators, can be deduced (Hunter & Underwood 2009).

After being successfully developed, the 'crinoid model' was taken a stage further, with its application to three more echinoderm groups: echinoids (sea urchins), asteroids (starfish) and ophiuroids (brittlestars). Previously it was noted that lack of homology in the ossicles made identification beyond family level problematic within these groups. As with the crinoids, examination of complete specimens in museum collections has allowed the recognition of diagnostic ossicles that can identify tests, spines and marginal plates to generic level.

These new data has allowed the construction of a model for echinoderm palaeoecology across marginal marine environments. The application of this model to marine environments outside the British Jurassic, such as the Middle Jurassic of France and the Western Interior, USA, has demonstrated that factors such as substrate and marine connection (salinity) have a greater bias than palaeogeographical and stratigraphic controls.

I propose that the small size of these echinoderm micro-fragments and the large number found preserved, means that they can be used as tool for facies recognition alongside other more traditional fossil groups, such as foraminifera and ostracods and are far more informative than many other macrofossils currently used.

REFERENCES

BENTON, M. J., and SIMMS, M. J., 1995. Testing the marine and continental fossil records, Geology. 23: 601-604.

HESS, H., 1975. Die fossilen Echinodermen des Schweizer Juras. Veroffentlichungenaus dem Naturhistorischen Museum, Basel. 135p.

HUNTER, A.W., and UNDERWOOD C. J., 2009. Lithofacies and Taphofacies control on distribution of crinoid habitats in the Bathonian (Middle Jurassic) of England and France, Acta Pal. Polon. 54: 77-98.

Warta Geologi (Newsletter of the Geological Society of Malaysia), Vol. 37, No. 1, January-March 2011