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ECHINONEUS & *ECHINOMETRA* – TWO NEW RECORDS OF TROPICAL ECHINOIDS FROM THE MIOCENE OF AUSTRIA AND THEIR PALAEOCLIMATIC IMPLICATIONS

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During recent investigations in the Badenian of the Austria two echinoid species were recovered that were not known from this area before. One of them, a species of *Echinoneus*, is recorded for the first time from the whole Paratethys and the second, *Echinometra mathaei*, was known only by a single specimen from the southern-most part of the Central Paratethys before. The extant relatives of both are common in the tropical zone today and their occurrence in the Middle Miocene of the Central Paratethys implies similar high-temperature conditions during the deposition of the Leitha limestone. This is in strong contrast to recently published results which imply a cool-water origin (RANDAZZO et al. 1999), and supports earlier studies which proposed deposition during a climatic optimum (e.g. RÖGL, 1998; HARZHAUSER et al., 2003 and references therein).

The specimens of *Echinoneus* come from bioclastic coralline algal wackestone exposed in the Kreide AG quarry at Müllendorf (Bgld, Austria). There they are associated with a species of *Brissus*. The two extant species of *Echinoneus* (*E. cyclostomus* and *E. abnormalis*) are widespread in the tropical zone. While nearly nothing is known on the ecology of *E. abnormalis*, *E. cyclostomus* is better studied. It is a cryptic, if not always really burrowing species and is found in the shallow sublittoral of the tropical region (circumtropical) except at the west coasts of America, Africa and Australia. Usually it is associated with rocks or reef debris of coarse sand to gravel size and is often found attached to the underside of coral slabs. Although rarely recovered (due to its cryptic habit) it seems to be a common member of shallow water reef habitats in the Caribbean (HENDLER et al., 1995) and the Indo-Pacific (MORTENSEN, 1948; ROSE, 1978). FONTAINE (1953) and ROSE (1978) suggested that *E. cyclostomus* indicates the proximity of reefs, thus being potentially a very valuable indicator in palaeoenvironmental reconstruction. Both in extant environments (KIER & GRANT, 1965) and the fossil record (CHALLIS, 1980; DONOVAN & VEALE, 1996; and references therein) the co-occurrence of *Echinoneus* with *Brissus* in biodetritic sediments close to reef-like structures was recorded. In the present occurrence the same situation is observed.

Echinometra mathaei is here recorded from the Leitha limestone at Hundsheim (NÖ). Previously fossil representatives of this species were known only from the Badenian of Bulgaria (KOJUMDGIEVA & STRACHIMIROV, 1960, under the name *E. miocenica*), from the Mediterranean (e.g. the Rhône Basin, PHILIPPE, 1998) and the Red Sea (ALI, 1985). Today *Echinometra mathaei* is widespread and very common in the rocky intertidal and sublittoral (down to c. 30 m) of the tropical Indo-Pacific. The extremely poor fossil record is connected with the low preservation potential of the skeleton in the preferred habitat (the intertidal) and the general lack of sedimentation in that enviroment (KIER, 1977; GREENSTEIN, 1993; DONOVAN & GORDON, 1993). *Echinometra mathaei*, like its congeners, is restricted to the tropical climate zone today. Successful reproduction takes place in a narrow temperature interval between 28 to 36° C, although normal development only occurs at temperatures below 34° C (RUPP, 1973).

When the extant distribution of the genera *Echinoneus* and *Echinometra* is plotted on a sea surface temperature map it is apparent that their spatial distribution falls well within the 20° C winter isotherms over most of their range. Only along the west coasts of Florida and Australia their range extends across the 20° C winter isotherms, but is limited by the 15° C

isotherms. Employing an actualistic approach similar temperature ranges may be inferred for the fossil representatives of these two genera. Thus a deposition of the Leitha limestone and contemporaneous sediments of the Central Paratethys during a climatic optimum seems highly likely.

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