isthmus, resulting in reduced upwelling, which allows substantial reef growth in this area. Despite similar seasonal variations in salinity, temperature ranges show distinct differences between the two ocean bights: nearly constant temperatures year round in the Gulf of Chiriqui; seasonal temperature variations in the Gulf of Panama.

Coralline red algae are especially abundant in the Gulf of Chiriqui, where they occur with different species and growth forms: (1) thin, unilayered crusts (0-5 m below sea level), (2) multilayered, nodular rhodoliths on open shelf banks (20-50 m) affected by storm waves (Montuosa), and (3) open-branched rhodoliths in more protected shallow-water settings between islands (Secas, Contreras). Rhodoliths show a dominane of spheroidal gowth shapes indicative for a high-energy Rhodoliths pavement facies according to BOSENCE (1983).

Variations in the Mg/Ca ratio in coralline red algae have been widely reported to depict changes in (palaeo-) temperature of the ambient seawater environment (CHAVE, 1954; CHAVE & WHEELER, 1965; HENRICH et al., 1996; HALFAR et al., 1998, 2000). Growth banding in corallines has been used to calculate and compare growth rates in various environmental settings.

Corallines with open-branching thalli (*Lithothamnium* sp.) display a distinct banding with light and dense layers. Light bands consist of cells with thin walls and open lumina, whereas dense bands display thicker cell walls and narrow cell lumina. Mg/Ca mapping with a microprobe detector and EDX analysis along a profile along the thallus axis revealed a significant difference between open and dense layers: light bands show relatively high Mg values of 17.82 wt% (mean) and a Mg/Ca ratio of 0.21, dark bands have comparatively low values of 12.94 wt% Mg (mean) and a Mg/Ca ratio of 0.14. Comparison of Mg/Ca ratios in rhodoliths from the Gulf of Chiriqui and the Gulf of Panama suggests differences in growth rates of rhodoliths, which are explained by the seasonal temperature differences between the two gulfs.

Lithothamnium crassiusculum (Gulf of California) dwells under different hydrographic conditions: at nearly constant salinities (35.1-35.5‰) but with seasonal temperature fluctuations (19°-30°C). Mg concentrations range from 13.2 – 22.5 mol% $MgCO_3$ (Mg/Ca ratio 0.15 - 029) (HALFAR et al., 2000). In contrast, *Lithothamnium* sp. from Gulf of Chiriqui dwells under nearly constant temperatures (annual SST range 27°-29°C; 26°-27 °C in 40 m water depth) but strong salinity fluctuations (SST 25-35‰). Differences in Mg/Ca ratio between light bands (0.21) and dark bands (0.14) in the Panama species, therefore, suggest a much stronger salinity control of the Mg/Ca (palaeo-) thermometer signal than expected earlier.

In summary, the geochemical and isotope analysis of the coralline algae, in combination with the detailed analysis of corals and mollusks, will allow a precise determination of the seasonal variations in the different sea bights in which the above described coralline red algal carbonate community developed. This precise correlation will help us to unravel the evolution of the carbonate biotic communities within the sedimentary basins in response to the closure of the Isthmus of Panama.

THE LAST RUDIST ECOSYSTEMS IN EAST-CENTRAL MEXICO

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The Cardenas Formation in east central Mexico is of Maastrichtian age and contains some of the last rudist assemblages known worldwide (MYERS, 1968; JOHNSON & KAUFFMAN, 1996; SCHAFHAUSER et al., 2003). We analysed the biostratigraphy, depositional environment, and

sequence stratigraphic framework of the Cardenas Formation, as well as Sr-isotope ages ($^{87}Sr/^{86}Sr$) in plagioptychids, in order to reveal the timing and mode of rudist extinction in this region.

Rudists thrived in a wave-dominated shoreface delta system, which developed in the foreland belt of the uplifting Sierra Madre Oriental. Folding and thrusting within the foreland belt led to palaeohighs, which were exposed to erosion, and terrigenous sediment was transported into the sea by wave dominated deltas. As a result of high sedimentation rates and unstable environments rudist bioconstructions are of minor extension than in the underlying Valles San Luis Potosí carbonate platform (WILSON & WARD, 1995). The decrease in size is a result of significant loss in habitat due to the orogeny of the Sierra Madre Oriental. Progradation of the foreland belt led to increased sediment input, which covered the rudist biostromes and prevented further rudist settlement. Sr-isotope stratigraphy indicates an early late Maastrichtian (67.98 Ma) age for the last biostrome. Progradation of the foreland belt and a decrease in sea level caused subaerial exposure of the area, which resulted in the total loss of rudist habitat. This is indicated by the red terrestrial sand and siltstones of the conformably overlying Tabaco Formation, which has been deposited during the late Maastrichtian.

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COMPARISON OF DEVONIAN DELTHYRIDOID SPIRIFERIDS FROM CENTRAL EUROPE AND SOUTH CHINA (BRACHIOPODA)

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Delthyridoid spiriferids from the Devonian of Central Europe and South China are studied and compared side-by-side in order to elucidate possible phylogenetic relationships. At first, we have studied the genera *Arduspirifer* MITTMEYER, 1972 and *Rostrospirifer* GRABAU, 1931. Species of both genera have variably been assigned to *Acrospirifer* HELMBRECHT & WEDEKIND, 1923 or *Euryspirifer* WEDEKIND, 1926 in the literature, and they have been regarded as closely related to each other.

Whereas the genus *Arduspirifer* has been described in detail and is well-established (e.g. SOLLE, 1953; JANSEN, 2001; SCHEMM-GREGORY & JANSEN, 2004, 2005) the status of *Rostrospirifer* is still a matter of discussion (e.g. TALENT et al., 2001). Our side-by-side comparison of materials have shown that these genera are externally similar with regard to outline and macro- as well as micro-ornamentation, however very different concerning their internal structures.