Non-marine ostracode shell chemistry as a paleohydrochemical indicator: assumptions and constraints

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ABSTRACT: Some continental ostracodes show a relationship between temperature, the chemistry of their host waters and the trace-metal composition of their shells. It is commonly assumed that this relationship holds for most, if not all, ostracodes. We argue that this is unwarranted until the following criteria are satisfied: 1) trace-element uptake is in equilibrium with host waters and, 2) trace-element uptake is not affected by vital effects.

We measured the Mg/Ca and Sr/Ca content of two broadly distributed North American ostracodes, *Limnocythere ceriotuberosa* and *Candona caudata*. The fossils were collected from Pleistocene Summer Lake (south-central Oregon) sediments. *L. ceriotuberosa* was found through most of the sequence, and *C. caudata* occurred commonly at several intervals. *Limnocythere sappaensis*, *L. bradburyi*, *Candona patzcuaro* and *Cytherissa lacustris* also occurred, though less commonly. The assemblages indicate changes in paleotemperature, alkalinity and salinity through the sequence. Our paleoenvironmental interpretations concur with sedimentological and palynological evidence indicating several salinity excursions during the lake history.

89 valves of *L. ceriotuberosa* and 31 valves of *C. caudata* from 16 stratigraphical intervals, were analysed using inductively-coupled plasma-argon emission-spectrometry (ICPAES). These data provide a base for comparing the ostracode assemblage and sedimentological paleoenvironmental interpretations with the trace-metal method. The Mg/Ca and Sr/Ca molar ratios from individual shells of *L. ceriotuberosa* and *C. caudata*, at the same stratigraphical horizons, vary inversely with each other, but exhibit a positive correlation within each species. However, no correlation exists for the Mg/Ca or Sr/Ca ratios between species; and the ratios show a very weak or no correlation with the assemblage-based paleoenvironmental interpretations.

These results suggest that the species physiology may play a significant role in trace-element composition of the valves. Cadot & Kaesler (1977) concluded that Mg uptake in marine ostracode valves might be determined by their phylogenetic history. Our data suggest phylogeny may explain the Sr concentration as well. Indeed, if trace-metal concentration in some ostracodes relates to factors other than trace-metal concentrations or temperature of the water mass, then the use of non-marine ostracode shell chemistry as a paleohydrochemical indicator is brought into question. Chivas *et al.* (1985) determined experimentally that there was a positive correlation between salinity and trace-metal composition of the Australian ostracode *Mytilocypris henricae*. Conversely, Teeter & Quick (1990) found a negative correlation between salinity and the Mg concentration in

Cyprideis americana from the Bahamas. The inverse relationship between Mg/Ca and Sr/Ca ratios shown by *L. ceriotuberosa* and *C. caudata* suggests that, at a minimum, detailed culturing studies must be done on a species by species basis before using non-marine ostracode shell chemistry in paleohydrochemical investigations.

REFERENCES

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