CONCLUDING REMARKS — AGE AND ORIGIN OF CRUSTACEAN DIVERSITY IN “EXTREME” ENVIRONMENTS

BY

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INTRODUCTION

This special symposium was organized in honour of Jan H. Stock, in order to accentuate the important contribution of this well-known carcinologist to the present knowledge of global biodiversity, especially through the description of numerous groundwater crustaceans and their distribution. The subject fitted well within the main theme chosen for the Fourth International Crustacean Congress in Amsterdam, 1998, i.e., “Crustaceans and the Biodiversity Crisis”.

Jan H. Stock’s contributions not only increased our knowledge on the diversity of taxa living in one of the so-called “extreme environments”, groundwater, he also proposed hypotheses on the origin and antiquity of the various subterranean crustaceans he discovered. One of the more generally accepted working hypotheses is that the subterranean environment (for example caves) and the deep sea domain, share similar ecological conditions. Lack of light, low temperature variance, low energy availability, and perennial existence, all in terms of millions of years, form a complex of extreme environmental conditions (sometimes viewed as extremely stressful life conditions) to which organisms adapted both narrowly and in a predictable way (e.g., Howarth, 1993; Uiblein et al., 1996; Hoffmann & Parsons, 1997). This view was challenged, using different types of evidence. For example, Danielopol (1992, 1997) noted that groundwater-dwelling organisms adapted to their environment following the same ecological rules that operate for surface-dwelling organisms. Similarly, Van Dover (1999) recently noted that the deep sea is much more dynamic than previously perceived. This “extreme environment” thus also presented closer analogies to shallow wa-
ter habitats than was thus far accepted. In general, it may seem that mainly “common” rules apply in seemingly “extreme” environments.

The introduction to this special symposium (Danielopol & Martens, 1999, this issue) already stressed the interest of reviewing some of the other hypotheses developed by Stock, especially those pertaining to the colonization of inland subterranean waters by marine animals, and even more in particular those on the putative deep-sea origin of marine cave faunas. This hypothesis was first presented by the Austrian naturalist Theodor Fuchs (1894) and was recently revived by various marine biospeleologists, e.g., Iliffe et al. (1983, 1984). It was later refuted by Stock (1986), who took a completely opposite view, arguing for shallow-water ancestors of anchialine cave faunas. Recently, new biological, geological, and hydrological evidence has been presented which is relevant to this discussion and it seemed useful to re-evaluate all available data and hypotheses on this topic.

While trying to draft a program for this “Jan H. Stock Memorial Symposium”, it became apparent that actually this subject neatly fits into a wider framework, namely the comparative research on age and origin of crustacean diversity in various similarly “extreme” habitats, such as the deep sea, anchialine caves, groundwater and ancient lakes. Thus, it was decided to widen the topics of presentations and discussions. We were most curious to see how the contributors would embed their specific talks into this wider framework and are happy to confirm that we were far from disappointed, as the results have been both exciting and stimulating. Whereas the presentations effectively covered the entire range of topics, discussions mostly centred around two main topics. The first was, not surprisingly, the original central theme: are anchialine cave faunas derived from deep sea ancestors (and in relation to this, are extant deep sea faunas ancient or not)? The second topic related to age, origin, and persistence of the present-day crustacean diversity in other long-lived habitats, such as groundwater and ancient lakes. Here, not only evolutionary history but also ecological dynamics, allowing the persistence of high diversity levels, were extensively discussed.

The old proverb that science progresses through (intellectual) conflict has again been confirmed, as attendants of the sessions doubtlessly learned at least as much from discussions between advocates of opposing views, as they did from the talks themselves. It shows that such topical meetings in smaller groups can indeed be very useful, often more so than larger and less focused gatherings.