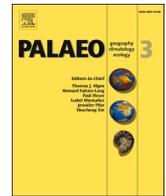




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Preface

Reading the diaries of life – Current advances in sclerochronological research

1. Introduction

In June 2019, 150 scientists from 26 countries convened at the 5th International Sclerochronology Conference (ISC) in Split, Croatia, to discuss current research and future directions in sclerochronological research. One special issue that emerged from this conference was recently published in the journal ‘Estuarine Coastal and Shelf Science’ (Peharda et al., 2020) and contains nine papers addressing bivalve and fish otolith sclerochronology. Noteworthy, it also includes an article on “Fundamental questions and applications of sclerochronology” (Trofimova et al., 2020), which presents results of a community-wide opinion-poll on research priorities in this field. Authors identified 50 key questions that can serve as stepping stones for collaboration and advancement of sclerochronology research.

A second topical issue that resulted from the 5th ISC is presented herewith and contains 20 papers, the great majority of which (14) are the result of international collaborations. Early-stage researchers (pH.D. students and postdocs) are lead authors of 14 papers, clearly illustrating the successful recruitment of a new generation of sclerochronology researchers. A total of 84 authors from 16 different countries contributed to this special issue, illustrating the geographic expansion of sclerochronology over the last decade.

The temporal scale covered in this issue is also broad. Some contributions involve exclusively fossil specimens (*Arctica islandica* in Butler et al., 2020 and Trofimova et al., 2021) with some as old as the Cretaceous (various species in Coimbra et al., 2020) and others from the Upper Albian or the Upper Turonian (*Inoceramus hercules* in Walliser et al., 2020). In some studies, modern and fossil materials are combined with representation from the Upper Holocene (Alexandroff et al., 2021), the Upper Holocene and Upper Pleistocene (Bayer et al., 2020), the Mid-Pliocene Warm Period and lower Pleistocene (Palmer et al., 2021), and the Lower Pliocene (Johnson et al., 2021).

The number of papers on sclerochronology continues to rise (Fig. 1). Noteworthy, *Palaeogeography, Palaeoclimatology, Palaeoecology* (PPP) became one of the most important outlets for the research in this field over the last two decades. This journal was also chosen for the current special issue given the success of prior, well-cited thematic issues on sclerochronology including the recent “New research in the methods and applications of sclerochronology” (Butler and Schöne, 2017) and “Modern calibration of paleoenvironmental proxies from biogenic carbonate geochemistry” (Prendergast et al., 2017). Earlier theme issues in this field were published in PPP in 2013 following the 2nd ISC in Mainz, Germany: “Unraveling environmental histories from skeletal diaries - advances in sclerochronology” (Schöne and Gillikin, 2013) and again following a session held during the American Geophysical Union Ocean

Sciences Meeting 2004 “Looking back over skeletal diaries - High-resolution environmental reconstructions from accretionary hard parts of aquatic organisms” (Schöne and Surge, 2005). The triennial International Sclerochronology Conferences, dedicated sessions at other conferences, and resulting thematic issues resulting are highly important for the development of the discipline, as there can be conspicuous pulses in output, as occurred in 2017 (Fig. 1).

2. Diversity of sclerochronological archives in this issue

Bivalves remain the most targeted taxa in sclerochronological research (Peharda et al., 2021), which is also reflected by the number of contributions to this theme issue. However, the number of studied bivalve species continues to rise clearly illustrating the efforts of the sclerochronological community to diversify research. Only two papers of this issue involve *Arctica islandica* (Butler et al., 2020; Trofimova et al., 2021) – the most frequently studied sclerochronological archive to date. According to a review published in this issue (Peharda et al., 2021), *A. islandica* has been a target species in over 60 scientific papers published between 2010 and 2019 (e.g., Butler et al., 2010; Shirai et al., 2014; Reynolds et al., 2016; Estrella-Martínez et al., 2019; Bonitz et al., 2018; Mette et al., 2019; Poitevin et al., 2019; Wanamaker Jr and Gillikin, 2019).

Other marine bivalve taxa in this issue include *Aequipecten opercularis* (Johnson et al., 2021), *Eucallista (Amiantis) purpurata* (Bayer et al., 2020), *Crassostrea virginica* (Goodwin et al., 2021), *Glycymeris glycymeris* (Alexandroff et al., 2021), *Mercenaria* spp. (Palmer et al., 2021), *Mercenaria mercenaria* (Goodwin et al., 2021), *Spisula solidissima* (Das et al., 2021; Moon et al., 2021), and *Venus verrucosa* (Uvanović et al., 2021). Many of these species are commercially important but have a quite short life span in comparison to *A. islandica* or *Neopycnodonte zibrowii*, whose longevities can exceed five centuries (Wisshak et al., 2009; Butler et al., 2013). According to Peharda et al. (2021) over 130 extant marine bivalve species from 35 families have been targeted by sclerochronology research in the last decade. The contribution by Bayer et al. (2020) in the present issue adds a new species to this list - *Eucallista (Amiantis) purpurata*. Bivalves living in habitats outside the open ocean also serve as promising environmental archives. Graniero et al. (2021) analyzed shells of the estuarine bivalve, *Rangia cuneata*. Furthermore, two freshwater species were investigated, namely *Elliptio complanata* (Graniero et al., 2021) and *Margaritifera laevis* (Watanabe et al., 2021).

Beyond bivalves, contributions to this theme issue also used gastropods, coralline red algae and corals, in some cases involving both modern and fossil specimens. Research conducted on gastropods includes Hollyman et al. (2020) on the whelk *Buccinum undatum*, García-

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