Werner Piller and the search for the origin of the Indian Ocean

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Already the pioneers of Austrian paleontology, such as Moriz Hörnes (1815–1868), Rudolf Hoernes (1850–1912) and Franz Xaver Schaffer (1876–1953), discussed the question from where the subtropical mollusc faunas of the Paratethys derived. At that time, most paleontologists considered the Indian Ocean as main source for marine faunal immigrations. The seminal paper by Fred Rögl and Fritz Steininger "Vom Zerfall der Tethys zu Mediterran und Paratethys", published in 1983, provoked a revival of Oligocene-Miocene paleobiogeographic research in Austria. A focal point was the timing of the closure of the Tethys Ocean. In respect to the very poor geological data on the Middle East, the Levant and Arabia, all paleobiogeographic considerations remained largely hypothetical. The only solution was to start own research projects in these regions. Consequently, Werner Piller in cooperation with Fritz F. Steininger and Markus Reuter initiated several FWF and DFG projects since the late 1990ies. First fieldtrips in Turkey, Greece, Egypt and central Iran led to a better understanding of the stratigraphy of the Eastern Mediterranean region and its marine faunas. It soon turned out, that the assumed connection into the Indian Ocean via the Iranian Qum Basin was a misconception, as this area was an embayment of the proto-Mediterranean Sea during Oligocene and early Miocene times (Harzhauser et al., 2002; Reuter et al., 2007). In the follow-up projects, the geographic focus shifted to the east and new data were collected in southern Iran, northern India, southern India, Sri Lanka, the Sultanate of Oman and Tanzania. For the first time, it was possible to compare coeval Oligocene and Miocene biota from the proto-Mediterranean Region with those from the early Indian Ocean. In contrast to traditional hypotheses, these efforts clearly documented a strong faunistic separation of both regions already during the early Oligocene (Harzhauser et al., 2007) and a complete loss of connectivity during the Miocene. The assumed immigration of molluscs from the Indian Ocean during the Burdigalian turned out to be a myth. In contrast, the working group traced west-east immigrations of Tethyan elements. Emblematic examples for this "go-east" scenario are found among strombid gastropods and tridacnid bivalves. Thus, the Western Tethys Region seems to have acted as centre of origin and diversity during Oligocene times (Harzhauser et al., 2007). After the final closure of the seaway, this centre had shifted to the southeast, heralding the enormous biodiversity of the modern Indo-West Pacific Region.

Despite the enormous success of the "Middle-East-working group", established by Werner Piller, the question of the origin of the Paratethyan mollusc faunas remained open. Recently, the tropical eastern Atlantic came into focus as potential centre of origin based on the similarity of some Miocene gastropod families with extant faunas on the genus level (Harzhauser & Landau, 2017). The Oligocene-Miocene development along the coast of western Africa, however, is completely unknown. Thus, this might be the starting point of a new research topic.

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