

Palaeobiogeography of Late Bajocian–Tithonian ammonites of northeastern Iran

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Jurassic rocks are widely distributed and superbly exposed in the Alborz Mts. (northern Iran) and Koppeh Dagh (northeastern Iran). The Lower Jurassic and large parts of the Middle Jurassic are characterized by a thick siliciclastic succession, whereas the Upper Bajocian to Tithonian rocks are predominantly carbonates, which represent a platform, slope and basin system. The Upper Bajocian–Tithonian ammonite faunas the NNE Iran are mostly of Submediterranean affinity, but elements of Subboreal, Mediterranean, and Ethiopian provinces are occasionally intermingled. Palaeobiogeographically the Late Bajocian to Bathonian ammonites belong to Submediterranean Province, as elsewhere in north and central Iran. This is supported by the occurrence of ammonites such as *Garantiana* and *Morphoceras* and some cosmopolitan taxa such as *Cadomites* and *Oxycerites*. In order to unravel the origin of the faunal elements and their migration routes, the relationship of the ammonite fauna of Iran to that of other regions was evaluated. On the whole, at the species level, the Toarcian to Early Bajocian ammonite faunas of northern and central Iran show a close relationship to that of northwestern Europe. A characteristic feature of this fauna is the scarcity of *Phylloceratidae* (accounting for less than 1% up to 3%) and the absence of *Lytoceratidae*. Remarkably, from Late Bathonian onward to Kimmeridgian, *Phylloceratidae* account for more than 50% of the ammonites fauna. Palaeogeographic reconstructions show the position of the Iranian plate (North and Central Iran) during the Middle Jurassic time at the southern margin of Eurasia at a palaeolatitude of around 30° N which rather corresponds to European regions (Enay & Cariou, 1997). The open migration routes across pericontinental shelf seas along the northern Tethyan margin that were approximately parallel to palaeolatitudes may explain the strong affinities of the Late Bajocian–Bathonian ammonites of northern and Central Iran to those of the Submediterranean Province. The Callovian ammonite fauna has a typical northwest Tethyan character, and belong to the Submediterranean faunal province (Seyed-Emami *et al.*, 2013), and are largely dominated by *Phylloceratidae* ammonites. These pelagic taxa that preferred open oceanic

conditions are accompanied consistently by *Perisphinctidae*, *Reineckeidae*, *Oppeliidae* (*Hecticoceratinae*), *Macrocephalitidae*, *Tulitidae*, *Aspidoceratidae* (*Parawedekindia*, *Peltoceras*). On the other hand, this is supported by the occurrence of Submediterranean ammonites such as *Macrocephalites*, *Pachyceras*, and some cosmopolitan taxa such as *Hecticoceras* and *Reineckeia*. Some taxa from the Oxfordian–Kimmeridgian belong to the Western Tethys Province (*Sequeirosia* and *Passendorferia*) or Subboreal Province (*Cardioceras*). It is remarkable that, besides some cosmopolitan ammonites, there is no direct connection with faunas from southwestern Iran, western India and the southern Tethys.

Finally, the Tithonian ammonite faunas of northeastern Iran are mostly of Submediterranean affinity (Seyed-Emami *et al.*, 2013). However elements of the Mediterranean faunal provinces occasionally occur. In order to unravel the origin of the faunal elements and their migration routes, the relationship of the ammonite fauna of Iran to that of other regions need to be analysed in the future. Especially the appearance of several allegedly regionally restricted *Ataxioceratidae* such as *Phanerostephanus*, *Nannostephanus*, *Nothostephanus* and the *Oppeliidae* as *Oxylenticeras*, which occur in Ethiopian Province (Page, 2008) is of great palaeobiogeographical interest.

References

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