Collective behaviour in 480-million-year-old trilobite arthropods from Morocco

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SUPPLEMENTARY TEXT

Supplementary Text | General information on *Ampyx priscus*: morphology and distribution.

Genus *Ampyx* DALMAN, 1827

Type-species : *Ampyx nasutus* Dalman, 1827 (by monotypy)

Ampyx priscus THORAL, 1935

1935. *Ampyx priscus* nov. sp. - Thoral[1], p. 305; Pl. 28, Figs 7-10.
1946. *Ampyx priscus* THORAL - Thoral[2], p. 92.
1966. *Ampyx priscus* THORAL - Dean[3], p. 279; Pl. 3, Figs 1-8; Pl.4, Figs 1-6.
1986. *Ampyx priscus* THORAL - Bérard[4], p. 135; Pl. 12, Figs 1-6, 8, 9.
1998a. *Ampyx* cf. *priscus* THORAL - Vidal[5], p. 61; Pl. 10, Figs 3-9.
2008. *Ampyx* - Chatterton and Fortey[6], p. 76; Pl. 1, Figs 6-9.
2016. *Ampyx priscus* THORAL - Martin et al. [7], p. 144

Description*:* Cephalon with a parabolic anterior outline. Prominent elliptical glabella, strongly convex, raised well above the cheeks, inflated anteriorly, with usually one pair of tiny muscle spots just anterior to the occipital furrow (exceptionally two pairs in rare specimens from Montagne-Noire). These two spots form a constricted area at the base of the glabella. No eyes. Well-developed straight glabellar spine pointing forward, with a tapering shape, slightly tilted upwards, about twice as long as the glabella and probably hollow. Its basal part bears a median ventral groove (Supplementary Fig. 1k). The rest of the spine has an elliptical transverse section. The librigenae are relatively narrow, display a broad sigmoidal boundary with the cranidium, and extend postero-laterally into a pair of long and slender librigenal spines. Distally these elongated spines run almost parallel to the main longitudinal body axis. Their total length is at least twice that of the exoskeleton (excluding glabella spine), exceptionally more than three times. The librigenal spines are grooved on both sides along their entire length. The ventral groove is the deepest and is flanked by an inner and outer lobe. The dorsal groove demarcates a narrow outer lobe from a much broader inner one. Thorax with 6 segments at holaspid stage. Its width reaches a maximum at the second segment, then decreases regularly towards the pygidium. The anterior margin of the pleurae of the first segment is slightly truncated and fits against the posterior margin of the cephalon. Pygidium subparabolic, with a median posterior notch. Its width is about twice its length (sag.). The distal part of the pygidial axis has a triangular shape and does not reach the pygidium posterior margin. The segmentation of the pygidium is very weak on external moulds (anterior pleural furrows curved backwards, only). Internal moulds show up to three rings along the pygidial axis added to the anterior half ring.

Stratigraphic range and palaeogeographic distribution

Ampyx priscus is reported from the Saint-Chinian, La Maurerie and Landeyran formations in the Montagne Noire (Hérault, southern France, about 100 km W of Montpellier[8,9]), dated from the Tremadocian to Floian[10,11]. In Morocco, this species occurs from the late Tremadocian to the Floian of the Fezouata Shale[12] (see Supplementary Fig. 1). In the Meseta (northern part of Morocco) a congeneric species comparable with *A. spongiosus* from Spitzberg was found in possibly younger Floian horizons[13]. In addition to French and Moroccan localities, *A. priscus*

occurs in other localities of the peri-Gonwanan margins such as Sardinia[14] (Pillola, pers. comm. to MV) and possibly Turkey[15, 16] although no precise specific assignment is possible due to the poor preservation of the Turkish material.

Palaeoenvironments

Ampyx belongs to Raphiophoridae, a trilobite family which defines the eponymous biofacies[17,18] in the mid-shelf environments of Avalonia[19]. The raphiophorid biofacies was recognized in the Lower Ordovician of the Anti-Atlas[20] and constrained more precisely by recent sedimentological studies[21,22] in the Zagora area of Morocco. *Ampyx priscus* is typically found associated with with Asaphidae, sometimes with *Parabathycheilus*, *Colpocoryphe* and *Toletanaspis*. In Morocco *A. priscus* occurs in lower shoreface to upper offshore environments and is associated with fine sediments (mainly siltstones, more rarely mudstones) deposited slightly above and below the storm wave base (SWB; see Supplementary Fig. 1) by episodic distal storms (with no reworking of sediment at water-sediment interface) or through background sedimentation[7,12,21,22].

Supplementary references

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