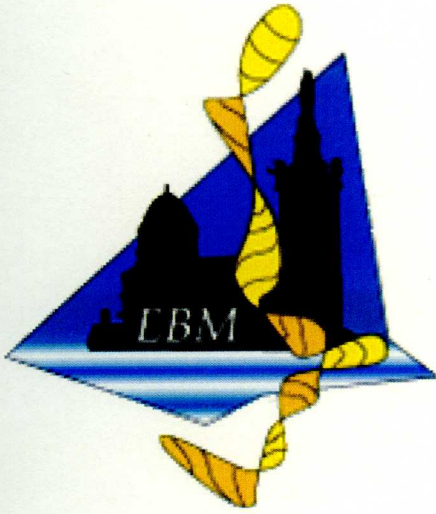


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A new Cambrian lobopod-bearing animal (Murero, NE Spain) and the problem of the ecdysozoan early diversification

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The Cambrian Xenusia are a highly morphologically variable group which includes vermiform lobopod-bearing animals with diverse cuticular elements, different muscular body systems, and variously differentiated head region. Trunk appendages also vary in length, stiffness, and ornamentation including terminal claws. The latter being preserved separately are treated among the earliest skeletal fossils and commonly are assigned to protoconodont-like teeth (*Mongolodus*, *Maldeotaia*).

A new xenusian is found in the Valdemedes Formation (uppermost Bilbilian Stage, former Lower Cambrian) representing the Murero Lagerstätte interval (Mesones Group) of the Cadenas Ibéricas (Aragon, north-eastern Spain). This part of the formation accumulated in calm, open sublittoral marine conditions. The fossil is preserved as a flattened compression in finely laminated pelitic green shale and replicated with chlorite. The preserved part of the fossil shows proboscis and stubby lobopods and, thus, is interpreted as the anterior part of a xenusian body including the head and anterior trunk area. The lobopods are not differentiated and are extremely short by comparison with those of other known xenusians. Besides, the new xenusian lacks any cuticular elements and its surface is smooth. The ratio of the lobopod length to the body width reveals that this xenusian hardly was able to use them for walking on the bottom surface. Possibly, it could use them for anchoring the body on the sediment surface or even within the sediment during warm-like crawling.

Such living conditions, probably, were not artificial for xenusians as some of them possessed appendages pointed laterally (Sweden *Orstenotubulus*) and some others had appendages extremely long for a normal walking locomotion (Chinese *Luolishania*) while some xenusians even born appendages on the anterior body area only (Chinese *Facivermis*).

In summary, the xenusian ground plan includes a segmented vermiform body lacking tagmosis; a non-retractable proboscis; paired lobopod appendages pointed laterally and equipped with terminal claws; a laminated chitinous-phosphate cuticle displaying a repeated anatomical patterning; a straight digestive tract with both terminal mouth and anus and axial paired midgut diverticulae; and a voluminous body cavity of probable coelomic type surrounded by peripheral circular and longitudinal cross-striated musculature in addition to which diagonally oriented fibres might be developed.

Highly morphologically variable xenusians, which crawled with their lobopods along the sediment surface, may gave rise to four morphofunctional lineages, namely, to stem-lineage cephalorhynchs or cycloneuralians (*via Facivermis*-type forms) by adaptation for

burrowing with introvert; to tardigrades (*via Hadranax*-like forms) by adaptation for interstitial habitat; to stem-lineage panarthropods (*via Luolishania*-type forms) by adaptation to walking life style with joint appendages; and to anomalocaridids (*via Kerygmachela*-type forms) by adaptation to swimming with lateral flaps in the pelagic realm.