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Cell Lineage, Axis Formation, and the Origin of Germ Layers in the Amphipod Crustacean *Orchestia cavimana*Carsten Wolff ... Gerhard Scholtz ¹ [Show more](#)<https://doi.org/10.1006/dbio.2002.0789>[Get rights and content](#)Under an Elsevier [user license](#)[open archive](#)

Abstract

Embryos of the amphipod crustacean *Orchestia cavimana* are examined during cleavage, gastrulation, and segmentation by using *in vivo* labelling. Single blastomeres of the 8- and 16-cell stages were labelled with Dil to trace cell lineages. Early cleavage follows a distinct pattern and the a/p and d/v body axes are already determined at the 4- and 8-cell stages, respectively. In these stages, the germinal rudiment and the naupliar mesoderm can be traced back to a single blastomere each. In addition, the ectoderm and the postnaupliar mesoderm are separated into right and left components. At the 16-cell stage, naupliar ectoderm is divided from the postnaupliar ectoderm, and extraembryonic lineages are separated from postnaupliar mesoderm and endoderm. From our investigation, it is evident that the cleavage pattern and cell lineage of *Orchestia cavimana* are not of the spiral type. Furthermore, the results of the labelling show many differences to cleavage patterns and cell lineages in other crustaceans, in particular, other Malacostraca. The cleavage and cell lineage patterns of the amphipod *Orchestia* are certainly derived within Malacostraca, whose ancestral cleavage mode was most likely of the superficial type. On the other hand, *Orchestia* exhibits a stereotyped cell division pattern during formation and differentiation of the germ band that is typical for malacostracans. Hence, a derived (apomorphic) early cleavage pattern is the ontogenetic basis for an evolutionarily older cell division pattern of advanced developmental stages. *O. cavimana* offers the possibility to trace the lineages and the fates of cells from early developmental stages up to the formation of segmental structures, including neurogenesis at a level of resolution that is not matched by any other arthropod system.

Keywords



Arthropoda; Malacostraca; germ band; mesoderm; ectoderm; cell fate; spiral cleavage; superficial cleavage

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