

The Descriptive and Experimental Embryology  
of the Penaeoidean Shrimp *Sicyonia ingentis*

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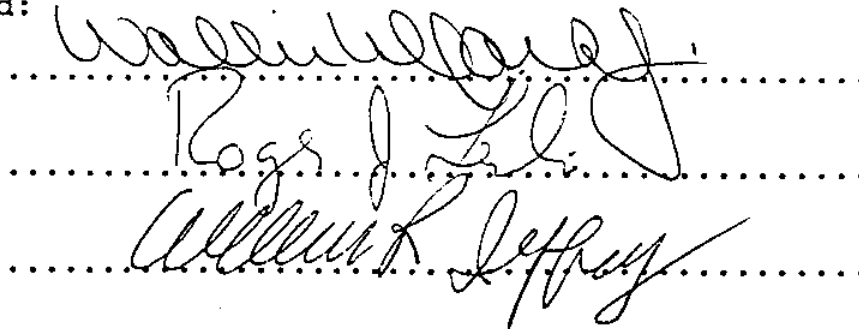
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Zoology

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Abstract

The late events of fertilization in Sicyonia ingentis were examined using antibodies to  $\beta$ -tubulin and mammalian heavy neurofilaments. The neurofilament antibody fortuitously labelled centrosomes in eggs, the subacrosomal region and acrosomal filament in sperm, and a cortical site in eggs which was associated with the positioning of mitotic spindles. During the pronuclear migrations a maternal aster formed in addition to the sperm aster. Colcemid treatment modulated the size of the first mitotic spindle and blocked pronuclear migration. The results indicate that centrosomal inheritance is paternal and pronuclear migration depends on microtubules.

The pattern of cleavage and mode of gastrulation were studied using anti-tubulin antibodies. Cleavage occurred in a regular pattern unlike typical spiral cleavage. Gastrulation was initiated by the invagination of two mesendoderm cells at the 62-cell stage, which had arrested in cell division at the 32-cell stage. Archenteron invagination

was accompanied by oriented cell division. The archenteron was composed of presumptive naupliar mesoderm and the blastopore was located at the site of the future anus of the nauplius larva. Microinjection of fluorescent lineage tracer showed that the mesendoderm cells formed from one vegetal 4-cell blastomere. Oriented cell division has previously been discounted as a potential morphogenetic force, and may be a common mechanism of invagination in embryos that begin gastrulation with a relatively small number of cells.

The fates and specification of early blastomeres were studied by lineage tracing and blastomere isolation experiments. Two- and 4-cell stage blastomeres were microinjected with lineage tracer and followed to the limb bud stage. First cleavage was approximately orthogonal to the future anterior-posterior axis. The 4-cell stage blastomeres gave rise to specific regions of the nauplius. Blastomere isolation and recombination experiments showed that the mesendoderm is autonomously specified and that developmental potential for archenteron formation is segregated at first cleavage. The D blastomere may also serve as a signalling region for other developmental events.

Clark/Crowe; R/A-81