

From worms to stars

Uncovering the early evolution of echinoderms

Imran Rahman
University of Oxford

Echinoderms are a diverse and successful group of marine invertebrates, with around 10,000 extant species belonging to five major groups (including starfish and sea urchins), as well as a rich fossil history that dates back to around 520 million years ago. They are unique among bilaterians in exhibiting pentaradial (five-fold) symmetry as adults, having departed radically from the bilaterally symmetrical ancestral body plan. Deciphering the evolutionary emergence of echinoderms therefore requires a detailed understanding of their early fossil record, which documents some of the fundamental transitions in the assembly of the modern body plan. Reconstructing the phylogenetic relationships of key fossil taxa reveals that echinoderms passed through successive bilateral, asymmetrical, triradial and pentaradial stages. Moreover, the sequence of character changes leading to modern forms can be uncovered; an echinoderm-type water vascular system evolved after the acquisition of a stereom skeleton, but before radial symmetry.