ONTOGENY AND FUNCTIONAL MORPHOLOGY OF *EOPARISOCRINUS CROSSMANI*, A CLADID CRINOID FROM THE MIDDLE ORDOVICIAN

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A post-larval development sequence of complete specimens of *Eoparisocrinus crossmani* provides a unique opportunity to examine growth and functional morphology. Food particles are caught by the tube-feet in the arms which must provide enough material to nourish a volume of tissue. Tissue volume is assumed to be proportional to crown volume. Ignoring the stem is justified inasmuch as most soft parts are housed in the crown. Crinoid arms grow by terminal addition of new plates at their distal tips in conjunction with calcite deposition on old plates. New branches appear where axillary plates are initiated. Consequently, the growth rates for number of brachials and length of food-gathering system compared to crown volume are much faster than if the data were isometric. The number of food particles collected is related to the number of food-catching tube-feet which can be estimated if the length of the arms and height of the covering plates are known. The size of the largest food item is constrained by the food groove width. Thus, food-gathering capacity is defined as the number of food-catching tube-feet multiplied by food groove width. Food-gathering capacity is the product of two linear dimensions so the expected exponent for food-gathering capacity and crown volume comprises 0.67. The computed exponent is significantly larger than the isometric value so the food-gathering capacity increases much more rapidly than if *E. crossmani* retained the same shape at all ages, and the ratio of food-gathering capacity:crown volume only declines slightly over the known growth range. Student's *t* tests indicate that all Ordovician inadunate crinoids examined follow nearly identical ontogenetic trajectories. Conversely, Ordovician camerates are characterized by larger food gathering capacities at equivalent crown volumes. This suggests that the feeding habits of Ordovician inadunates and camerates were quite different.

The ecological niche of a stalked crinoid is at least partially categorized by three parameters. Stem length limits the highest elevation above the seafloor. The column of *E. crossmani* becomes longer during ontogeny due to the formation of new columnals and height growth of old ones. Consequently, individuals gradually "move up" through various levels until the adult elevation of about 50 mm is reached. The growth rates of stem length relative to crown size are slow in the youngest and mature animals but quite rapid in juveniles. The food groove width defines the size of the largest food particle that can be trapped and transported down the arms to the mouth. The exponents for the average food groove width versus cup height or crown volume are slightly less than the corresponding isometric values. The food groove width is augmented less rapidly than if the shape were constant, because distal plates and branches are more narrow and have more slender food grooves than proximal plates. Growth curves for food groove width versus stem length and elevation were generated for *E. crossmani* and its common associates. Together, elevation and food particle size define the main dimensions of the niche. The various taxa are more or less separated by different food groove widths at most comparable elevations with two exceptions. One deals with adults of *Eoparisocrinus crossmani* and juveniles of *Cupulocrinus crossmani* which sometimes occur together. This overlap would have been of short duration if the juveniles were growing rapidly. The youngest crinoids of all species probably intergraded. This pattern minimizes ecological overlap and probably competition between the different species. Tube-foot spacing is correlated with feeding habits and environment. The tube-foot spacing of *E. crossmani* is constant regardless of size which suggests that it employed the same type of feeding mechanism throughout post-larval ontogeny.