

Food and Crowding as Sex Controlling Factors in Cladocera.

C. A. STUART AND H. J. COOPER. (Introduced by A. M. Banta.)

From the Biological Laboratory, Brown University.

In an attempt to show that crowding and the subsequent accumulation of excretory products were not essential for the production of males by Cladocera, Stuart and Cooper¹ reared isolated *Moina* mothers in from 100 to 500 ml. of very dilute manure infusion medium.² It was found that isolated mothers reared in as large a volume as 500 ml. of suitably diluted medium not infrequently produced males. It seemed of interest then to ascertain whether or not crowded mothers reared in exceedingly small volumes of concentrated or heavily bacterized medium³ would produce female young.

After many preliminary experiments, the following procedure was selected: Manure infusion medium³ or manure infusion to which filtrate of mascerated Cladocera ("cell juice") had been added was dispersed in 2 ml. amounts in 15x5 mm. vials. Ten young sister Cladocera (*Moina macrocopa*) were placed in each vial. The cell juice was prepared by collecting several thousand Cladocera with embryos or eggs in the brood chamber and grinding them up in a mortar in a small amount of pond water, then filtering the resulting extract through paper. The medium was bacterialized by the addition of one drop of a concentrated suspension of *Aerobacter aerogenes*.³ The bacterization was repeated at from 4 to 8 hour intervals until the animals laid eggs, at which time the 10 mothers were placed in 100 ml. of normal culture medium to release their young. As controls 10 mothers, sisters of those in the vials, were reared in the usual 100 ml. of unbacterized medium in the usual 6 oz. bottles. When the mothers released, the number and sex of the young were determined. Twenty-six such experiments were carried out.

Mothers in the control bottles, reared in approximately 10 ml. of medium per mother, produced an average of 12.3 young per mother, of which 27.9% were males. The percentages of male young in the various bottles varied from 8% to 55%. On the other hand, the mothers reared until eggs had been laid in approximately 0.2 ml.

¹ Stuart, C. A., and Cooper, H. J., *Physiol. Zool.*, 1932, **5**, 70.

² Banta, A. M., *Science N. S.*, 1921, **53**, 557.

³ Stuart, C. A., and Banta, A. M., *Physiol. Zool.*, 1931, **4**, 72.

of medium per mother, produced an average of 13.1 young per mother, of which but 6.3% were males. The percentages of male young in the various experimental vials ranged from 0% to 21%.

A most interesting fact brought out by these experiments is that the mothers in 5 of the vials produced an average of 14.0 young per mother of which 100% were females. This would seem to indicate that the detrimental effect of crowding and excretory substances had been entirely overcome in 5 cases by the addition of an adequate amount of food. The importance of the food factor in these experiments will be realized when one considers that Cooper, Stuart and Miller⁴ have shown that 9 mothers reared in 2 ml. of unbacterized medium in similar vials, though they may survive for relatively long periods of time, rarely produce any young at all. It has been shown, therefore, that in certain cases, even with an extreme of crowding but with an adequate supply of living bacteria, Cladoceran mothers may produce female young.

The addition of "cell juice" appeared to favor the growth of Cladoceran mothers, as animals reared simply in bacterized manure infusions did not seem to thrive as well. We are inclined, however, to believe that the "cell juice" possessed little if any nutritive value for the Cladocera, but that it did furnish an excellent substrate for the growth of the added bacteria.

6309

Depression Periods in Cladocera.

C. A. STUART. (Introduced by A. M. Banta.)

From the Biological Laboratory, Brown University.

For more than 3 years the writer has been interested in the periodic depressions that so frequently occur in stock cultures of Cladocera reared in manure infusions. Such periods have been reported by Warren,¹ Hartman,² and Allee.³ Stuart, Cooper and Coady⁴ believed that no one environmental factor was responsible for their occurrence and suggested several factors that might be

⁴ Cooper, H. J., Stuart, C. A., and Miller, R., *Anat. Rec.*, 1932.

¹ Warren, E., *Quart. J. Microsc. Soc.*, 1900, **43**, 199.

² Hartman, O., *Arch. f. Zellforsch.*, 1919, **15**, 1.

³ Allee, W. C., *Animal Aggregations*, Univ. Chicago Press, 1931.

⁴ Stuart, C. A., Cooper, H. J., and Coady, H., in press.