

ject touching the skin between the members of a pair, but instead are pulled widely apart after such stimulation, with their terminal combs retracted.

By the action particularly of pilocarpine, it can be shown that in species normally sluggish, responding mildly to external excitation, the much more violent type of behavior characteristic of species armed with urticant spines may be induced through the effect of neurophil drugs. Therefore the effect of these substances is brought about in relation to nervous pathways already existing. And a suggestion is had as to the basis of behavior differences in species structurally related.

The failure of strychnine to produce its "typical" effects, in these insects, coupled with the observed "reversal" under atropine, points to possible chemical differentiation of the synaptic homologues in insects, and argues for caution in the use of drugs as a test for synapse-function in invertebrates.

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### Selective pairing in gammarids.

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Studies on the sexual coupling of organisms have shown it necessary to recognize that association of mates may be selective rather than random. It is evident that such selective coupling may have important evolutionary consequences.<sup>1</sup> The problem of selective coupling on the basis of somatic characteristics, however, is an entirely different problem from that of selective union of germ cells. This point must be clearly in mind; the distinction has occasionally lapsed in discussions of the topic.<sup>2</sup>

It has been shown by Pearl and by Jennings that paramœcia assort with respect to size; and the nature and effects of this assorting have been pointed out. More recently it has been shown that the nudibranch *Chromodoris zebra*, which practises internal

<sup>1</sup> Wright, S., *Genetics*, 1921, vi, 144.

<sup>2</sup> Cf. Jones, D. F., *Biol. Bull.*, 1920, xxxviii, 251.

fecundation, shows a rather high degree of assortative mating according to size.<sup>1</sup> Crozier pointed out some of the likely consequences of large individuals mating with large, and small with small, and he showed that an adaptive result is probably thus attained in a purely mechanical, automatic manner.

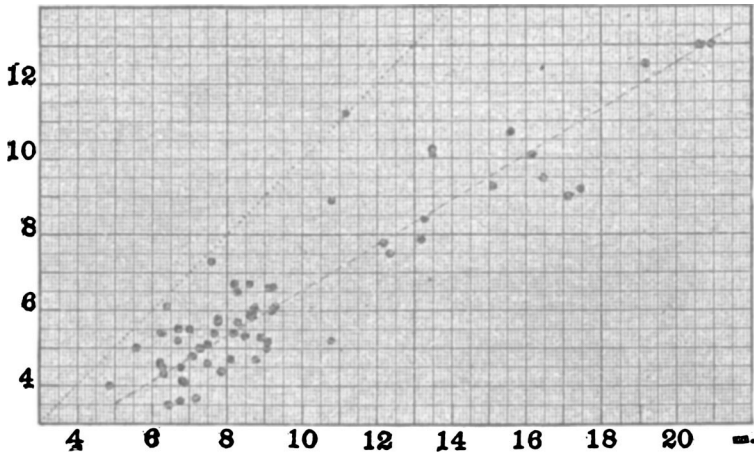


FIG. 1. Relation between length of male *Gammarus locusta* and length of female; measurements of 62 pairs. The dotted line shows curve of relation, if male and female were of equal size in each pair. The line drawn through the plotted points shows how the actual assortment depends in part on the intrinsically smaller average size of the females.

It is possible that this phenomenon, in varying degrees, is of wide occurrence among animals. As further evidence there is here presented a study of naturally occurring pairs of *Gammarus locusta* (Linn.), a small salt-water crustacean. It is possible to study size relations of the members of breeding pairs, because the male carries the female about with him for a considerable time. The formation of such pairs is by the usual sex-recognition methods of the crustacea. It is agreed by those who have studied sex-recognition in typical crustaceans that it is a purely mechanical affair,<sup>2</sup> and this was observed to be true in *Gammarus*. The male shows certain strong clasping reflexes, and itself resists being clasped. The female, however, is usually passive when clasped.

<sup>1</sup> Crozier, W. J., *Jour. Exper. Zool.*, 1918, xxvii, 247; *Amer. Nat.*, 1920, v, 182.

<sup>2</sup> Holmes, S. J., *Biol. Bull.*, 1903, v, 288; *ibid.*, 1909, xvi, 313. Andrews, E. A., *Jour. Exper. Zool.*, 1910, ix, 235.

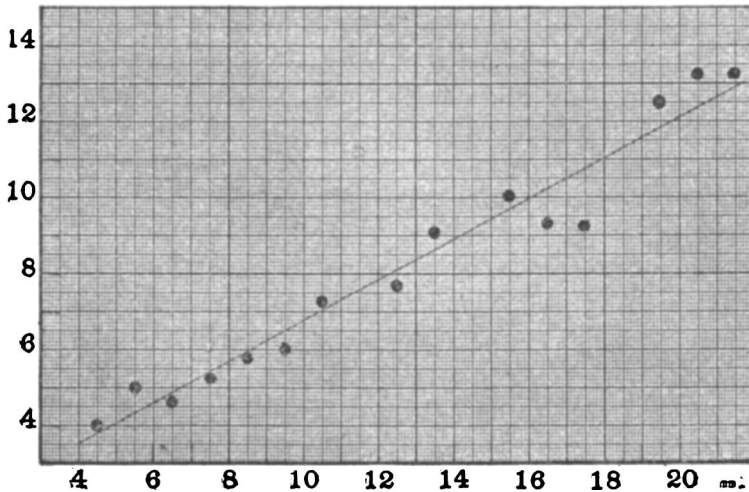


FIG. 2. Regression plot; ordinates are the main lengths of the mates of males in the corresponding length-classes. The index of correlation (length of male : length of mate) is  $r = 0.804 \pm 0.030$ .

With the help of a student, Mr. Connemacher, pairs of *Gammarus locusta* were collected on the shore of Raritan Bay, on Staten Island. The length of each of the members of each pair was measured. The results show a high degree of selective coupling on the basis of length. The figures bring this out clearly. Large individuals tend to mate with large, and small with small. This appears to be entirely automatic.

The upper limit of length of the female with which any given male will mate seems to be determined by his ability to clasp and hold her.<sup>1</sup> The lower limit is much more elastic, but is nevertheless a limit, apparently also determined by mechanical features of the clasping process.

These animals can be bred in the laboratory, and it should therefore be possible to discover the result or lack of result of the selective coupling.

<sup>1</sup> Holmes, *loc. cit.* (1903).