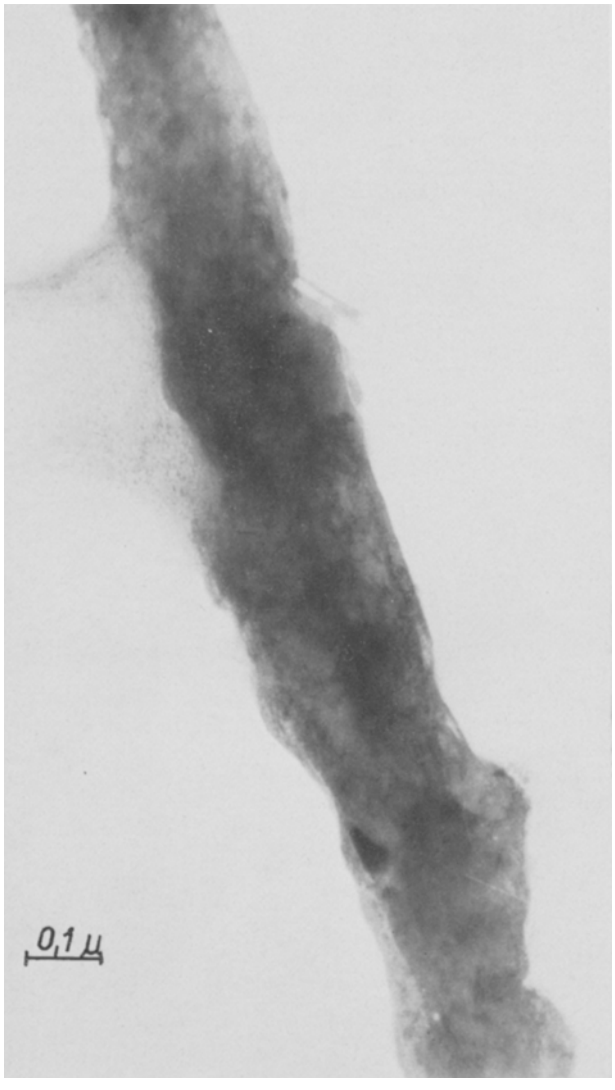

Fig. 2. Electron micrograph of α-elastin – proteoglycan interaction product (complex coacervate) formed at pH 3.0. Negative staining with 12 m*M* uranyl acetate – 19.5 m*M* oxalic acid solutions, pH 3.0. ×40,000. The bar represents 0.1 µm.

electroneutral complex arises[10]. In the case of α-elastin and proteoglycan, the ionic interaction may be assumed to take place through basic groups on α-elastin and ester sulphate groups on proteoglycan, similarly as in the collagen – proteoglycan interaction[11].

At high temperatures, α-elastin undergoes simple coacervation as a result of the association between hydrophobic side chains. This simple coacervation results in fibril formation[3]. It has been suggested[3] that the increase in order of α-elastin is offset by a decrease in order of the solvent.

In the present work, fibrillation of α-elastin has been ascertained in the presence of proteoglycan under conditions which do not give rise to coacervation of α-elastin alone. In this case, the increase in order of α-elastin will be compensated for mainly by a decrease in free electrostatic energy of the system which is the driving force for complex coacervation[12]. Due to the presence of proteoglycan in ground substance in which elastin (and collagen) fibres are deposited, we presume that the kind of interaction described above is implicated, at least partly, in the formation of fibrils from native soluble elastin in connective tissue.

Further experiments comprising tropoelastin, the native precursor of elastin, are now underway.

Zusammenfassung. Die Wechselwirkung zwischen α-Elastin und Proteoglykan in mässig saurem pH-Bereich hat die Fibrillation von α-Elastin zur Folge.

V. PODRAZKÝ and M. ADAM[13]

Research Institute of Food Industry, Na bělidle 21, 150 38 Praha 5 (CSSR), 26 June 1974.

[10] A. VEIS, J. phys. Chem. *65*, 1798 (1961).
[11] V. PODRAZKÝ, F. S. STEVEN, D. S. JACKSON, J. B. WEISS and S. J. LIEBOVICH, Biochim. biophys. Acta *229*, 690 (1971).
[12] J. T. G. OVERBEEK and M. J. VOORN, J. cell. comp. Physiol. *49*, Suppl. *1*, 7 (1957).
[13] Research Institute of Rheumatic Diseases, Na slupi 4, 120 00 Praha 2, CSSR.

Cyclomorphosis and Amphigony in *Brachionus calyciflorus* Pallas (Rotatoria)

It has been shown by selection experiments that the offspring of a single amictic female of heterogonic rotifers is not genetically homogeneous. For this reason genetic recombination in parthenogenetic lines has been postulated[1].

The hypothesis that the morphologic variability, which is found in the offspring of a parthenogenetic female, is correlated with the appearance of males and with the consequent amphigonic processes has therefore been subjected to experimental test.

The experiment was initiated with one amictic female of *Brachionus calyciflorus* Pallas, which was collected from a small pond near Turin. From this female, bearing postero-lateral spines of medium length (S/B = 14, see below), a line was cultured in an inorganic medium (No. 10 of CHU)[2] which was also used for rearing green unicellular algae (*Oöcystis* sp.) employed as food. High temperature (26 °C), crowding (> 4 individuals/ml) and excess of food insured an environmental pressure which determined the appearance of mictic females[3]. Every 3rd h the animals have been counted and typed as mictic or amictic, according to the method proposed by GILBERT[3].

Amictic and mictic females were fixed and stored for further morphological analysis, and a constant population density of 5 individuals/ml was maintained throughout the experiment, which was carried on over a month (about 22 generations). Resting eggs were stored for further hatching. The percentage of mictic females increased gradually during the experiment, until it

[1] G. BADINO and C. ROBOTTI, Experientia *31*, 298 (1975).
[2] G. E. FOGG, *Algal Cultures and Phytoplancton Ecology*, (The University of Wisconsin Press, Madison and Milwaukee 1965).
[3] J. J. GILBERT, J. exp. Zool. *153*, 113 (1963).

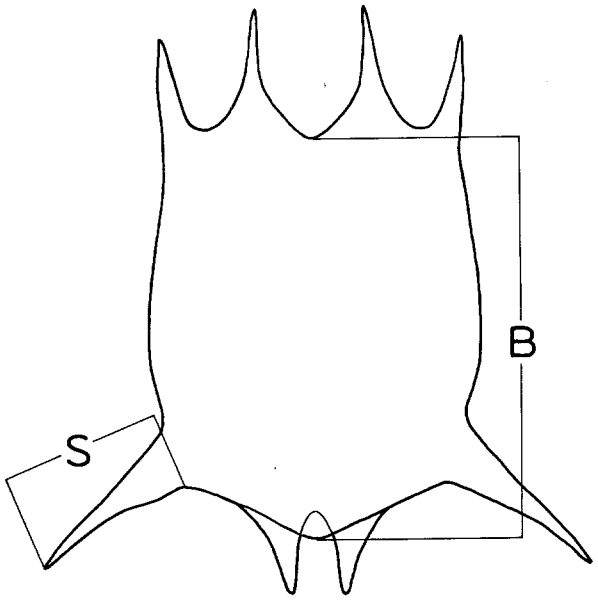

Fig. 1. Morphology of *Brachionus calyciflorus* Pallas. S, postero-lateral spines; B, body.

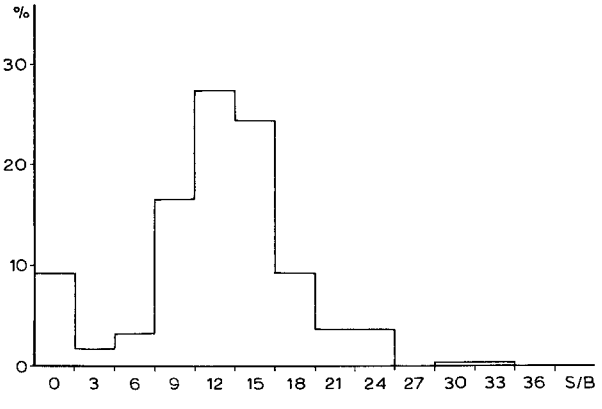

Fig. 2. Distribution of spine length (S/B) among the offspring of a single amictic female.

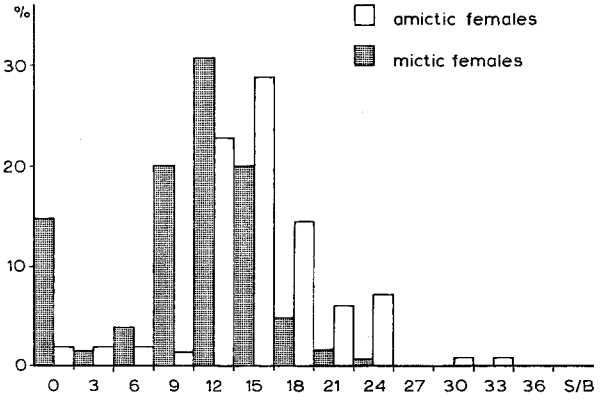

Fig. 3. Distribution of spine length (S/B) between amictic and mictic females.

reached a mean value approaching 30%. The variability of morphological characters also increased, as previously observed in another rotifer, *Asplanchna sieboldi*[4].

The analysis of the length of postero-lateral spines was undertaken on fixed and stored animals, according to the method described by GILBERT[5]. Spine and body length measurements were made and the S/B ratio $\left(\frac{\text{Spine length}}{\text{Body length}}\ 100\right)$ was calculated (Figure 1). Such ratio is also indicated as 'spine length'. The distribution of spine length among the whole offspring shows 2 peaks, corresponding respectively to the S/B = 0 and to the S/B = 12 classes (Figure 2).

Figure 3 shows that the variability of this character is not regularly distributed between the 2 female classes (mictic and amictic), but that there is larger number of mictic females towards the S/B = 0 class.

Figure 4 demonstrate, infact, a strong negative correlation ($r = -0{,}8911$; $t_{10} = -6{,}2085$; p 0,0001) between the percentage of mictic females and the S/B ratio.

The offspring of resting eggs stored in the course of the experiment has been studied. Such offspring was the fruit of selfing, according to the current literature, or, better, of close imbreeding. 28 spineless females hatched from 40 eggs. They showed a very low viability (mean life 5 days in comparison with 7–8 days of their parents) and 4 of them extruded 1 female egg each. 3 eggs were lost by their mothers and failed to hatch. A spineless female hatched from the 4th egg, and she lived 1 day without giving any offspring. These results show that, in the course of generations, a gradual segregation of the S/B = 0 character has taken place, along with the appearance of mictic females.

The correlation between the appearance of mictic females and the S/B = 0 character indicates furthermore that the two phenomena are related to a common genetic mechanism, which can only be recombination[1] and the consequent progressing homozygosis. The low viability of the offspring of resting eggs in this experiment also supports such interpretation.

Heterozygosis of rotifers is insured in natural environment by devices that tend to oppose inbreeding[6] and by heterozygosity of populations[7], but in laboratory conditions, when animals are allowed (or compelled) to reproduce amongst the offspring of a single female, progenies with reduced viability are often obtained[7–9].

On the basis of such results, an interpretation of the intriguing cycle of heterogonic rotifers emerges in terms

[4] H. KIECHLE and H. BUCHNER, Rev. Suisse Zool. *72*, 283 (1966).
[5] J. J. GILBERT, Arch. Hydrobiol. *64*, 1 (1967).
[6] D. D. WHITNEY, Biol. Bull. *25*, 318 (1913).
[7] C. W. BIRKY, JR., J. exp. Zool. *164*, 105 (1967).
[8] D. D. WHITNEY, J. exp. Zool. *12*, 337 (1912).
[9] E. W. HERTEL, Physiol. Zool. *15*, 304 (1942).
[10] G. BACCI, *Sex Determination* (Pergamon Press, London 1965).

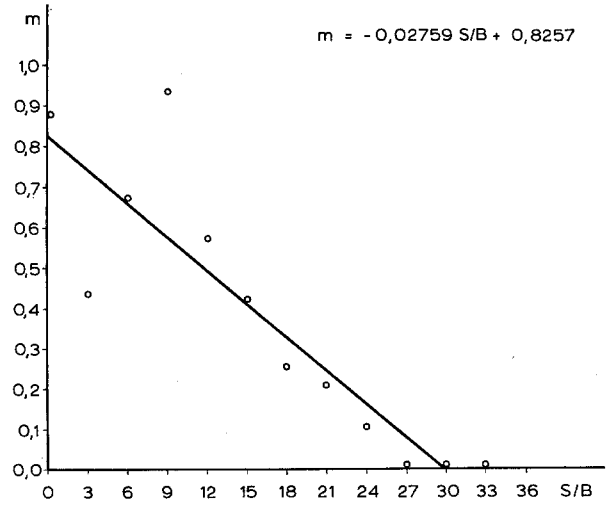

Fig. 4. Correlation between spine length (S/B) and the percentages of mictic and amictic females of Figure 3.

$$m = \frac{\text{mictic females \%}}{\text{mictic females \%} + \text{amictic females \%}}$$

of the adaptative values of a population genetics mechanism[10]: a kind of feed-back system takes place, before homozygosis grows too high, by means of the appearance of mictic females (which are expressions of the same homozygosis) and then of males, so that the subsequent cross-fertilization results in both recovering the original heterozygosis and producing resting eggs.

Riassunto. La correlazione fra un carattere morfologico (lunghezza delle spine postero-laterali) e la percentuale di femmine mittiche nella discendenza di una singola femmina partenogenetica di *Brachionus calyciflorus* (Rotatoria) dimostra l'esistenza di un meccanismo genetico comune ai due fenomeni. Dai risultati ottenuti emerge una interpretazione del ciclo eterogonico (comparsa di femmine mittiche e ciclomorfosi) in termini di valori adattativi di un meccanismo di genetica di popolazione.

C. ROBOTTI

Istituto di Zoologia, Facoltà di Scienze M.F.N., Università di Torino, Via Accademia Albertina 17, I–10123 Torino (Italy), 10 January 1975.

Adaptation Studies of Radiation-Induced Barley Mutants

It is commonly observed that the effects of genotype and environment are not independent and that the relative performance of different genotypes changes in different environments, i.e. there exists a genotype × environment interaction. The importance of this interaction reflects the necessity of evaluating genotypes in more than a single environment. The plant breeder must consider this interaction in the selection of superior genotypes. These genotypes can be selected on the basis of their stability of yield performance over a range of environments.

In the present work, a technique similar to that employed by FINLAY and WILKINSON[1] was used to estimate the stability parameters of barley mutants to elucidate the yield potential of the pertinent genotypes across different sites.

Material and methods. The material used in this project was comprised of *early* and *late* M_2 plants selected from the irradiated populations of Prior cultivar (a standard Australian commercial variety). The seeds of 10 M_3 plants of each of these M_2-derived *early* and *late* families were bulked and then were tested in the M_4 generation in field-plot experiments. 29 mutant families, along with 11 barley cultivars having different geographic origins, were grown in a two replicate randomized block layout at contrasting sites differing in annual rainfall pattern and soil type in cereal growing areas of South Australia in 1968, to assess their adaptation. These sites chosen were situated near towns of Monarto South (referred to herein as Bundaleer, the name of farm), Minlaton, Adelaide (at the Waite Institute) and Clinton.

The experimental plots, each of 3 rows, 17.5 cm apart and 3.10 m long, were sown 35 cm apart with pathways 1 m wide between blocks of plots. When plants were mature, 30 cm at each end of the plot was removed and remainder of plot (2.50 m) was harvested and weight of clean grain was recorded in g/plot.

Yield data were converted to $\log_{10}$ for statistical analysis. The 3 main parameters describing the performance of genotypes over a range of environments, i.e. mean yield (mean) and stability parameters viz. regression coefficient (b) and S.E. (b) were computed according to regression technique suggested and used by FINLAY and WILKINSON[1] and further extended by EBERHART and RUSSELL[2].

Results and discussion. The mean yield of all 40 genotypes at each site was used as an estimate of 'site mean yield' (environment mean). The sites used in 1968 provided a range of environments as shown in Table I. The site mean yields ranged from 236 g/plot at Bundaleer (low-yielding site) to 432 g/plot at Waite (high-yielding site). The mean yield of individual genotypes (averaged over 2 replicates) at each site is regressed upon the site means to provide stability parameters for each genotype.

In the calculation of means and regressions referred to in this paper, the basic yield data measured on a natural scale were transformed to a logarithmic scale because it induced 1. a reasonable degree of homogeneity of experimental error, and 2. a high degree of linearity in the regressions of individual yields on the site means. The mean yield over all environments (mean) and 2 measures of stability viz. regression coefficients (b) and S.E. (b) for each genotype are shown in Table II.

Table I. Site mean yields (g/plot) in the year 1968

Scale	Sites			
	Bundaleer (B)	Clinton (C)	Minlaton (M)	Waite (W)
Arithmetic (natural)	236	246	290	432
$\log_{10}$	2.346	2.358	2.444	2.622

[1] K. W. FINLAY and G. N. WILKINSON, Aust. J. agric. Res. *14*, 742 (1963).

[2] S. A. EBERHART and W. A. RUSSELL, Crop Sci. *6*, 36 (1966).

[3] A. GHAFOOR ARAIN, Ph. D. Thesis, University of Adelaide, Australia, 1973, p. 163.