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Comparison of Rates of Killing of Parthenogenetic and Sexual Forms of Daphnia magna at Higher Temperatures.

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In a recent paper[1] the temperature characteristics for the rate of killing of 2 species of cladocerans were reported. One of these species, *Moina macrocopa,* yielded a value of the temperature characteristic equal to about 108,500 calories, for the temperature interval of 42° to 47° C. The second species, *Daphnia pulex,* yielded a slightly higher value, 119,500 calories, for the temperature interval 32° to 37° C. The animals used in these experiments were adult parthenogenetic females. The present paper presents data for the parthenogenetic females of a 3rd species, *Daphnia magna,* and an account of a comparison of this parthenogenetic form with the sexual females and the adult males of the same species.

The procedure used in determining the rate of killing in the present case was the same as that described in the paper just referred to. Curves of the velocities of killing at each of several lethal temperatures were determined separately for the 3 forms used. The parthenogenetic females were reared from young females placed in plenty of food. The males were reared as young from parthenogenetic females which previously had been somewhat crowded together in rich food; the sexual females were obtained by crowding females together in weak food. The rate of killing was taken as the reciprocal of the time necessary to kill 50% of the animals (Table I). To determine the temperature characteristic, the logarithms of these rates were plotted against the reciprocals of the absolute temperatures (Fig. 1) and the value of the constant μ calculated from the slope of the line drawn through the plotted points according to the equation,

$$K_2/K_1 = e(\mu/R)\ (1/T_1 - 1/T_2)$$

where K_1 and K_2 are proportional to velocity constants at the respective temperature T_1 and T_2, R the gas constant, and μ the critical thermal increment or temperature characteristic.[2]

The graphs show that the thermal increment for the parthenogenetic and sexual females is practically the same, with μ equal to 187,700 calories. The plotted line gives a better fit for the parthe-

[1] Brown, L. A., and Crozier, W. J., *J. Gen. Physiol.,* 1927, xi, 25.

[2] Crozier, W. J., *J. Gen. Physiol.,* 1924, vii, 123.

TABLE I.

Showing data for rates of killing of parthenogenetic females, sexual females and males of *Daphnia magna* at temperatures 35° to 41° C. The times given are those for 50% dead. The durations of exposure at each temperature ranged from those that killed 100% down to those that failed to kill the animals at all.

°C		Number of animals	Time in seconds	1/time x 10^4 (Rate)
35	Parthenogenetic females	376	5280	1.89
	Sexual females	238	7200	1.39
	Males	251	8160	1.23
36	Parthenogenetic females	503	2460	4.07
	Sexual females	204	4860	2.06
	Males	175	3600	2.78
37	Parthenogenetic females	430	600	16.7
	Sexual females	272	1440	6.94
	Males	560	1440	6.94
38	Parthenogenetic females	504	260	38.5
	Sexual females	275	336	29.8
	Males	386	288	34.7
39	Parthenogenetic females	409	104	96.2
	Sexual females	168	118	84.7
	Males	145	56	179.0
40	Parthenogenetic females	350	40	250.0
	Sexual females	148	65	154.0
	Males	161	33	303.0
41	Parthenogenetic females	335	23	435.0

nogenetic females than for the sexual females. This may be due in part to the fact that fewer animals were used in determining the velocities of killing in the latter form, but probably is due to the greater difficulty in getting animals of equivalent ages in the case of the ephippial females. The thermal increment for the males is somewhat different than that for the females, due to the presence of a "break"[3] at 37°. The exact slope of the graphs above and below this point cannot be given much weight, because the temperature range is limited. On the whole the sexual female more nearly resembles the parthenogenetic female, according to its temperature characteristic, than it does the other sexual form, the male.

It is interesting to note that data for the parthenogenetic females of this species from earlier work of v. Transehe,[4] when plotted in the same manner, shows a break at 38° with a comparable value (177,500) of the temperature characteristic above this temperature. An exact comparison cannot be made, however, as he used a differ-

[3] Crozier, W. J., *J. Gen. Physiol.*, 1925, ix, 525.

[4] von Transehe, N., *Arch. ges. Physiol.*, 1913, cliii, 323.

ent end point for the death of his animals than was used in the present experiments.

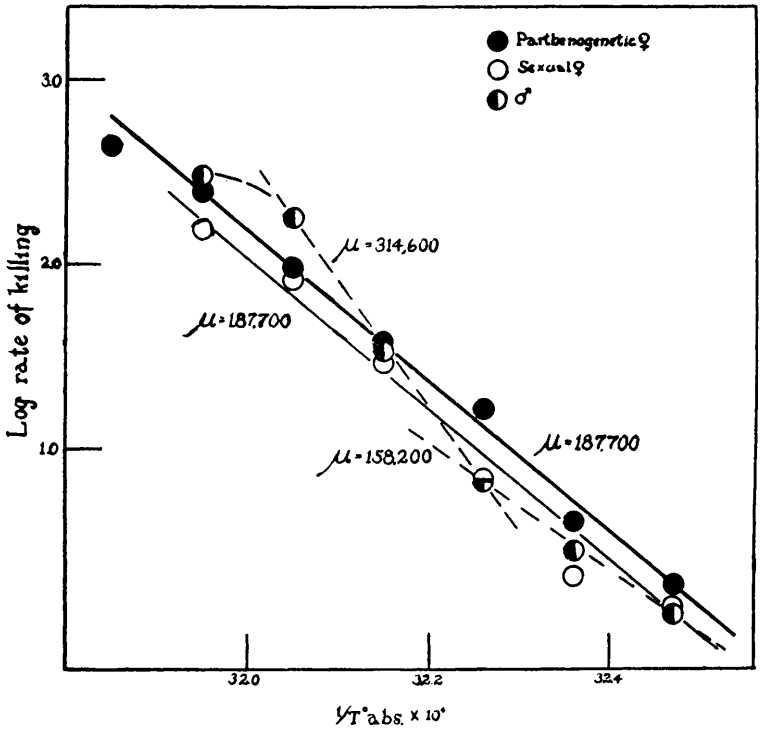

FIG. 1.

Logarithms of the rates of killing (see Table I, last column) of parthenogenetic females, sexual females, and males of *Daphnia magna* plotted against the reciprocals of the absolute temperatures. The temperatures Centigrade range from 35° to 41°. The values of the thermal increments (μ) are calculated from the equation given in the text.

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Nitrogen and Sulfur Metabolism of Diabetic Children.

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The excretion of nitrogen and sulfur in the urine of 36 diabetic children of from 2 to 15 years of age has been studied in an attempt to gain more information concerning the protein metabolism