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AUTOGENOUS–ANAUTOGENOUS OVIPOSITION IN *CULISETA INORNATA* FROM MANITOBA, CANADA

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ABSTRACT. *Culiseta inornata* females, provided with sucrose and deprived of blood, laid a mean of 30.2 ± 0.9 eggs in the first gonotrophic cycle. Twenty-three percent of these eggs hatched and developed to pupae. Females that were bloodfed after the first cycle completed an additional 1–4 cycles.

There are 2 published reports of autogenous oviposition in *Culiseta inornata* (Williston). Owen (1942) reared 3 autogenous females that oviposited, and Hudson (1977[1]) reared 2 autogenous females that laid 23 and 32 eggs. One autogenous daughter laid 31 eggs. The objective of this study was to select for an autogenous strain of *Cs. inornata*. The study of physiological factors that control and affect autogeny would benefit from a comparison of 2 strains of *Cs. inornata*, one entirely autogenous and one entirely anautogenous.

The colony of *Cs. inornata* used was established from 16 egg rafts collected at Glenlea, Manitoba, in June 1991. Each generation (apart from the F_3, which was split into 2 groups and recombined in the F_4) was either autogenous–anautogenous (P, F_2, F_4, F_6, F_8, F_9, F_{11}, F_{13}) or anautogenous. Autogenous–anautogenous females were denied blood in the first gonotrophic cycle and took blood in subsequent cycles. Anautogenous females took blood in every cycle (Table 1). Larvae were reared at a temperature of 21.0 ± 0.5°C and adults (transferred as pupae) were maintained at 24.0 ± 0.5°C. Larvae and adults were maintained at a photoperiod of 16:8 (L:D). Larvae were fed an excess of finely ground bovine liver powder (ICN Biochemicals, Inc.) supplemented with yeast in early instars. Adults were kept in a 30 × 30 × 30-cm sleeve cage and were provided with a water wick and 3 or 10% sucrose solution.

Opportunities to bloodfeed and oviposit were restricted. Females were denied sucrose for 2 days prior to bloodfeeding and were offered human blood by attaching a 15.0 × 2.5 × 2.5-cm screened cage to the forearm. Parous females were given one opportunity (20–40 min) to bloodfeed at the end of each oviposition period. Females oviposited in screened cages (see above) that were partially submerged in water. The oviposition period was 2 days and only one female was placed in each cage. Ovipositing females were kept on benches in the laboratory (at a temperature of 24 ± 2°C). The parental generation oviposited communally. Autogenous and anautogenous nullipars were 10–13 and 9–12 days of age, respectively, at the start of the oviposition period. Parous females were given 7–8 days to complete each gonotrophic cycle.

Autogenous–anautogenous females (n = 221) laid rafts with a $\bar{x}$ ± SE (range) of 30.2 ± 0.9 (4–84) autogenous eggs in the first cycle. F_{11} and F_{13} females laid the smallest rafts (14.2 ± 2.1 and 16.2 ± 3.0 autogenous eggs, respectively). Twenty-three percent of eggs (n = 5,239) laid by autogenous–anautogenous females in the first cycle (P, F_2, F_6, F_8, F_9, F_{11}, F_{13}) hatched and developed to pupae. Attempts to select for autogeny were unsuccessful after F_8. The proportion of females that laid autogenous eggs in the first cycle in F_8, F_9, F_{11}, and F_{13} was 29.1, 14.1, 7.2, and 7.6%, respectively. Females that did not oviposit in F_8 and F_9 were 4.3 and 5.7% autogenous, respectively. Females were dissected and scored as autogenous if they had at least one egg (stage V follicle, Watts and Smith 1978).

A sample of F_2 females was dissected at 11–12 days of age. Fifty percent of pupae were retained at larval rearing conditions and 50% were transferred (described above). There was no autogeny at 21°C (n = 84) and 6.7% autogeny at 24°C (n = 90). Females reared from rafts collected at Glenlea, Manitoba (September 1991), and dissected at 8–12 days of age were 0.8% autogenous at 21°C (n = 121) and 2.4% autogenous at 24°C (n = 123).

Owen (1942) showed that anautogenous *Cs. inornata* are able to complete up to 7 gonotrophic cycles when provided with optimum conditions and also reported a reduction in fecundity with increased parity status. This trend was also apparent in the current study, apart from the first cycle of autogenous–anautogenous females (Table 1). The number of eggs developed would be affected by the quantity of blood imbibed and the number of eggs laid would be affected by egg

[1] Hudson, J. E. 1977. Seasonal biology of *Anopheles, Culex* and *Culiseta* in central Alberta, (Diptera: Culicidae). Ph.D. thesis. University of Alberta, Edmonton, Alberta.

Table 1. Fecundity of 1- to 4-parous *Culiseta inornata*.

Cycle	Autogenous–anautogenous females[1] Mean eggs laid ± SE (range)	♀♀	Anautogenous females[2] Mean eggs laid ± SE (range)	♀♀
1	27.4 ± 1.2 (4–58)	102	166.7 ± 9.1 (62–303)	185 39[3]
2	118.8 ± 4.1 (54–164)	25	83.1 ± 5.7 (19–167)	88 35[3]
3	86.0 ± 7.4 (56–116)	7	53.3 ± 3.4 (22–108)	27
4	63.3 ± 18.9 (42–101)	3	31.4 ± 4.0 (21–53)	8

[1] Females were F_8, F_9, F_{11}, and F_{13}.

[2] Females were F_{10} and F_{17}. A few females that were less than ⅓ bloodfed or laid minuscule rafts were excluded in the first cycle.

[3] Number of rafts used to calculate the mean.

retention. The mean egg raft size of anautogenous 1-pars (Table 1, Cycle 1) was within the range of means reported by Buth et al. (1990) for wild *Cs. inornata* in Manitoba. Three 4-pars (one autogenous–anautogenous and 2 anautogenous, not shown in Table 1) completed a 5th cycle.

The decline in female numbers during successive cycles (Table 1) was due to mortality, and a lack of response to bloodfeeding and oviposition stimuli within the limits described.

Although the objective of this study was not met, the data show that *Cs. inornata* from Manitoba can oviposit viable eggs without imbibing blood and that females deprived of blood in the first cycle can become multipars.

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