EFFECT OF JUVENILE EXPOSURE TO NACL ON ADULT SIZE AND FECUNDITY OF SNOW-MELT *AEDES*[1]

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Juvenile snow-melt *Aedes* inhabit relatively pristine environments that are low in natural and man-made contaminants. While we normally think of man's impact on the environment in catastrophic terms such as filling in oviposition and larval sites, actions by man to moderate his own environment for his safety can result in ecological alterations which can, in time, be as devastating as the physical loss of oviposition sites. The present note determined the effect of juvenile exposure to NaCl, one among many potential man-made contaminants, on adult size and fecundity.

Specimens used were from eggs laid by feral *Aedes* females in accordance with Kardatzke (1976). Juvenile stages were reared using the standard method described by Kardatzke (1979). All juveniles were reared to either death or adulthood with NaCl added to the standard juvenile media in increments of 1,000 ppm (wt/vol). Within 24 h of pupation, individuals were removed from the rearing media and placed in small jars of water located in emergence cages (Kardatzke 1979). Individuals were allowed to emerge with males removed and killed within 24 h of emergence. A 10% honey/water solution was continuously available to the females.

Twenty-four hours after emergence of the last female, mosquitoes were transferred to oviposition cages and offered a human blood source. After all females had engorged, they were maintained in the oviposition cages for 7 days at 21°C and 85% RH with honey/water solution continuously available.

At 7 days post-engorgement females were anesthetized with carbon dioxide and then immobilized with chloroform. Immobilized females were wetted with 70% ethyl alcohol and pinned dorsal side down onto a paraffin surface. Sufficient Ringers' solution was over the paraffin to completely cover the mosquito. The right wing was removed and measured from the anal notch to the tip of the wing using a calibrated dissecting microscope. Ten females were measured per treatment per species. The 2 ovaries of each female were then exposed by grasping the 8th and 9th abdominal segments with a fine jeweler's forceps and pulling until the reproductive system was extracted. If the entire abdomen separated, the ovaries were dissected from the abdomen. Under microscopic examination the total number of ovarioles in both the right and left ovaries was counted. Wing and ovariole data were analyzed using one-way ANOVA.

Increasing salinity of the water during the juvenile stages of development resulted in decreased wing size in the adult females and decreasing egg production (Tables 1 and 2). The various species shown in Table 1 all became smaller, as measured by wing length, as the level of NaCl increased with significant declines (90% confidence interval) in size in all species except *Aedes canadensis* (Theobald), *Ae. punctor* (Kirby) and *Ae. stimulans* (Walker). Four species [*Ae. abserratus* (Felt and Young), *Ae. ciner-*

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Table 1. Effect of juvenile exposure to NaCl on adult size of female snowmelt *Aedes*.

Species of *Aedes*	Mean wing length of 10 females per treatment (mm) PPM NaCl							
	0	1,000	2,000	3,000	4,000	5,000	6,000	$P > F$
abserratus	3.96	4.00	3.85	3.63	3.36	—[a]	—[a]	0.020
canadensis	3.95	3.82	3.86	4.04	4.04	3.88	—[a]	0.592
cinereus	3.39	3.26	3.32	3.20	3.10	2.98	—[a]	0.004
fitchii	4.41	4.24	4.27	4.23	4.11	4.10	—[a]	0.008
provocans	4.30	4.33	4.16	3.92	—[a]	—[a]	—[a]	0.095
punctor	4.12	4.12	4.19	4.08	4.14	3.81	—[a]	0.153
sticticus	3.73	3.64	3.54	3.42	3.28	3.19	3.13	<0.001
stimulans	4.40	4.28	4.12	4.42	4.19	3.90	—[a]	0.139

[a] No juveniles survived to adulthood in this treatment.

Table 2. Effect of juvenile exposure to NaCl on adult fecundity of female snow-melt *Aedes* as measured by number of ovarioles.

Species of *Aedes*	Mean no. of ovarioles of 10 females per treatment							
	PPM NaCl							
	0	1,000	2,000	3,000	4,000	5,000	6,000	$P > F$
abserratus	50.6	44.6	36.7	33.8	13.6	—[a]	—[a]	0.002
canadensis	81.2	67.0	83.1	57.2	46.6	22.7	—[a]	0.003
cinereus	68.2	70.4	58.7	44.0	28.9	24.4	—[a]	<0.001
fitchii	56.9	47.1	39.9	34.0	29.8	16.0	—[a]	<0.001
provocans	42.5	25.4	6.9	00.0	—[a]	—[a]	—[a]	0.016
punctor	74.3	58.0	61.9	45.7	49.8	22.3	—[a]	0.002
sticticus	81.0	84.6	72.5	52.0	32.0	24.5	15.8	<0.001
stimulans	75.9	60.7	47.5	48.3	24.4	8.2	[a]	<0.001

[a] No juveniles survived to adulthood in this treatment.

eus (Meigen), *Ae. provocans* (Walker) and *Ae. stimulans*] showed some increase in size with initial levels of NaCl above zero, but this rapidly disappeared with increased levels of NaCl. *Aedes fitchii* (Felt and Young) and *Ae. sticticus* (Meigen) did not exhibit this increase in size. In all species studied there were significant losses (greater than 98% confidence interval) in ovariole numbers (Table 2).

Kardatzke (1980) demonstrated that relatively low levels of NaCl were detrimental to juvenile snow-melt *Aedes* as measured by survival to adulthood. A comparison of LD_{50} from Table 1 of Kardatzke (1980) revealed that levels of NaCl that caused a 50% reduction in juvenile survival also produced a 50% reduction of ovariole number. Even when the mortality is not observed in the juvenile stages, the morbidity measured by the reduction in the female size and reproductive potential indicate that minor environmental contamination by salt may place a ecological pressure against the local population of snow-melt *Aedes*.

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