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Effect of Ectoparasite Removal Procedures on Recapture of *Microtus californicus*

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ABSTRACT: We tested the null hypothesis that anesthetizing meadow voles (*Microtus californicus*) and brushing them vigorously for ectoparasites would have no effect on the later recapture of these voles. Voles were trapped from 6 December 1993 to 10 January 1994 at Faye Slough Wildlife Area near Eureka, Humboldt County, California (USA). Alternate trapped voles were anesthetized with ethyl ether and brushed vigorously for ectoparasites. There was no significant difference in the frequency of recapture nor in the time to first recapture between those voles anesthetized and brushed, compared to control animals.

Key words: Capture-recapture, *Microtus californicus*, techniques, ectoparasite surveys, small mammals.

Ectoparasite surveys, in which small mammals are live-trapped, anesthetized, and brushed vigorously for ectoparasites are used in studies on the epizootiology of sylvatic plague (*Yersinia pestis* infection) (Clover et al., 1989) and other small mammal-associated diseases. For statistical purposes, it commonly is assumed that such parasite removal procedures do not affect the likelihood of recapturing these treated hosts after their release back into their original population. However, to our knowledge, this assumption has not been formally tested.

Our objective was to determine whether anesthetizing and brushing California meadow voles (*Microtus californicus*) affected the probability for subsequent recapture of the voles. Our null hypotheses were that the frequency of recapture and the time elapsed until first recapture were independent of initial treatment for the voles. This study was approved by the Institutional Animal Care and Use Committee, Humboldt State University, Arcata, California.

The study was conducted at the Faye Slough Wildlife Area (40°47′N, 124°90′W), Humboldt State University, north of Eureka, Humboldt County, California (USA). A 35 × 45 m trapping grid was established. Eighty 23 × 8 × 9 cm Sherman live traps (H. B. Sherman Traps, Inc., Tallahassee, Florida, USA) were used, spaced at 5 m intervals in an eight by ten pattern. Each trap was supplied with polyester batting and bird seed. Traps were checked once each day for 13 trapping days between 6 December 1993 and 10 January 1994.

Every captured vole was marked with a toe clip such that each individual could be recognized. Toe-clipping was preferred over ear tags since ear tags can be lost and we desired accurate recapture frequencies for statistical comparisons. On each trapping occasion, every other individual trapped was anesthetized with ethyl ether; these individuals then were brushed briskly for 1 to 2 min with a toothbrush against the natural direction of the fur, from the tail toward the head, to dislodge ectoparasites (Clover et al., 1989). Following full recovery, each animal was released near its capture site. Animals not anesthetized served as the control group; they also were marked and released at the site of capture.

To determine whether there was an effect on recapture due to the initial treatment of anesthetizing and brushing, a chi-square test of independence (Khazanie, 1986) was performed using the total numbers exposed to each initial treatment and the number of individuals recaptured in each group. In addition, a Mann-Whitney rank test (Khazanie, 1986) was used to test the null hypothesis that the time to first recapture was independent of treatment.

Among 49 voles captured, anesthetized, and brushed for ectoparasites (n_1), 25 (51%) were recaptured on at least one occasion. Of 60 control voles captured but

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not anesthetized or brushed (n_2), 29 (48%) were recaptured. Based on a chi-square test, the null hypothesis of independence between treatment and recapture was not rejected ($P > 0.05$). Initially, we anesthetized and brushed every second animal trapped, regardless of its capture history. However, for our analyses, we omitted animals from the treatment group if they previously had been captured and used as part of the control group; this resulted in unequal sample sizes ($n_1 = 49$, $n_2 = 60$).

We did not number the traps in the trapping grid; thus we were unable to compare mean distance travelled between captures among the voles of the two groups. The mean ± SD time to first recapture was 3.4 ± 5 days for anesthetized and brushed voles ($n = 25$), compared to 3.0 ± 0.3 days for control animals ($n = 29$). Based on the Mann-Whitney rank test, we failed to reject the null hypothesis that initial treatment did not significantly ($P > 0.05$) affect the number of days elapsed to first recapture.

Based on both the frequency of subsequent recaptures and the mean time to first recapture, our data provided evidence that ether anesthesia and vigorous brushing for parasite removal did not significantly affect the probability of subsequent recapture in voles. This information is useful for the development of study designs where limiting sources of bias in recapture probability is an important consideration.

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