The room contains a two light bank system, one overhead and one over each aquarium. Timers allow for staggered lighting somewhat simulating sunrise–sunset. An air pump sustains 75 to 100 aquaria.

Two 15 gal (68 liter) tanks were used (0.3 × 0.6 m); one was the treatment tank and the other was the control tank. The water was a mixture of conditioned tap water mixed with aquarium salt (Instant Ocean®) and trace elements to equal 42% in the control tank. The tanks were aerated by air stones throughout the test. The following equipment was used for recording water quality; dissolved 0_2 meter, YSI, model, 51B; American Optical Salinity Refractor; and Marine Master pH test kit.

A test was conducted with four *Fundulus confluentus* (two males and two females), one *Fundulus grandis*, five *Cyprinodon variegatus*, four *Poecilia latipinna* (two males and two females) and one *Dormitator maculatus* on February 22, 1982, after allowing the fish one wk to become acclimated. Matched specimens were placed in the control tank and in the treatment tank, which was treated with ISA-20E at the rate of 0.68ml/m², a dosage higher than recommended for field use.

After 168 hours of treatment with ISA-20E at a dosage of 0.68ml/m², there was no mortality in the five species of saline fish and no significant differences were detected in water quality in the test and control tanks either before treatment or after the 168 hr of the test.

None of the freshwater vertebrates nor the saline fishes exposed to the monomolecular organic surface film showed detrimental effects.

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ANOPHELES CRUCIANS: A NEW ADULT RECORD FROM MICHIGAN

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An outbreak of Eastern equine encephalomyelitis (EEE) in southwestern Michigan during the summer of 1980 (D. B. Francy 1980, personal communication) led to subsequent mosquito surveys in 1981 and 1982. Mosquitoes were collected under the direction of H. D. Newson, Department of Entomology, Michigan State University. Specimens were sent on dry ice to the Division of Vector-Borne Viral Diseases, Centers for Disease Control, Fort Collins, Colorado, where they were identified to species and tested for virus.

Two adult female *Anopheles crucians* Wiedemann were recovered from a CO_2-baited CDC light trap collection near Three Rivers, St. Joseph County, on the evening of July 12, 1982. The trap site was a swampy area, populated with young trees and adjacent to a small stand of conifers.

The only record of *An. crucians* from Michigan prior to this date was based on larvae taken in Midland County and reported by Newson et al. (1975), Cassani and Newson (1980), and Darsie and Ward (1981). The presence of two female specimens in the 1982 collection from St. Joseph County constitutes a new adult record for the state. Since it has been reported from Wisconsin, Illinois, Indiana and Ohio (Darsie and Ward 1981), it is not surprising that it occurs also in Michigan.

The specimens have been compared with the descriptions in Howard, Dyar and Knab (1917) and Carpenter and LaCasse (1955) and found to be the same. As an adult, *An. crucians* is indistinguishable from *An. bradleyi* and *An. georgianus*, although they may be separated in larval and pupal stages (Floore et al. 1976). Since the distributions of the latter two species are geographically remote from southwestern Michigan, the identification of the two specimens as *An. crucians* was made with confidence. The specimens were not tested for virus so that they could be retained for taxonomic purposes in the reference collection at the Centers for Disease Control, Fort Collins, Colorado.

Eastern equine encephalitis virus has been isolated from *An. crucians* in Georgia, Louisiana, Alabama and Florida (Floore et al. 1976). It is unlikely, however, that this species played an active role in the Michigan outbreak, since it is apparently rare and because Chamberlain et al. (1954) rated its vector potential for EEE as poor

after failing to demonstrate transmission using experimentally infected *An. crucians* in the laboratory.

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EVACUATION RATE OF MOSQUITO-FED NEWTS, *NOTOPHTHALMUS* V. *VIRIDESCENS*

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Newts have long been suggested as a natural control for larval mosquitoes in temporary ponds which are devoid of fish (Chandler 1918, Sergent and Foot 1922, Matheson and Hinman 1929). However, much information on newt feeding habits shows that they live on quite an opportunistic diet (Hamilton 1932, Morgan and Grierson 1952, Wood and Goodwin 1954, Ries and Bellis 1966, Christman and Franz 1973). This probably reduces the mosquito destroying efficiency of the newt.

Nonetheless, there is evidence that newts can concentrate their feeding on mosquito larvae (Hamilton 1940) and have a significant impact on animal biomass in limited areas of a lake ecosystem (Burton 1977). As newts and mosquitoes frequently coexist in the field, experiments were conducted to verify the mosquito-feeding capacity of newts and to measure their evacuation rate.

Experiments on feeding capacity were conducted at room temperature (25°C) in 5 liter aquaria filled with filtered pond water. The newts, *Notophthalmus* v. *viridescens* (Rafinesque), were captured in outdoor ponds or purchased in pet shops and acclimatized for at least a week on an *Aedes atropalpus* (Coquillett) mosquito diet. These larval mosquitoes were easily available from rock pools of La Gabelle (Québec). Photoperiod was maintained at 16L:8D. Newts were starved 24 hr before experimentation and then individually tested at densities of 25, 50, 75 and 100 mosquito larvae (3rd and 4th instars). Experiments started at 0900 (3 hr after morning light started) and ended 24 hr later.

Table 1 shows that the newts can easily consume more than 40 larvae/24 hr and seem to reach full satiety with approximately 70 larvae. This corresponds well with the newt feeding rate of 45 larvae/day as cited in the literature (Sergent and Foot 1922, Matheson and Hinman 1929). These data appear to be more closely related to ingestion rate or capacity rather than to evacuation rate. They give little, if any information about the length of time for transit of food through the intestine.

To collect data on intestinal clearance speed, four newts were placed in water at 17°C, each single newt being allowed to eat 25 mosquito larvae after a preliminary fasting period of 3 days. Observations were then made at 6 hr intervals for any dropping containing undigested mosquito cephalic capsules until all 25 head capsules were recovered from each newt. The temperature of 17°C was selected in order to approximate the conditions found during the spring in temporary ponds (Bourassa and Aubin 1974).

The evacuation rate of the newt appears to be a linear function of time described as, $Y_x = Y_o - RX$, where Y_x is the number of mosquito larvae still inside the newt digestive tract after X hours, Y_o is the ordinate intercept corresponding to the initial number of eaten larvae, and R is the instantaneous rate of evacuation. The equation obtained is: $Y_x = 27.18 - 0.117X$ ($n = 24$, $R^2 = 0.73$, $F = 60.8$); the F test is highly significant ($P < 0.001$). In fish, gastric evacuation rates generally display an exponential function against time, but linear relations do exist (Elliott 1972, Persson 1979).

Solving the equation gives an estimate of 153 hr to recover all 25 mosquito head capsules from each newt. The first feces to be evacuated by the newts contained a mean number of 13.7 capsules and came after 65.2 hr. This last