increpitus, Cs. incidens, Cs. particeps and *An. franciscanus* McCracken.

Culex tarsalis Coq. was relatively successful both in feeding on the dog and allowing parasite development. However, since this is primarily an ornithophilic species, it is not usually considered an important vector of heartworm (Bemrick and Sandholm 1966). *Culiseta incidens* on the other hand, could be involved as an intermediate host of this nematode: it is relatively abundant almost year round and is attracted to dogs and willing to feed on them. The latter factors could compensate for the relatively low percentage of fed mosquitoes which supported development of *D. immitis*. A study on mosquito host preference (Tempelis and Washino 1967) reported 56 *Cs. incidens* had fed on cattle and horses only. This study does not necessarily contradict our suggestion that *Cs. incidens* might play a role in *D. immitis* transmission, due to the relatively small sample sizes and different areas studies.

Aedes sierrensis appears to be the best potential vector among those studied. It is attracted to dogs, feeds readily on them and allows a good degree of development of the parasite. The distribution of this tree hole mosquito seems to roughly coincide with the published reports of the foci of heartworm transmission in the foothills of both the Sierra Nevada and coastal ranges in California (Hansen 1978).

ACKNOWLEDGMENTS. I wish to thank the La Honda Fire Brigade and all the people of La Honda for their cooperation and encouragement. I am also grateful to Dr. J. H. Theis, Department of Medical Microbiology, University of California, Davis for his continuing help and advice and Drs. J. F. Kraus, School of Public Health, University of California, Los Angeles and W. K. Longhurst, Department of Agronomy and Range Science, University of California, Davis for their review of the manuscript.

Lucia Hui, Vector Biology and Control Section, California Department of Health Services helped with the identification of the mosquitoes.

This research was partially funded by University of California, Faculty Research Award D670 and by School of Veterinary Medicine, Paulitz Estate Companion Animal Fund.

References Cited

Bemrick, W. J. and H. A. Sandholm. 1966. *Aedes vexans* and other potential mosquito vectors of *Dirofilaria immitis* in Minnesota. J. Parasitol. 52:762–767.

Bohart, R. M. and R. K. Washino. 1978. Mosquitoes of California. University of California. Div. Agricultural Sciences. Priced Publication Number 4084.

Hansen, C. P. 1978. The sudden rise of the dog heartworm (*Dirofilaria immitis* to a serious pest level in San Mateo County. Proc. Calif. Mosq. Vector Control Assoc. 46:15–16.

Kartman, L. 1953. Factors influencing infection of the mosquito with *Dirofilaria immitis* (Leidy, 1856) Exp. Parasitol. 2:27–78.

Ludlam, K. W., L. A. Jachowski and G. F. Otto. 1970. Potential vectors of *Dirofilaria immitis*. J. Am. Vet. Med. Assoc. 157:1354–1359.

Tempelis, C. H. and R. K. Washino. 1967. Host feeding patterns of *Culex tarsalis* in the Sacramento Valley, California, with notes on other species. J. Med. Entomol. 4:315–318.

Weinmann, C. J. and R. Garcia. 1974. Canine heartworm in California with observations on *Aedes sierrensis* as a potential vector. Calif. Vector Views 21:45–50.

CULISETA MELANURA IN NEWFOUNDLAND

LEWIS T. NIELSEN[1] AND JOSEPH E. MOKRY[2]

During May and June, 1981, we conducted an intensive mosquito survey on the Island of Newfoundland. During this survey several species previously unreported from the Island were found. Details on these and other species collected are now in press (Nielsen and Mokry 1982).

Of particular interest was the collection of *Culiseta melanura* (Coq.). A single larva of this species was collected on the Avalon Peninsula, 15 km SW of St. John's, V-28-81, and was

[1] Biology Department, University of Utah, Salt Lake City, Utah 84112.

[2] Research Unit on Vector Pathology (RUVP), Memorial University of Newfoundland, St. John's, Newfoundland, Canada A1C 5S7.

reared to an adult male. The larva was found in a small, deep, flooded depression at the base of roots in a boggy area where the forest had been cleared to install a power line. The larva was associated with those of *Culiseta morsitans* (Theob.). Although the habitat was characteristic of *melanura,* a repeat visit to the area failed to turn up more larvae.

Collection of this species in Newfoundland is a considerable northern extension of its range and was unexpected. The only previous Canadian records were from southern Ontario and Quebec (Chant et al. 1973, Ellis and Wood 1974). *Culiseta melanura,* the principal sylvan vector of eastern encephalitis virus (EE) in birds, is the only medically important culicid species now known to occur in Newfoundland. The presence of EE virus in birds on the Island, however, has not been established.

The senior author is grateful to the National Geographic Society, Committee for Research and Exploration for providing a grant which made this study possible. We also thank Dr. Marshall Laird, Director of RUVP, for providing facilities and personnel to aid in this investigation.

References Cited

Chant, G. D., W. F. Baldwin and L. Forster. 1973. Occurrence of *Culiseta melanura* (Diptera: Culicidae) in Canada. Can. Entomol. 105:1359.

Ellis, R. A. and D. M. Wood. 1974. First Canadian record of *Corethrella brakeleyi* (Diptera: Chaoboridae). Can. Entomol. 106:221–222.

Nielsen, L. T. and J. E. Mokry. 1982. Mosquitoes of the Island of Newfoundland—A report of new records and notes on the species. Mosquito Systematics 14(1):34–40.

A SEX-LINKED MUTANT, *MAROON-EYE,* IN *AEDES ALBOPICTUS*

TAKEO TADANO

Department of Medical Zoology, St. Marianna University School of Medicine, Sugao, Kawasaki City, Kanagawa Prefecture, Japan

Fifteen years have passed since Bat-Miriam and Craig (1966) described the first 8 mutants in the dengue vector *Aedes (Stegomyia) albopictus* (Skuse). Only 13 mutants have been thus far described for this species, and genetic linkage studies have been performed for only 5 of them. A homeotic mutant, *proboscipedia (prb),* is situated at a map distance of about 20 units from the sex locus (*M, m*) (Bat-Miriam and Craig 1966, Quinn and Craig 1971); 2 dominant alleles, *White-body (Wb)* and *Frosty-body (F),* are linked to *pigmented pupa (p)* with 3.5 recombination units. Both *Wb* (or *F*) and *p* are inherited independently of the sex allele (*m*). Furthermore, inheritance of *brown-eye (b)* shows an independent assortment with either *sex, Wb,* or *p* (Tadano et al. 1980, Tadano 1981).

Recently, Yong et al. (1981) have reported 2 enzyme variants, glucose phosphate isomerase (*Gpi*) and phosphoglucomutase (*Pgm*), in this mosquito and that these loci were segregated independently. The genetic relationships between these enzymes and the morphological mutants (including *sex*) are unknown.

This paper describes a new recessive sex-linked mutant, *maroon-eye (mar)* in *Ae. albopictus,* and also provides a tentative assignment of linkage groups for this species.

MATERIALS AND METHODS

The following 3 strains were used for this study: (1) the Nagasaki strain, (2) the *White-body (Wb)* mutant which was originally derived from the Nagasaki strain, and (3) the *maroon-eye (mar)* mutant isolated from the Okinawa strain. The rearing methods employed have been previously described (Tadano et al. 1980). Mass crosses were used for these experiments, but blood-fed females in the experimental cages were isolated into individual plastic cups for single ovipositions. Each egg batch was hatched separately and reared as a family. Phenotypes of the offspring were also scored in single families. A few families which did not produce the offspring phenotypes at theoretical ratios due to a very low hatchability or high larval mortality were neglected from the subsequent considerations, but all other families were pooled in each cross experiment for further statistical treatments.

RESULTS AND DISCUSSION

The *mar* mutant has dull brick red eyes at the pupal stage, but it has almost the same eye color as its wild type at the larval and adult stages. The *mar* phenotype is quite similar to that of *brown-eye (b).* When the *mar* pupae were initially detected in an inbred line of the