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THE FIRST RECORD OF *AEDES TOGOI* (THEO.) IN THE UNITED STATES—ABORIGINAL OR FERRY PASSENGER?

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Aedes togoi (Theobald) is probably a native of the temperate Pacific east coast of Asia, where its larvae breed in rock pools at the high tide line. In Japan and the south coast of Siberia it has adapted to live in artificial containers. Interest in the species stems from its present distribution in rock pools around the Pacific rim from 2 to 50°N latitude and from the fact that it is a natural vector of Japanese B encephalitis virus and several filarial nematodes in Asia.

The first North American specimen of *Ae. togoi* appears to be an adult female in the Canadian National Collection, identified in 1974 (D.M. Wood personal communication). It was collected at Horseshoe Bay, 5 km northwest of Vancouver, B.C., by C.D. Garrett and is undated. It could have been taken as early as the mid 1940's when this dipterist moved to the coast and certainly predates the first larva, collected from Cordova Bay, 5 km north of Victoria, southern Vancouver Island, and identified by A. Stone in 1970 (Sollers-Riedel 1971).

Wood et al. (1979) give Vancouver and Victoria as the only localities for *Ae. togoi* but in 1977 and 1978, Dr. R. M. Trimble and I found it fairly widely distributed in Canada on suitable rocky shores, up to 55 km from these sites (Trimble & Wellington 1979).

Since 1978, I have searched for this species on the northern coastline of Washington State. There appear to be few suitable rocky outcrops on the coast of the mainland for some 35 km south of the border. Rock pools found just south of Bellingham were in porous sandstone, and the only mosquitoes breeding in them were *Culiseta incidens* (Thomson). Many of the islands in the San Juan group appear to have suitable rocky shores, but the only area searched, around the marine station at Friday Harbor, San Juan, did not yield mosquitoes.

In 1980 the search was continued south to Fidalgo Island and the area around the ferry terminal for Sidney, B.C., and the San Juan Islands, at Anacortes (Fig.1). All larval instars and pupae of *Ae. togoi* were found in a small rock pool by my son, Owen, on Aug. 22. The site was Rosario Beach on the west coast, some 6 km south of Anacortes. The pool was above recent high tide levels and many of the larvae and pupae were concealed under a mat of green alga (*Enteromorpha* sp.). Some chironomid larvae were present under detritus and many copepods were swimming with the mosquito larvae. From its chloride concentration, measured coulometrically, the pool contained 70% seawater.

Larvae and adults reared from the pupae, correspond closely to the descriptions given by La Casse & Yamaguti (1950) and Wood et al. (1979).

This species has now been found in an area extending 120 × 60 km, and it seems unlikely that it was introduced as recently as the 1940's. In Canada, *Ae. togoi* is seldom found more than a few hundred meters from the coastline and, without human assistance, one would expect it to spread along the shore from one rocky outcrop to the next. Several of its breeding sites, however, are separated from other rock pools by many kilometres of sand or gravel beach and one site, on South Pender Island, is separated from the closest known site by about 27 km of open sea.

The site on Fidalgo Island is 43 km, as the gull flies, from Cordova Bay but well over 150 km following the coastline south from Vancouver.

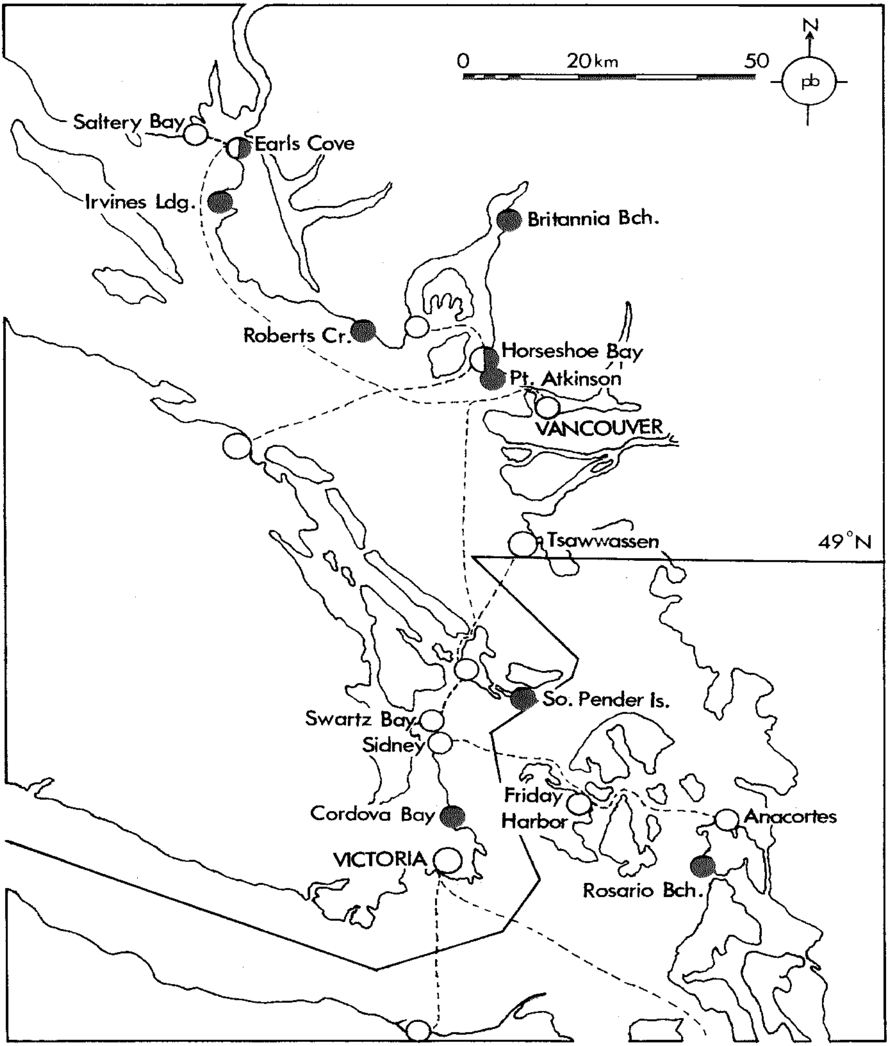

Fig. 1. Map of the coast line showing the known breeding sites of *Aedes togoi* (solid circles), ferry terminals (open circles) or both (halved circles), ferry routes (dotted lines) and the border between Canada and the U.S. (solid line).

It seems unlikely that the species could have crossed the Haro and Rosario Straits, or travelled 150 km south along coast line, lacking suitable rock pools, even in the last hundred years, and more probable that the species is either endemic or has been transported from site to site. It may be significant that the known breeding sites of *Ae. togoi* in North America are within 10 km of commercial ports or ferry terminals and that these are in rocky harbors, many of which have suitable breeding sites.

Similar questions were raised in 1968 when *Ae. togoi* was discovered in one season breeding along 800 km of the tropical east coast of Malaysia (Ramalingam 1969). Neither the Malaysian nor the North American material can be distinguished morphologically from Japanese specimens making it unlikely that either has been isolated for very long.

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INSECT TRAPS FOR PIT LATRINES

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Pit latrines are a major breeding site for *Culex quinquefasciatus* (= *Cx. pipiens fatigans*) and blow flies (*Chrysomya putoria*). In Dar es Salaam, Tanzania, *Cx. quinquefasciatus* is particularly important as a vector of Bancroftian filariasis. Studies were conducted in the early 1970's of the use of chlorpyrifos (= Dursban (®)) which showed that the larvicidal action of this chemical persisted for many weeks (Bang et al. 1975). Since 1972 the Dar es Salaam City Council has carried out a programme of spraying chlorpyrifos 6 times annually in pit latrines, cesspits, etc. In 1979 a high degree of organophosphate resistance was detected in laboratory tests with *Cx. quinquefasciatus* collected in Dar es Salaam and other Tanzanian towns (Curtis and Pasteur 1981). Preliminary indications from a field study are that this resistance is causing a serious reduction in the effective persistence of a larvicidal treatment.

For these reasons and because of the high cost in foreign exchange of the chlorpyrifos programme, a completely different approach to the problem has been tried out—the use of "exit traps" placed over the apertures of the pits. The traps can be cheaply made. Raybould (1966) recorded the use of modified paint tins for this purpose and in recent trials in Dar es Salaam I used traps consisting of a mosquito proof box made of plywood and metal gauze carefully attached to a wooden frame (Fig. 1). The box is mounted on a plywood baseplate equipped with carrying handles. In the baseplate and bottom surface of the box there is a 15 cm diameter hole covered in metal gauze in which a 2 cm hole is made. The hole is surrounded by a 3 cm high tube of gauze. Mosquitoes and flies enter the trap through this tube, presumably attracted upward from the pit by light and/or fresh air. They do not readily find their way out again but, if some do so, they would only go back into the pit.

Insects caught in the traps die there in a day or two. No provision was made for removing the corpses but ants were seen removing dead mosquitoes. If in the long term they are found not to work fast enough to avoid the risk of clogging of the trap with dead flies it might be worthwhile to experiment with the introduction of a lizard into the trap to eat the captured insects. A slight elaboration of the trap, to incorporate an entry trap to catch gravid mosquitoes attempting to enter the pit, may be worthwhile. However, such an entry trap on a blow fly infested pit caught nothing, whilst the exit trap caught and killed hundreds of flies in a week.

Provision is made, with appropriately placed flaps of plywood attached below the baseplate, to block other easy exit routes for insects but a precision fit is not necessary since, as might be expected, all mosquitoes observed emerging from pits towards dusk took the obvious route into the well lit and aerated trap rather than