OPERATIONAL AND SCIENTIFIC NOTES

A DREDGE SAMPLER FOR MOSQUITO LARVAE[1]

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Mosquito larvae are found in a great variety of habitats. This fact has created a need to develop a number of different sampling techniques to estimate larval numbers. Although the standard dipper is the most commonly used tool for estimating mosquito larval abundance, nets, floating quadrats and various area samplers have also been used with varying degrees of success (Andis et al. 1983, Knight 1964, Service 1976, Takahashi et al. 1982, Washino and Hokama 1968, Roberts and Scanlon 1974). Inaccuracy and/or inefficiency have made many of these techniques unsuitable for use in estimating larval populations in rice fields. In an effort to combine the accuracy and precision of a static quadrat with the efficiency of the standard dipper, we developed a dredge sampler for use in estimating larval numbers in rice fields. The dredge could, however, be adapted for use in other mosquito larval habitats.

The dredge was constructed by forming two 0.64 cm diam steel rods (148.5 cm long) into a rectangular frame with 20 cm long skids (Fig. 1). The resulting frame measured 10 cm wide by 38 cm high. The two rods were connected by welding a cross support to form the bottom of the rectangle. The top of the frame was formed such that the ends of the steel rods were used to attach the frame to a 2.5 cm diam wooden handle by a locking ferrule. This allowed for detachment of the frame and handle so that an anti-tear muslin net with a tip of 100 mesh nylon netting could be placed on the frame. The skids prevented the net from contacting the soil and therefore prevented mud and debris from contaminating the samples.

To determine the number of larvae for a given volume or area, the dredge must be pulled through the water for a known distance. A mark was first made at a point on the upper one-fourth of the wooden handle and another mark made a distance of 1m on the lower part of the handle. Thus, different individuals using the dredge could easily attain the required 1m sampling distance by placing the dredge perpendicular to the soil surface and pulling the handle through one hand from the upper to the lower mark. When the dredge is pulled across 1 m, the water surface area traversed is equivalent to 0.1 m^2 (area sampled = 10 cm × 1 m). The volume of water sampled can be obtained by recording the water depth at each sampling site (volume sampled = 1.0 cm × 1 m × water depth). Therefore, sampling data can be expressed as larval number per unit area or per unit volume.

There were no significant differences in the number of larvae caught per liter of water sampled between the dredge, static quadrant and dipper or in the number of larvae caught per meter square of area sampled between the dredge and static quadrat (Table 1). Data on larvae per unit area cannot be obtained with dipper sampling. Additionally, it took significantly more time to obtain a sample with the static quadrat than with the dredge or dipper. These results indicate that the dredge is as accurate as either of the the other two devices, whether comparing water volume sampled or unit area sampled. In addition, it has equivalent sampling efficiency to that of the dipper and is more efficient than the static quadrat. Samples from the static quadrat took significantly longer to obtain primarily because of the time required

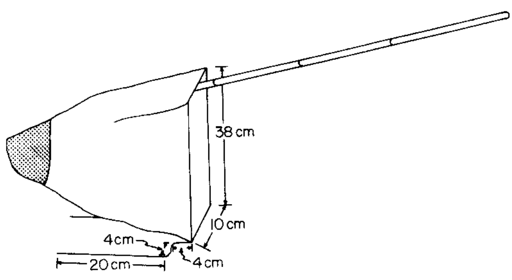

Fig. 1. Diagram of aquatic dredge used in sampling riceland mosquito larvae.

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Table 1. Performance of the dredge sampler as compared to other sampling devices in a rice field habitat.

Device	$\bar{x}$ larvae/ liter sampled	$\bar{x}$ larvae/ square meter sampled	$\bar{x}$ time (min)/ sample*
Dredge	0.40 A***	82.97 A	0.90 A
Static quadrat**	0.21 A	41.74 A	16.69 B
Dipper	0.76 A		0.89 A

* Mean time to obtain individual sample, place in ETOH and separate larvae for identification.

** Static quadrat after Andis et al. 1983.

*** Means in columns not followed by a common letter are significantly different as determined by Duncan's New Multiple Range Test ($p=0.05$).

to separate larvae from the mud and debris obtained during the sampling process. The dipper and dredge had little or no debris in the sample, and thus did not require extra handling time. Sampling time included the time to take the sample, place it in a vial containing ethanol and separate the larvae for identification.

In field use, the device proved to be easily handled, could be used for sampling in either levee ditches or drill planted pans, and performed well in shallow (5–10 cm) or deeper (20–30 cm) water (Fig. 2). Some difficulty did occur in using the dredge in mature rice fields in that larger plants prohibited the dredge from being pulled through the required distance. This was not a problem until the latter growth stages. The dredge could not be used in water deeper than its height without losing the ability to express the sampling results in larvae/volume of water sampled or larvae/unit area. The ease of construction, durability and relatively low cost (approximately $15/dredge, including labor) are major assets. Finally, the aquatic dredge can sample aquatic organisms other than mosquito larvae which is advantageous in measuring population changes for potential predators of mosquito larvae.

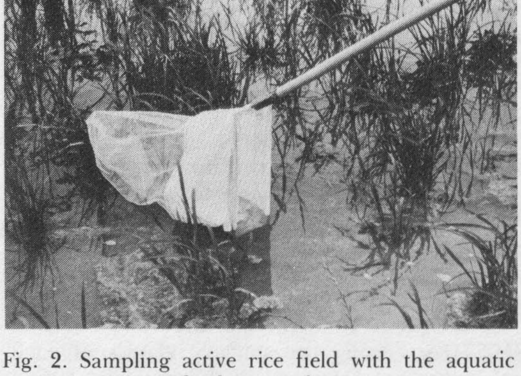

Fig. 2. Sampling active rice field with the aquatic dredge sampler.

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COLLECTION OF *AEDES ATROPALPUS* FROM COASTAL ROCK HOLES ON THE KEWEENAW PENINSULA, MICHIGAN

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Aedes atropalpus (Coquillett) was collected from three rock holes at Esrey Roadside Park (Keweenaw Co., MI), located on route M 26, along the coast of Lake Superior, 11 km south of Copper Harbor, MI. Both immatures and adults were present at this location on July 11, 1984. Previously, *Ae. atropalpus* has been reported from Isle Royale (Beadle 1963, Zavortink 1972, Cassani and Newson 1980) in Keweenaw County. Cassani and Newson (1980) also report collections of this species from peninsular Keweenaw County and from Marquette County, but they do not provide the exact location of the collection sites. Though this report does not represent the first record of *Ae. atropalpus* in Keweenaw Co., it does provide detailed information about the location and characteristics of the collection site.

Larvae and pupae, presumed to be *Ae. atropalpus,* were observed in all three rock holes on three separate occasions in July 1984. These immatures were collected and identified only on July 11. Adult emergence was noted while