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gate on the beach at night to stablize or decrease water loss. Most of the insects were older than 1 day and probably lost considerable amounts of moisture while resting in the woods during the day.

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AN EMERGENCE TRAP FOR AQUATIC INSECTS

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The identification of organisms is a prerequisite to developing water quality criteria for aquatic life. Identification is necessary because differences in water quality requirements are specific and may be different for closely allied species. The taxonomy of various species, particularly those associated with the aquatic environment, is much more detailed and better known for adults than for immature instars. To facilitate correlation of adult and larval forms, a trap was needed to collect the emerging adults from the various streams.

Traps and collecting devices reported in the literature usually lacked one of the following factors and in some cases were deficient in several of them. Corbet (1965) describes a trap which he used in a pond. He states that the trap was affected by wave action and therefore was not suitable. Mundie (1956) describes three types of traps used in sampling three types of collection sites. His stream trap is a small gauze-covered frame which would not withstand stream fluctuations. Ide (1940) and Sprules (1947) report using a net of wire window screen stretched over a light wood frame. This was also very fragile and was dislodged by a rise in water level of about six inches. It was of such dimensions that the individual collecting the emerged adults had to kneel or squat to work in the trap.

The trap described here is designed to eliminate these undesirable features.

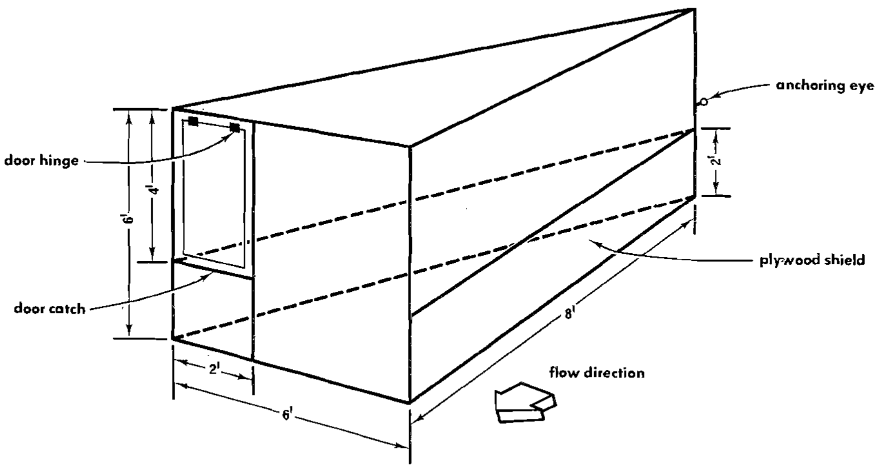

Figure 1. General plan of the emergence trap.

The streams in northern Minnesota have a steep gradient and are subject to rapid fluctuations in flow and depth; a change of two feet in an hour is quite common after a heavy summer shower. Requirements of the trap include: ease of collection of the adults, transportability, an adequate size to cover a bottom area large enough to encompass a variety of microhabitats, and ruggedness to cope with the rapidly changing stream levels. Preliminary work indicated that a square trap was distorted by water pressure and the screen was torn by floating debris.

The design (Figure 1) which was finally developed, consists of a triangular wood frame fastened together with nails and covered with Fiberglas window screen for retaining insects. The long sides were eight feet, the base of the triangle which contained the door was six feet across and the height was six feet. The upstream anchoring member of the triangle was a 2" x 4" of a good quality wood. All other members were 1" x 2" pine and the door was of 1" x 3" pine. Ordinary brass or Fiberglas screen and kitchen cabinet hardware were used. To minimize tearing of the trap by floating debris, 2' x 8' sheets of ½" exterior grade plywood were applied to the outside bottom of the upstream sides of the trap. Trap corners were braced as shown in Figure 2. The bottom of the trap was left open; the top was covered with Fiberglas screening. The screen used was 16 by 18 mesh and retained most insects except the smallest midges.

The door was hinged from the top to swing upward. This kept the hinges out of the water and allowed the door to close by its own weight. This was useful when both hands were burdened.

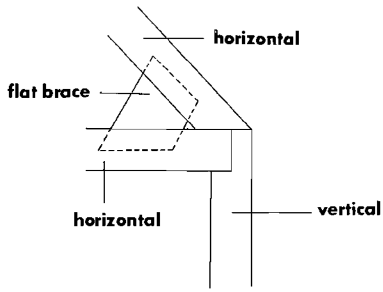

Figure 2. Corner detail.

The trap was anchored by a length of line running from an eyebolt through the 2 x 4 to a suitable anchor such as a large rock or strong tree upstream of the trap. It was found that if the anchor point was on the inside of a curve in the stream the trap would swing out of the main channel under high water conditions without damage. The trap was easily repositioned when water conditions returned to normal. Five of the traps were constructed and four were still usable after a full summer of use. One trap was demolished when a miscalculation in anchoring allowed it to smash against a bridge abutment under high water conditions.

The approximately 175 pound traps were constructed at the laboratory and transported to sampling sites on a flatbed trailer. One of the traps was hauled for 50 miles over rough roads with no difficulty. Trapping success was very good; as many as 1,000 individuals were collected within 48 hours. We are of the opinion that the trap would also be excellent for quantitative work if collections were made at more frequent intervals. One trap was moved periodically to bottom types that had various numbers of aquatic insects; the number of emerging adults correlated with the abundance of larval forms. Most common types of aquatic insects were collected with the exception of some, such as Neuroptera, which pupate in the bank soil and do not emerge directely from the water.

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