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An Effective Trapping and Marking Method for Aquatic Beetles

R. B. AIKEN

*Department of Entomology
University of Alberta
Edmonton, Alberta T6G 2E3*

R. E. ROUGHLEY

*Department of Entomology
University of Manitoba
Winnipeg, Manitoba R3T 2N2*

ABSTRACT.—A floating bottle trap, constructed from a translucent plastic jar fitted with floats that kept the trap mouth pitched downward, was designed to alleviate problems with previous trap designs. This trap yielded several dytiscid genera and exceptionally high numbers of commoner species. A marking technique, using waterproof tape applied to the pronotum, was successful in mark-recapture studies. The tape stayed on some animals in the field for over one year. [aquatic beetles, Coleoptera, Dytiscidae, Hydradephaga, marking, trapping]

The first discussion of bottle traps used to study aquatic beetles in North America is that of Adams (1909: 159), who mentions a trap designed by J. G. Needham. Needham (1923) described this trap and a variety of other sampling devices used in his studies in California ponds. His bottle trap, consisting of a wide-mouthed glass jar with a celluloid funnel insert, was particularly useful in sampling water beetles.

Claassen and Sibley (1926) used a similar bottle trap to collect bog-inhabiting beetles which were otherwise difficult to capture. They believed that the bottle trap increased the recorded diversity of aquatic beetles vis à vis netting. Hungerford et al. (1955), James and Redner (1965), Washino and Hokama (1968), Nilsson (1978), Aiken (1979) and Faber (1981), and others have shown that water beetles are easily collected in bottle traps (with or without the addition of a light source). Beetles collected in this manner have been used for studies of life history, habitat affinity, and taxonomy.

Most bottle trap designs suffer from one or more deficiencies. Glass bottles are heavy, awkward to store and subject to vandalism in the field. Shards of broken bottles beneath the

surface present a very real danger to field workers. Other designs are expensive to make and those requiring a light source are often impractical for field work in isolated areas. To alleviate some of these problems, the following trap was designed.

TRAPPING

The trap (Fig. 1) is a 128 oz (3.81) translucent plastic, wide-mouth jar. Such jars are available from most industrial suppliers of plastic containers. A rectangular opening measuring 9 cm × 12 cm was cut into the side of the jar and covered with fibreglass screen. The screen was glued to the bottle with silicone sealant. Glued to the outside of the bottle on either side of the opening were two pieces of styrofoam measuring 15 cm × 2.5 cm × 2.5 cm. These floats were glued at an angle of approximately 25 degrees to the longitudinal axis of the bottle. This placement forced the bottle to float with the mouth submerged and screened opening uppermost (Fig. 1). Fibreglass screen cones with a 2 cm opening at the apex were inserted into the bottle. The base of the cone was then folded back over the jar mouth and affixed at the mouth with elastic bands.

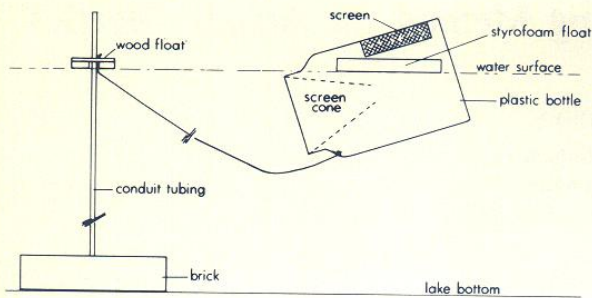


FIG. 1. Diagram of the bottle trap.

In the field, bottles were placed untethered or tethered to 1.5 m lengths of conduit tubing that were anchored to the bottom with bricks (Fig. 1). The bottle was tethered to this pole by a 60 cm length of nylon cord. The cord was attached at one end to a wooden float that slid over the pole and tied through a small hole near the neck of the bottle.

The trap is light weight, easily transported, less easily vandalized and useful for obtaining qualitative and quantitative samples of water beetles. The screen cone is flexible and, based on field observations, does not as easily allow escape of beetles as does the celluloid cone of Needham's design. The screened air hole allows specimens to be retained in good condition. This trap could be easily modified to hold a light source and/or a bait such as chopped liver.

This type of trap was extremely successful in trapping large numbers of aquatic beetles. Aiken (unpublished data) trapped a maximum of 81 specimens of *Dytiscus alaskanus* J. Balfour-Browne (Coleoptera: Dytiscidae) in a single bottle over two days. At times of peak population size, the mean catch/bottle was 21.5 *D. alaskanus*. Dip net collecting during similar times of the year yielded fewer than five specimens/day. Large samples of various species of *Dytiscus* L., allowed Roughley (1983) to demonstrate a meristic bias toward smaller specimens collected by dip net. This bias may be true of many other large and fast-swimming water beetles.

Other genera trapped were *Rhantus*, *Acilius*,

Graphoderus, *Hydaticus*, *Colymbetes*, *Coptotomus*, *Laccophilus*, and *Hydroporus*. One species, *Rhantus sinuatus* (LeConte) is usually considered scarce and is rarely collected. During a revision of North American species of *Rhantus*, Zimmerman and Smith (1975) examined less than 30 specimens. Larson (1975), despite intensive collecting throughout Alberta, examined only 21 specimens from four widely scattered localities. Presumably these specimens were collected by dip net. In contrast, more than 100 specimens were collected over a nine day period at George Lake in a series of bottle traps over a nine day period. Small numbers of predominantly later instar larvae of Dytiscidae and Hydrophilidae have also been collected using this bottle trap design.

The styrofoam floats allowed the mouth to float at a desired angle to the water surface and the opening in the side of the bottle permitted air and water flow through the bottle. Animals remained in the trap described here for three days with no apparent ill effects. Previous models of this trap without the screened opening, and glass bottle traps, which depend on a volume of trapped air to hold the bottle afloat, were inappropriate for life history studies. An insufficient quantity of air was contained in the bottle to sustain the beetles and many died before the traps were cleared. Field observations suggest that poor air and water circulation may have lead to death from overheating.

MARKING

Marking of aquatic invertebrates for studies of population dynamics is a perplexing problem (Murvosh and Miller 1970). We have attained some success with marking *Dytiscus alaskanus* with small pieces of Elastoplast® plastic waterproof tape (Smith & Nephew Inc., Lachine, Quebec). A strip of tape was applied to a 10 cm × 10 cm piece of Plexiglas to facilitate cutting and cut into 2 × 2 mm squares. One of these squares was applied to the pronotum of a beetle that had been dried with tissue paper. In about 7

hours, 1000 individuals were marked for a mark-recapture experiment (Aiken unpublished data). Animals marked in the laboratory retained the tape for three months with no ill effects. Individuals marked in the field on 24 May 1982 were trapped with the tape intact on 25 June 1983—over 13 months later.

ACKNOWLEDGMENTS

We thank F. L. Leggett, S. Cubrilo and C. Wilkinson for assistance in the marking experiments and J. Scott for drawing the figure. H. and F. Goulet, formerly of the University of Alberta, first introduced us to glass bottle traps. This study was funded by a Boreal Institute for Northern Studies Grant-in-Aid, a University of Alberta Central Research Fund Operating Grant and NSERC (Canada) Postdoctoral Fellowship to RBA. RER's participation, while in Edmonton, was supported by NSERC (Canada) Operating Grant A-1399 to G. E. Ball. Dr. T. D. Galloway of the University of Manitoba and N. Newhouse of the University of Alberta provided helpful and constructive comments on earlier drafts of the manuscript.

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