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A Live-Bucket for Use in Surveys of Small Streams

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Abstract.—Conventional equipment and methods used to hold fish during surveys of small streams are either cumbersome or cause injury and kill fish. We designed a live-bucket that is spillproof, inexpensive (US$20), easily assembled, keeps fish in good condition, and does not restrict a person's movements. The live-bucket was used during electrofishing surveys on 120 stream reaches ranging in water surface slope from 0% to 8% and with water temperatures as high as 18°C. Observed mortality while fish were held was less than 1% for cutthroat trout *Oncorhynchus clarki,* mountain whitefish *Prosopium williamsoni,* brook trout *Salvelinus fontinalis,* and brown trout *Salmo trutta* longer than 80 mm total length.

Electrofishing is a standard technique used to assess fish populations in small streams (Armour et al. 1983; Platts et al. 1983). Sampling typically is conducted by moving upstream through a reach, netting stunned fish, and placing them in a holding device such as a bucket or mesh bag. The holding device is carried or towed, and captured fish are periodically deposited in the holding device until sampling is completed. It has been our experience that equipment and methods used to retain fish during electrofishing surveys are either cumbersome or can cause injury and kill fish. Buckets filled with water are heavy, hamper the ability of the person holding the bucket to net fish, and can be spilled. Mesh bags circumvent these problems, but towing mesh bags through flowing water collapses the bag around fish, often leading to deaths if fish stay in the bag for extended periods. Our goal was to design a fish-holding device for use during surveys of small streams that retained the merits of prior approaches and avoided the pitfalls described above. The live-bucket we developed takes less than an hour to assemble, costs approximately US$20, keeps fish in good condition, is spillproof, and does not restrict a person's movements.

The materials required to construct the live-bucket include a plastic 19-L bucket, 30 cable ties, duct tape, and a nylon diver's bag (61 × 91 cm, DIVE2,[2] Memphis Net and Twine Company, Memphis, Tennessee). A drill equipped with a 9.5-mm bit, wire cutters, and a saw are needed to assemble the live-bucket.

The live-bucket is constructed by removing the handle from the bucket and sawing out the bottom. Holes spaced 5 cm apart are drilled around the circumference of the bucket within 1 cm of the upper edge (Figure 1). Thirty evenly spaced holes are also drilled through the side of the bucket. Next, the bucket is slid into and pushed to the bottom of the diver's bag. The lower edge of the bucket is held firmly against the bottom of the bag while the bucket and bag are fastened together by running cable ties through the holes along the upper edge of the bucket and the mesh of the bag. A tight seal prevents fish from lodging between the bag and bucket. The cable ties are fastened on the outside of the bucket and the excess trimmed with wire cutters. Finally, the outside lower edge of the bucket is wrapped several times with duct

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[2] Mention of trade names does not imply endorsement by the University of Wyoming.

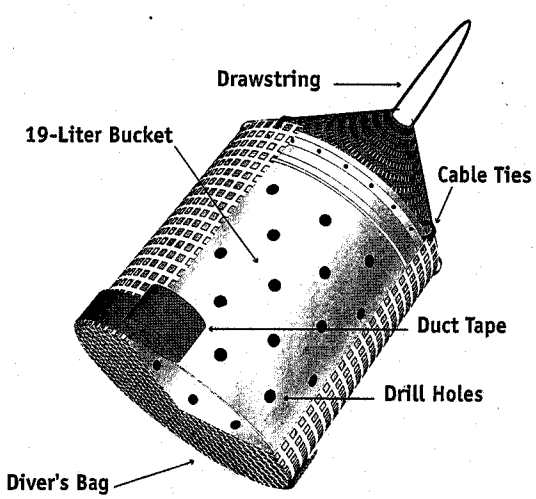

FIGURE 1.—Schematic of a live-bucket for use in surveys of small streams.

tape to prevent the bag from abrading as it is dragged through the stream.

During stream surveys, the drawstring of the bag is looped over a worker's arm or belt. The live-bucket is left to trail behind as the worker moves upstream. When fish are captured, the live-bucket is pulled alongside, the bag opened, and fish deposited. The drawstring and drag of the water on the live-bucket keep the bag closed and prevent fish from escaping. The amount of drag created by the live-bucket is minimized because it is bottomless, but care should be taken when working in high water velocities. The holes drilled in the side of the bucket improve water circulation. The bucket itself acts as a shell to prevent the bag from collapsing and shields fish from potentially harmful collisions or currents that may impinge them against the bag. At the completion of collection activities, fish can be removed from the live-bucket by draping the open end of the bag over the sides of the bucket.

We have used the live-bucket on 120 stream reaches ranging in water surface slope from 0% to 8% and with water temperatures as high as 18°C. Observed mortality while fish were held (often in excess of 1 h) was less than 1% for cutthroat trout *Oncorhynchus clarki,* mountain whitefish *Prosopium williamsoni,* brook trout *Salvelinus fontinalis,* and brown trout *Salmo trutta* longer than 80 mm total length.

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