IN THE FIELD

The Zip Net:
An Insect Sweep Net with Removable Capture Pouch for Serial Collecting

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As part of a scanning electron microscope workshop, students and I go outdoors with sweep nets to collect specimens. It soon became apparent that removing specimens from the net without injuring or losing them was difficult, especially with very small flies, fleas, orthopterans, and collembolans. This article provides instructions to make a simple conical sweep net with removable, lock-seal plastic bags for convenient capture of crawling and flying insects—a “zip net.” With this innovation, I have captured sub-millimeter collembolans and large hymenopterans at the same time without losing specimens. The zip net has the added advantages of allowing specimens to be seen as they are collected, of fixing them at the collection site, and of making many separate collections without changing nets. The lock-seal bag modification described here can also be adapted to cloth (but not mesh) insect nets already owned.

Materials and Methods
Supplies and equipment needed: One standard-size cotton/polyester pillowcase (20 in x 32 in [51 cm x 81 cm], with 2-in [5-cm] hem, 180-300 threads per inch); a sewing machine; a plastic zipper-type seal from a heavy-gauge storage or freezer bag with two-color single or double closure (e.g., ZipLok™, Glad™ or generic); a can of 3M™ 90 spray adhesive; cardboard covered with wax paper for over-spray; a 12 in (30 cm) diameter sweep-net frame (homemade or commercial, e.g., BioQuip™ 7612 or 7312 series); and a box of zip-type sandwich- or snack-style bags of the same brand for collections.

Constructing the net cone. Lay pillowcase flat. Draw the cone pattern with an indelible pen, with a hem-to-truncated-tip length of 18-20 in (46-50 cm) and an opening of 4.5 in (11.5 cm) when measured flat at the bottom (Fig. 1A). Sew a close stitch along the tapered sides of the pattern to form the funnel. Cut across both sides of the pillowcase along the horizontal line to form the opening (“X” in Fig. 1A). Cut and trim the tapered edges. (If using a pre-made cloth sweep net, cut off...
Making the zip closure for the collection bag. Cut off the zip closure from the quart-size storage/freezer bag, making a strip about 1 in (2.5 cm) wide. Separate the two sides of the strip. Orient one strip so that the interlocking channels are face-down on the wax-paper-covered overspray cardboard. Lightly spray the back of the strip with the 3M™ 90 adhesive; repeat with the other strip. Lay the pillowcase funnel flat on the overspray area and spray a 1” stripe of adhesive across one side of the bottom end of the funnel. Repeat spray and let dry about 5 min, until tacky to touch with a knuckle. Press the closure strip, closure-face up, with the top edge along the guide line above the bottom edge of the net (Figs. 1B and 3). Press down well. Replace the wax paper and repeat the spraying, drying, and pressing with the other strip and the other side of net, making sure the closure bead of the second closure strip is aligned exactly with the closure bead on the other side. Cover with wax paper and weight with a book for 10 min. Trim plastic closure strips up to the cloth edges along the sides and bottom of funnel. The net’s closure strips should now be at least 1/2 in (1.2 cm) narrower than the capture-bag closures. At the top of the funnel, cut the corner of the hem at the seam to open up the hem for the wire loop of the net frame (Fig. 1A). Thread the wire loop through the hem of the pillowcase, bending the loop to facilitate sliding the net over the loop.

Using the net. The smallest size (“snack”) bags are best for most collections. Lay the net on a flat surface. Attach a new plastic bag by matching the complementary channels on one side (e.g., blue to red) and, starting from one end, press along the channel to seal; repeat with the other side (Fig. 3). (The seals always have a thin bead of one color that fits into a thick bead of the other color. Different brands usually work if you match thin beads to thick beads.) Press together any excess closure on either side of the net. Sweep the net as usual, then snap the net with your wrist to force specimens into the bag. The attachment of bag to net is robust, so the bag will not separate from the net when snapped. One can collect many insects in one bag by rolling the net over on itself between sweeps and re-snapping before sweeping. Once collection is complete, fold the net over and pull one end of the bag down and away from the net’s sealing strip (Fig. 4). Rapidly seal up the bag as it is pulled away, leaving a large air pocket to prevent damage to specimens. For wet fixation, the closure can be opened just enough to allow the fixative to be poured or injected into the bag and the insects submerged. Check for leaks. For dry preservation, I add one or two homemade snap-top, vented fume capsules filled with ammonium carbonate crystals or ethyl-acetate-soaked cotton to the bag before collection (Fig. 3 and inset). Fig. 5 illustrates a typical collection from two running sweeps of a small residential lawn and adjacent plants, showing the wide range of arthropods captured, from centimeter to sub-millimeter sizes. Damage to specimens, even under SEM
observation, is negligible, except for larger Lepidoptera, whose wings may be injured during capture.

Transferring bagged specimens. To transfer insects in alcohol from bag to a permanent container, wash all insects to a lower corner of the bag. Hold the corner over a container half-filled with alcohol (preserve jars work well), cut off the corner into the jar with scissors, and add a penciled label to the jar. For dry preservation, the fume capsules usually can subdue even the largest insects. Shake immobilized insects to one corner of bag and cut off corner into a killing jar. For live, unanesthetized specimens, put the bag in a home freezer (ca. -20 deg. C) for about 1 min (not much longer!), shake specimens to a corner, and transfer.

The zip closure on the net should hold up through many collections. I have used one of my early models for over three years with the same strips. If strips become damaged, peel off and re-glue with new, or cut off the old strip and glue on a new one above the new opening (Fig. 1B).

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Endnotes
1 3M™ Hi-Strength 90 Spray Adhesive, 24 fl oz, is available at most building-supply companies.
2 BioQuip Products, 2321 Gladwick Street, Rancho Dominguez, CA 90220, USA.

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Fig. 5. Sample catch, from two running sweeps of a residential lawn and adjacent flowers in Evanston IL, 17 June 2014, in 95% ethanol. (A) Low-power survey of part of the collection. (B) Detail showing a range of sizes in the sample, top to bottom: a picturewing fly (ca. 10 mm), a mite-infested fruit fly, two thrips, and a collembolan (< 1 mm). Calibration bar = 5 mm