A Comparison of Aquatic Insect Sampling Tools

Bridal Veil Basin

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Abstract

A study was conducted to determine which aquatic insect sampling tool was the most efficient in collecting the largest number of insects. The three tools used were the D-frame net, also referred to as a “kick net”, which is a net attached to a frame in a “D” shape; the kick screen, a very fine wire mesh; and the Surber Sampler, a bucket-like tool that has a hole in the front, bottom and back with a net attached to the back hole. All three tools were tested at two sites on Bridal Veil Creek, a healthy headwaters stream high in the San Juan Mountains of southwestern Colorado. It was hypothesized that the Surber Sampler would be the most precise in sampling the largest most accurate amount of insects, because it has a specific collection area for sampling. The kick screen tool, however, was the most the most successful sampling tool in this study.

Introduction

Aquatic macro-invertebrates are a sign of a healthy aquatic ecosystem; therefore, sampling aquatic macro-invertebrates is a necessity when determining the health of a stream. An aquatic macro-invertebrate is defined as an insect that lives in the water, can be see with the naked eye and has no backbone. Most of the aquatic insects are actually larvae that live under water until they are ready to emerge into adults that then live near the water, but not in the water. A healthy ecosystem was defined in Water For Life as being “sustainable and resilient to stress, maintaining its ecological structure and function over time similar to the natural (undisturbed) ecosystems of the region, with the ability to recover from disturbance, while continuing to meet social needs and expectations” (Alberta Wetland Policy, 2011). It is necessary to have healthy aquatic ecosystems because humans use water from the aquatic ecosystem every day.

It is important to study aquatic macro-invertebrates so that the communities surrounding the watershed know about the health of their water, and it is important to study sampling methods so that scientists can have the most accurate results when they take samples for their studies. A commonly used insect sampling method in aquatic science is called the “kick method”. The kick method is a process where insects are collected by dislodging insects from
the substrate, which is their habitat. Frequently used sampling tools include the kick net, the kick screen and the Surber Sampler.

Previous research has been completed to show the differences in some sampling tools. One study was conducted showing the variations in collecting insect larvae and adults (Mayumi, Kaoru, 2004). The experiment comparing aquatic insect sampling methods in the Bridal Veil Basin is different because it is searching for the largest and most accurate quantity of insects that a sampling tool can collect in a potentially fast moving stream. It is predicted that if the kick net, kick screen and the Surber Sampler tools are used to sample aquatic macro-invertebrates in the Bridal Veil Creek, the Surber Sampler will be the most precise tool to collect the largest quantity of aquatic macro-invertebrates, because the Surber Sampler has a semi-enclosed area for kicking and collecting while sampling, while the other tools don’t have a specific kick area.

Site Description

Deep in the San Jan Mountains, Bridal Veil Creek rushes into the headwaters of the San Miguel River. Eventually the river meets with others that flow into the mighty Colorado River and empties into the Pacific Ocean. Bridal Veil Creek is mostly bedrock, but there are many spots where small rocks and sediment have built up, serving as habitat for many aquatic insects. In order to gather significant benthic insect samples, two sights were used: Bridal Veil Base Camp (Site 1) and Lower BVLC (Site 2). These sites are very similar, mostly covering the banks were a variety of small shrubs and plants. Approximately 5 percent of the rocks making up the substrate were 12-15 inches wide, 25 percent were 12 inches to fist size, 30 percent was less than fist size to sand, and 40 percent was sand and dirt. Site 1 was at a higher elevation; approximately 10,500 ft compared to the elevation of 10,400 ft at Site 2.
**Method**

To determine what the best sampling tool to collect aquatic macroinvertebrate insects is in a fast moving stream, three items were used, The kick net, the kick screen and the Surber Sampler. The kick net is a net attached to a pole (see Figure 1). The kick screen is a window screen attached to two dowels. The Surber Sampler that was used is a 5-gallon bucket with the bottom cut out and a hole in the back with a collection net attached.

Standard protocols for each tool and each site were used. The two sites were approached from down stream to avoid disrupting the organisms at the sampling location. The tools were placed at the downstream side of the sampling area with the opening facing upstream so that the opening is perpendicular to the flow, this allows the organisms in the water to flow into the tool easily. Stones the size of a fist and bigger inside the the sampling area were gently rubbed, underwater in front of the collection tool, removing organisms from their surface. The rocks were then placed outside of the sampling area. Once the larger stones were set aside, the streambed within the sampling area, of approximately 1 square foot, was vigorously kicked for one minute.

This process was completed twice for the Surber Samper because its set sampling area was half the area of a square foot. The kick net and Surber Sampler were removed from the water, using a forward scooping motion then carefully submerged once again in the water to work the sample to a bottom corner of the net. The kick screen was removed by quickly pulling the screen straight up out of the water. The samples were evenly emptied into the collection tray with water covering the bottom. The insects were moved into a separate collection tray, with a forcep and
eyedropper. The insects were collected for 30 minutes and then the collected insects were identified, using a dichotomous key.

![D-frame net, or “kick net”](image)

**Figure 1: D-frame net, or “kick net”**.

**Results**

The kick screen collected the largest quantity of insects existing at the Bridal Veil Creek sampling sites. Figure 2 illustrates the quantity of insects collected at all three sites for each sampling tool. The graph shows that the kick screen collected more insects in most of the insect categories. However in the *Plecoptera* order, the D-frame net collected the most insects and in the *Ephemeroptera* category the Surber Sampler collected the most insects. The Surber Sampler also collected the only *Gasterophilus intestinalis*. Table 1 shows that the kick screen collected the most insects, the Surber Sampler collected the second largest group of insects and the D-frame kick net collected the least amount of insects.
Figure 2: The quantity of insects captured by each of the three insect sampling tools: D-frame, Kick Screen, and Surber Sampler.

<table>
<thead>
<tr>
<th>Sampling Tool</th>
<th>Total number of Insects</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-frame</td>
<td>110</td>
</tr>
<tr>
<td>Kick Screen</td>
<td>136</td>
</tr>
<tr>
<td>Surber Sampler</td>
<td>113</td>
</tr>
</tbody>
</table>

Table 1: The amount of total insects that the tools collected.

Discussion

It was predicted that the Surber Sampler would be the most precise sampling tool to collect the largest quantity of aquatic macro invertebrates in Bridal Veil Creek, although this was
not the case. The Surber Sampler has a semi-enclosed area for kicking and collecting while sampling but the other tools, the D-frame and kick screen, do not have a specific kick area. The results show that the larger variety and higher quantity of aquatic insects were collected with the kick screen.

The Surber Sampler has a specific area to kick making it is easier to sample more accurately in addition to a net that collected the species for convenience. With a foot wide screen that had to be lifted straight out of the water the kick screen was perhaps the simplest method, but became difficult when transferring the insects because they clung to the net and had to be picked off. The kick screen was the only tool that collected *Tricoptera*, *Oligochatae*, slug, and mite. This may be due to the fact that kick screen is held straight up in the water, it has a very fine screen and the organisms didn’t have to travel far. One trend of Figure 2 is that the three methods collected many *Ephemeroptera*, *Plecoptera*, *Coleoptera*, and *Diptera*. This trend may be due to the fact that there were many more of these insects in the stream than the ones that were only collected by the kick screen. Figure 2 shows that the Surber Sampler was the only sampling tool that collected *Gasterophilus intestinali*, or aquatic worm, perhaps this is because the worms just happened to be at the Surber Sampler site.

According to a Minnesota aquatic insect sampling guide, dip netting is the most effective way to qualitatively collect aquatic insects (Ferrington). This is virtually the same as the D-frame net, which might explain why it caught the second highest amount of total aquatic insects (See Table 1).

One improvement, to make this study easier would be to have some sort of covered area close by that has a flat surface to sort the insects on, in case of rain, or wind. Another improvement would be to classify each order of insects into their family genus or species to be
more specific and account for a wider range of insect diversity. Further research on this subject could be conducted at several streams or rivers in the area in order to account for diversity among several riparian habitats. In addition, it would be interesting to ask which aquatic insect sampling tool would collect the largest and most accurate amount of aquatic insects in a still water environment.
Works Cited


