Modification of the mouth aspirator for collection of cave arthropods

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Hand collection is commonly used as a sampling technique in bio-surveys of terrestrial cave invertebrates because of its selectivity. This method largely benefits from the activity of the collector – gentle disturbance from the examination of the underside of a rock, or air movement generated by exhalation directed on a substrate – which causes movement of cryptic arthropods that increase their visibility. Similarly, experienced collectors use exhalation to charge silk and webs with condensation, which facilitates the localization of taxa that are otherwise almost impossible to find (e.g. Araneae: Leptonetidae, Ochyroceratidae, Symphytognathidae). Visual searches require the use of tools to capture and transfer the specimens into collecting vials. A fine brush is suited for minute or slow moving taxa, but in many cases, the use of a mouth aspirator is the only reliable method.

The use of mouth aspirators in caves may be problematic because of the risk of ingesting pathogens that can cause short-term, but rather violent, illness (P. Paquin, pers. obs.). Another serious concern is the contraction of histoplasmosis. This pulmonary disease is caused by *Histoplasma capsulatum*, a fungus that exists as a soil saprophyte and grows in soils enriched with bird and bat guano[3]. The disturbance of contaminated soils creates aerosols containing conidia, and the disease may be contracted from simply breathing contaminated air[2]. Histoplasmosis is known to have been contracted through spelunking, but also in commercial tours of infected caves, through the observation of bats outside caves, and in a rural house that harbored bats[1, 2, 3]. Histoplasmosis can be contracted rather easily in contaminated areas and therefore, the use of a mouth aspirator appears a serious risk in caves that harbor bats.

Cave bio-surveys may be attempted with passive techniques such as pitfall traps that do not require the use of mouth aspirators, but the suspected low mobility and/or density of troglobiotic animals challenges the reliability of this

sampling method in this particular environment. Baited pitfall traps have been reported successful for some taxa, but its overall efficiency to collect predators with low mobility – such as sedentary cave-adapted spiders – remain uncertain.

There are several types of aspirator: some use the suction generated by a manual pump[4], other have a system where the collector blows instead of creating a vacuum. A few field trials with these aspirators lead us with the conclusion that they are not powerful enough to work efficiently, especially when compared to standard mouth aspirators. Mouth aspirators use negative pressure created by the collector that suction organisms into a clear chamber of the apparatus. Some models have a chamber in the middle of the device[4, 5], while others have a transparent section at the tip of the aspirator such as the one used here for modifications (Fig. 1). This model consists of a flexible rubber tube of 13 mm fitted over a rigid clear plastic tube that contains a fine mesh in its inner junction. The flexible end of the aspirator is kept in the mouth of the collector, while the clear, rigid portion is oriented towards the specimen to be collected. The air pressure created by the vacuum aspirates the specimen into the clear tube. The mesh prevents the specimen to go in the flexible tube and mouth of the collector. The specimen is examined and then, it may be transferred into a collecting vial (dry or with alcohol) by placing the tip of the clear portion in the vial and gently blowing through the device, or released.

We present here a simple modification of this mouth aspirator for a safer use in caves. A Sterivent Mini™ commercial filter (Figs. 1a arrow, 1b) [from tyco Healthcare (http://www.tycohealth-ece.com/index.php-folder=36.htm)] was added to the flexible portion of the tube of an aspirator (Figs. 1a, 1b). Sterivent Mini™ is designed for medical use and filters bacteria and viruses with 99.999% efficiency, and has a large filtration surface of 320 cm^2, which results in almost no resistance to air circulation. This modification results in protection against breathing pathogens without loosing the needed vacuum pressure for mouth aspirators. The filter could be installed at the tip (Fig. 1a) or in the middle (Fig. 1b) of the flexible tube.

While there are no guarantees that this modification provides an absolute protection against pathogens, it greatly diminishes the risk of contracting pathogens when using mouth aspirators. The addition of the Sterivent filter does not change collecting efficiency by decreasing the vacuum pressure. The filter cost is low (about $6.00) and is easy to replace if needed. We suggest that Sterivent filtration be adopted as standard practice for mouth aspirators in caves particularly, and in any habitat that potentially harbors pathogens.

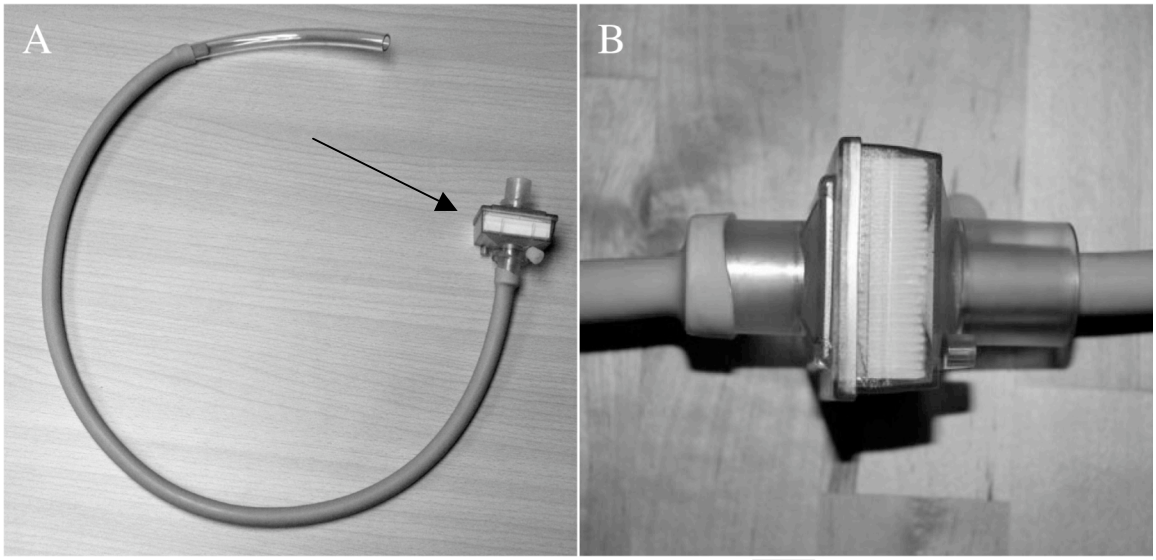

Figure 1. A mouth aspirator completed with a Sterivent Mini™. A) A flexible rubber tube is fitted over a clear rigid plastic tube that contains a fine mesh in its inner junction as a regular mouth aspirator. A Sterivent Mini™ (arrow) is added at the tip of the flexible portion. B) The Sterivent Mini™ may also be added in middle of the flexible portion of the aspirator.

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