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High-output suspended mega-sifter for sampling forest litter mesofauna

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Abstract
A novel mega-sifter suspended from trees and designed to quickly process large amount of forest leaf litter in search of mesofana is illustrated and discussed.

Key words: Arthropod sampling methods, mega-sifter, forest litter.

Efficient sampling of arthropods and other mesofauna from forest leaf litter often requires mechanical separation of the fine litter fraction from larger twigs and leafs. This is predominantly achieved by using hand-held sifter (Smetana 1971). So performed, sifting process requires prolonged muscular effort of holding and constantly shaking sifter with litter inside it, which limits method's output.

A novel suspended mega-sifter (Fig. 1) free from the aforementioned shortcomings is reported herein. Its simple design is self-evident from Fig. 1, while the production cost if relatively very low. Its main advantage is the much greater sifting surface (about 2 meter square, which is about 10–20x greater, as compared to a regular hand-held sifter). This improvement permits rapid sifting of a much greater volume of forest litter. Another advantage is the small weight (<2 kg) and compact size when packed (only cloth and ropes, no sizable or heavy rigid details), which makes it transportable and operational by a single individual. The third advantage is that the bungee cords (Figs 1A,C,F) suspending the device to trees considerably reduce the muscular effort at the sifting stage. Experience demonstrates that the most laborious part of this new sifting process is gathering large quantities of the leaf litter in bags (Fig. 1B) and their delivery to the suspended sifter (whole the labour to set up and dismantle the device is the second greatest). The use of two separate meshes (length of each side of individual squares is 12 mm and 5 mm, respectively) is critically important, since two-step sifting prevents clogging the finer mesh. Another critically important consideration is the use of two receiving bags to store sifted litter: one bag for the <12 mm intermediate fraction (Fig. 1A, C, D) and another for the <5 mm final fraction (Figs 1E, F).

Three practical limitations detected when using the mega-sifter in the field limit device's applicability. Firstly, the labour to deliver litter (Fig. 1B) to this suspended and therefore immobile device makes it disadvantageous to take samples from a significant distance. Secondly, the herein described device quickly generates very larger quantities of the fine-fraction forest litter (<5 mm), which is, ironically, its main function. Using this suspended mega-sifter, a single individual during half day work might generate up to 100 kg of fine litter fraction (<5 mm). Removal of such a large among of fine litter from the sifting site was noted as a significant physical challenge. Furthermore, extraction of mesofauna from so great amount of fine forest litter using standard Winkler funnels (Krell et al. 2005; Owens & Carlton 2015) becomes the major bottleneck in the sampling process, which, perhaps, can be solved by using much increased number of funnels. Because of these practical limitations, the herein described mega-sifter was used in author's work only once, and then substituted by its classical hand-held model. It is possible to imagine, however, that the herein reported device might prove highly efficient for some specialized sifting tasks, such as detecting organisms with extremely low density or, alternatively, for obtaining large biomass of litter Arthropoda.

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Fig. 1 – Details of design and sequence of steps when using a novel suspended mega-sifter to rapidly process large amount of forest leaf litter. **A**, mega-sifter at the beginning of operation suspended among four trees using bungee cords; the first collecting bag and a larger 12 mm mesh are used (insert: details of suspension and the 12 mm mesh); **B**, forest litter packed in a bag to be delivered to the suspended mega-sifter; **C**, sifting forest litter through 12 mm mesh; **D**, <12 mm litter fraction is accumulated in the collecting bag; **E**, closed bag with <12 mm liter fraction moved away and another empty collecting bag is suspended under a finer 5 mm mesh (insert: details of suspension and the 5 mm mesh); **F**, sifting <12 mm litter fraction through 5 mm mesh; the final <5 mm litter fraction is accumulated in the bag.