Using a Centrifuge in Pond Water Microscopy

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One of the foremost traits of microscopists is patience. We gather our samples and prepare our slides and then search for subjects of our interests. Those of us who explore pond water may go through hundreds of water drops to track down a single hydra or a *Daphnia magna*. Recently I found a truly magnificent *Micrasterias* species on a slide but was unable to isolate it. I have been looking for this species ever since, with no luck.

Why not take a sample of a hundred or more drops and reduce it to one drop, in effect distilling the pond water sample? The answer is simple – a centrifuge.

A centrifuge spins fluid samples at high speeds, thereby precipitating the solid matter into a mass at the bottom of a vial and leaving clear fluid at the top. In serology a blood sample can be centrifuged and the red cells will be compacted at the bottom of the vial leaving a somewhat clear fluid above it. A simple field test for anemia can be done by comparing the ratio of the mass of red blood cells to the fluid above it.

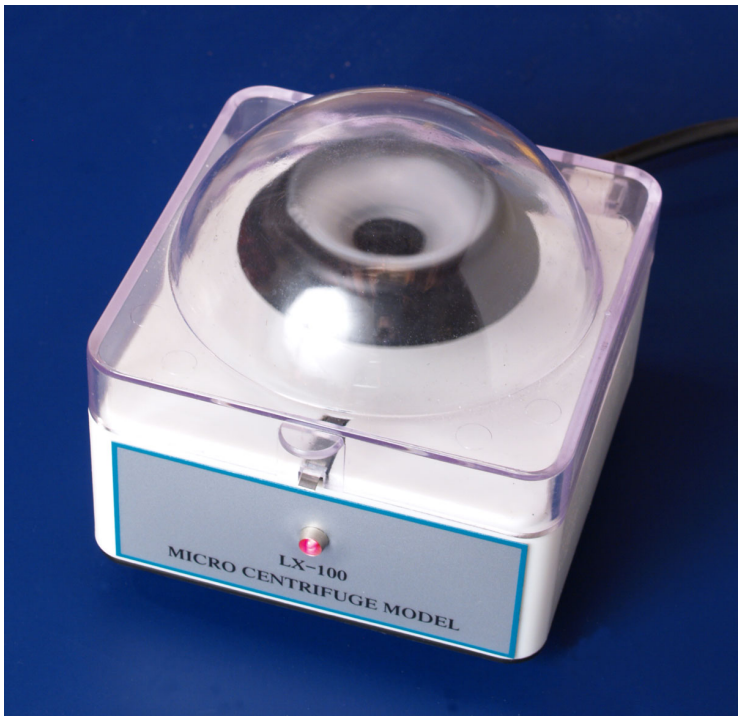
While there are many centrifuges available on eBay with variable speeds and timers, I settled for a very basic unit from China that sells on eBay from $70 to $100 USD.

These models come in 120 and 220 volt models, so be careful when buying that you get the right specification. The footprint of the unit is 4.5 x 4.5 inches.
The unit rotates at 3000 RPM and does not have a timer. I keep a stopwatch on my bench and usually centrifuge my samples for five minutes. The unit does have a thermal sensor, and if it gets too warm it will shut down. You will have to wait a few minutes for it to cool down before preparing another sample.

The rotor holds six 1.5 milliliter vials. You can centrifuge two or six vials at a time since the weight has to be evenly balanced. All of the vials must have equal amounts of fluid to maintain balance. If two vials are used they must be in positions opposite of each other.

The 1.5 milliliter vials have a snap cap to prevent aerosols being created that would occur with an uncapped vial due to the Venturi Effect.
Extra vials are available in convenient 500 and 1000 unit bags. 1000 unit bags are available on eBay for about $20 USD.

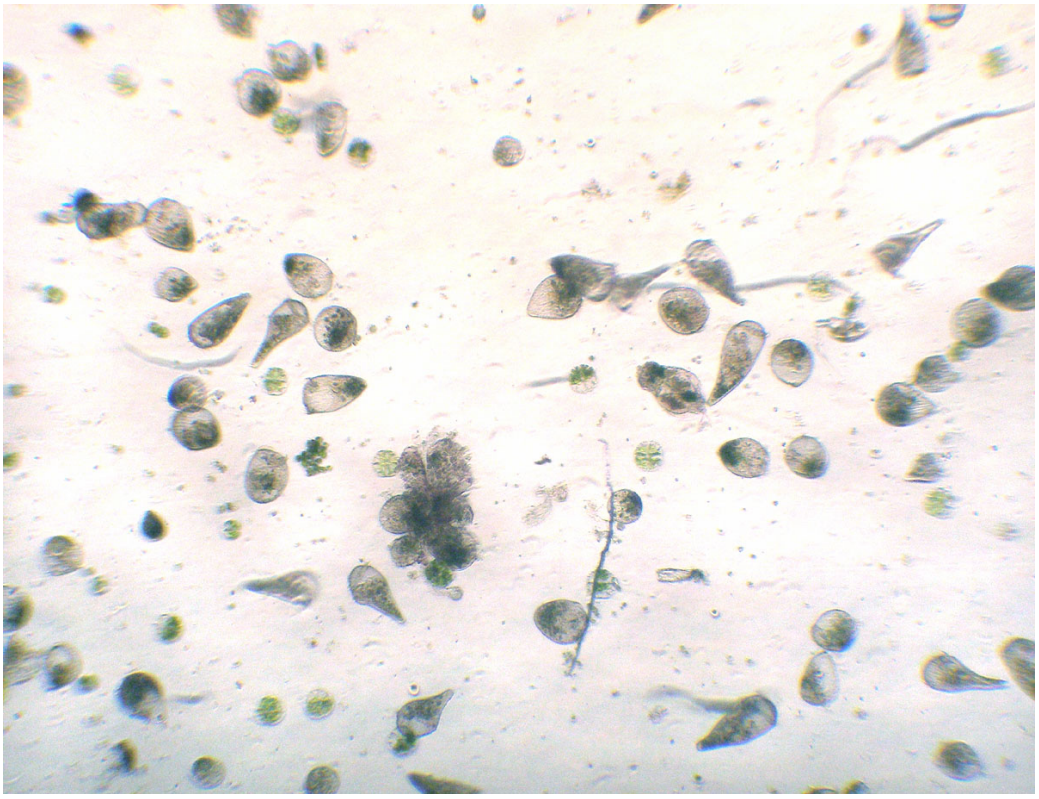
Since I may use the same vials for several weeks, my left over vials will be in my estate.



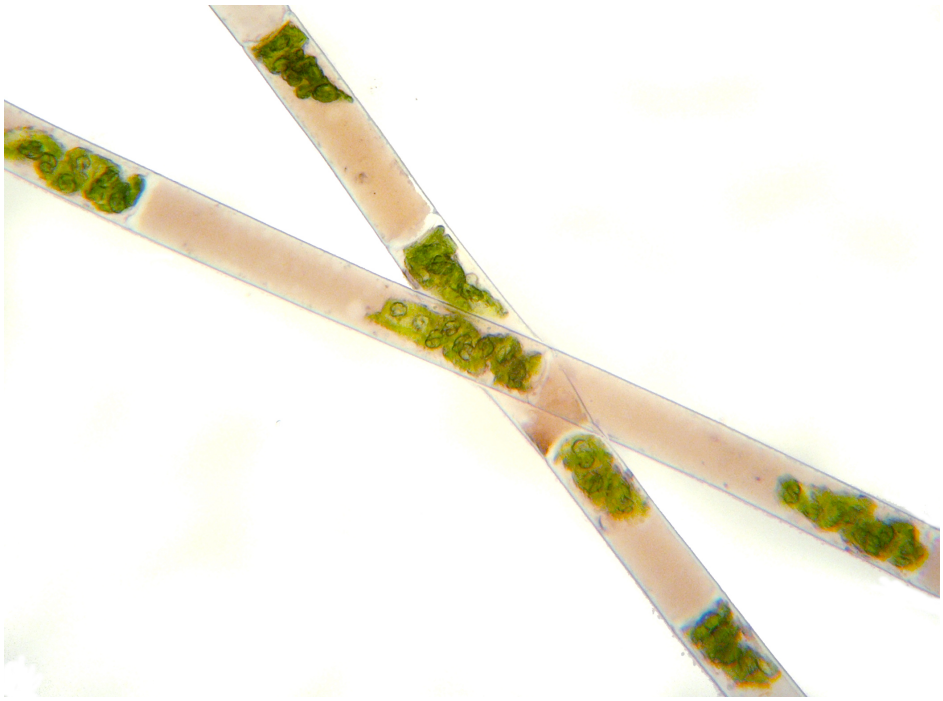
Like most centrifuges, when the rotor cover is up, the centrifuge will not spin. Rotation starts when the cover is closed. When the time is up, simply open the lid to stop the rotor.
At the bottom of the vial will be the concentrated sample, called a "pellet." I have added pellets from other vials and centrifuged them again to make a more concentrated sample. You carefully draw off the fluid above the pellet with an eyedropper or a pipette until all that remains is a single drop of water containing the pellet, which can then be transferred to a slide.
Since I only do two vials at a time, I made a small oak rack to hold the vials while I am preparing the samples.

The result of centrifuging is a much denser sample that makes surveying a water drop for ciliates, desmids, protists and microcrustaceans far more efficient than the one-drop-at-a-time method.
I've been very surprised at the organisms that can withstand the G-forces created during centrifuging. I've seen *Volvox* make it through. Some ciliates such as *Stentor* and *Vorticella* become sluggish after centrifuging. Microcrustaceans such as *Daphnia* and copepods do very well.

I apologize for the lack of depth of field in this shot, but it was made with a 4X objective on a phase contrast microscope that has a condenser with a negligible minimum aperture.



One downside is that desmids and algae don’t do very well with centrifuging. The chloroplasts tend to shift over to one side of the cell as seen in this shot.



So, if you do a lot of work with fresh water or marine water samples, you might want to give centrifuging a try.

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