CAN DIGITAL IMAGING FLOW CYTOMETRY REPLACE MICROSCOPE MEASUREMENTS OF DIATOM CELL DIMENSIONS?

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The development of digital imaging flow cytometry offers the possibility of replacing the often tedious and time-consuming measurements of diatom cell dimensions utilizing light microscopy with a more rapid, quantitative alternative to obtain data. Digital imaging flow cytometry is beneficial for applications that require measurement of large numbers of cells to obtain reliable population estimates, either in space or time. In addition, such an approach offers the opportunity to examine diatom population dynamics in terms of size diminution and the timing of sexual reproduction using large sample sizes, previously prohibitive in terms of time and effort. In this study, we chose three diatom species to evaluate the results from digital imaging flow cytometry; these taxa cover a range of size and shape encountered in fresh waters, *Achnanthidium minutissimum*, *Hannaea baicalensis,* and *Didymosphenia geminata*. Cell lengths were measured using a light microscope and compared with cell lengths measured by a FlowCam (Fluid Imaging Technologies, Maine, USA). The FlowCam acquires and stores digital images of each cell detected from heterogeneous samples over a size range; we tested the range from 1µm to 200 µm. We evaluated the limits of the FlowCam under different operating conditions and determined that best results were obtained by optimizing the system through choice of correct filters, thresholds, and objectives for each species. Using examples from the three test species, both the benefits and limitations of this new technology will be discussed.

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