

## Improved Device for Extracting Sediment Pore Water

The feasibility of conducting toxicity tests with sediment pore water has been demonstrated, and the porewater approach has been used successfully in marine and estuarine sediment quality assessment studies. Initially, we designed and used an extraction device made of Teflon, which has been described previously (RIB No. 89-107). Our experience with this Teflon pressurized extraction device has led to the development of a similar but improved device.

### Improved Porewater Extractor Composed of a Modified PVC Compression Coupling

The Teflon extractors are expensive (~\$500 per unit); the setup is somewhat awkward to use, cumbersome to load, unload, and reload sediment; and the system requires two persons to operate. The improved extractor (Fig. 1) is constructed from a polyvinyl chloride (PVC) compression coupling for 10 cm i.d. PVC pipe. These commercially available couplings (Lascotite) consist of a cylinder (25 cm high and 13 cm in diameter) with threaded ends and threaded open compression nuts. The coupling is fitted with end plates cut from 8 mm thick PVC sheeting and are held in place by threaded end nuts. The gaskets provided with the coupling are discarded and silicon O-rings are used to seal the top and bottom connections. Like the original Teflon extractor, the bottom end plate (Fig. 1) has several interconnected concentric grooves to

facilitate flow of the pore water to the central exit port. An 8- $\mu$ m polyester filter is placed between the bottom end plate and the silicon O-ring. Before a sediment sample is loaded, the bottom end nut is tightened in place by using the stationary bottom wrench (Fig. 1) and a standard strap wrench. After the sediment is loaded, the top end plate (fitted with a pressure relief safety valve and a quick-disconnect fitting for attaching the compressed air line) within the top compression coupling nut is attached. To tighten the top coupling nut, the strap wrench and the coupling nut wrench (Fig. 1) are used. Once the extractor is loaded and sealed, a high-pressure hose is attached to the quick-disconnect fitting on the top end plate, and the extractor is pressurized with air from a SCUBA tank, as was done with the original Teflon extractor system. Pressure is controlled with a first-stage regulator on the tank, an intermediate governor regulator, and second-stage regulators attached to a manifold that services multiple extractors (Fig. 2). The governor regulator is set (usually at 40 psi) to control the maximum pressure allowed at the second-stage regulators. During the extraction process, pressure at the second-stage regulators is gradually increased from ~10 psi to 35–40 psi. Simple wooden stands can be constructed to accommodate several extractors simultaneously. The stands support the extractor units and provide a space below each to place a porewater sample collecting jar or bottle.

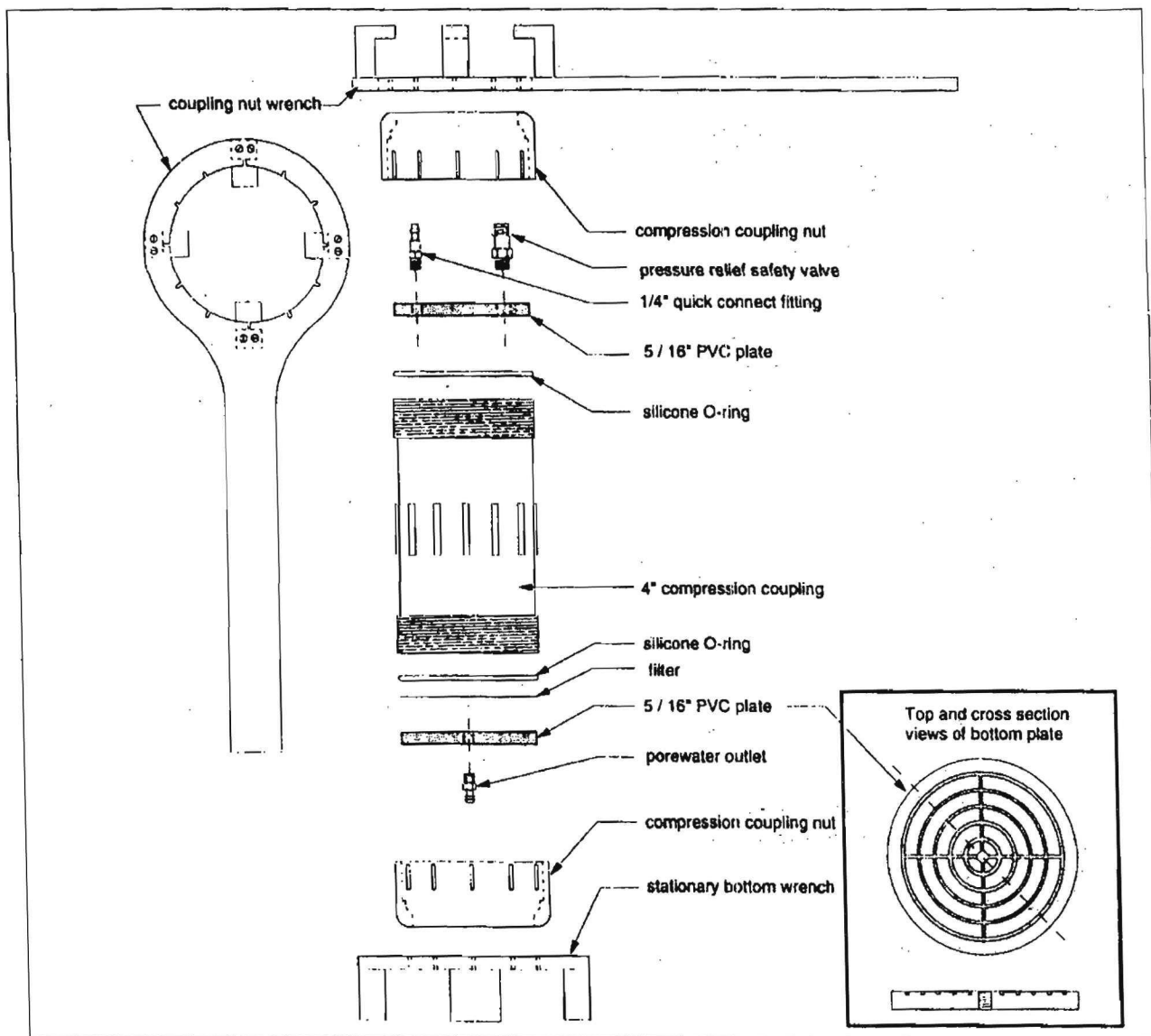
## **Use of the PVC Porewater Extractor is Advantageous**

By using the PVC system, the extradiation of pore water from sediment can be accomplished in the field as well as in the laboratory. We presently extract pore water from 12 sediment samples simultaneously. The PVC units are easier to use than the more awkward Teflon extractors. The bottom portion of the Teflon units could not be sealed until after the addition of sediment and required two persons to operate. The bottoms of the PVC units can be sealed before loading sediment, and only one person is required to assemble and manage them. The initial cost for the PVC extractors is less than that for the Teflon design (~\$60 per PVC unit versus ~\$500 per Teflon unit). Once the extractors have been constructed, costs are limited to the labor required to perform the extractions, washing of the materials, and to purchasing compressed air for the SCUBA tanks. Polyester filters can be acid-washed (10% HCl) and reused, but have a limited lifespan.

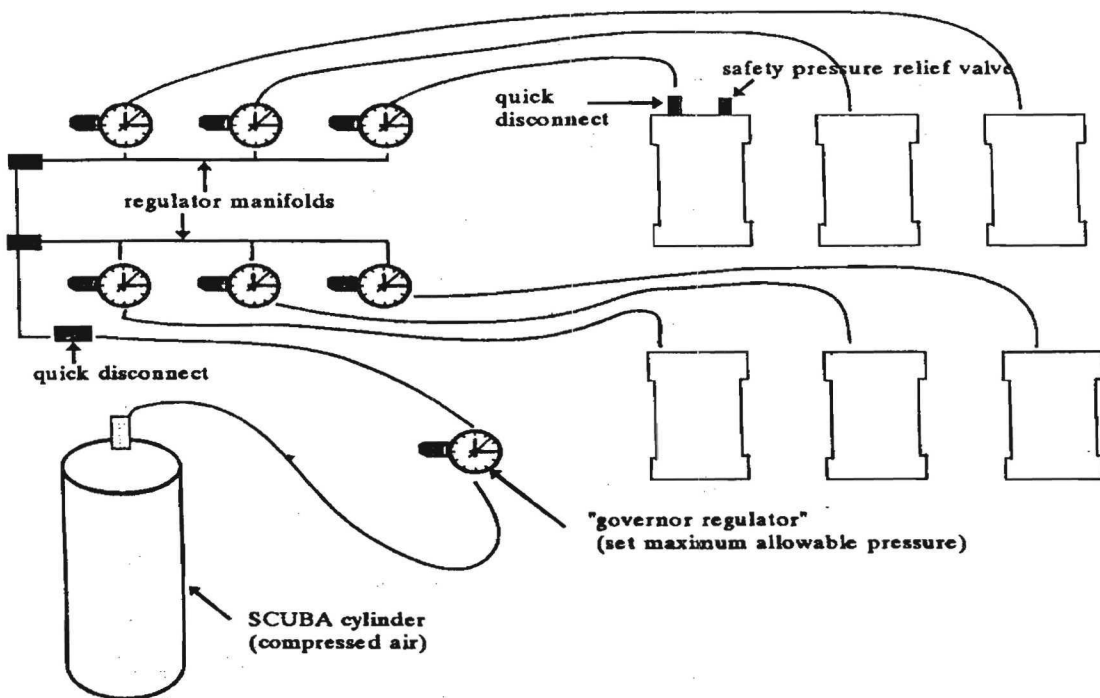
We recommend soaking the PVC extractors in deionized water for a week or more with several water changes to ensure that they do not leach toxic material into the samples. Chemical analysis has not detected any organic contaminants, including phthalates, after extractors have been soaked. In addition, pore water extracted from uncontaminated reference sediments with the PVC extractors show no toxicity. The toxicity of contaminated pore water obtained with the PVC and Teflon extractors does not differ in our tests.

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**Fig. 1.** Sediment porewater extraction device.



**Fig. 2.** Schematic of sediment porewater pressure extraction system.