Literature Review and Report: Surface Sediment Sampler Database

LITERATURE REVIEW AND REPORT

SURFACE SEDIMENT SAMPLER DATABASE

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ABSTRACT

A literature review was conducted to identify available surface sediment sampling technologies with an ability to collect undisturbed sediments to depths of up to 1 meter below the water sediment interface. This survey was conducted using published literature and references, Environmental Protection Agency reports, professional sources, journal articles, internet web sites, sales brochures, and other sources as identified. For each piece of sampling equipment or sampling tool identified during the literature search, the following information was collected: general description of the equipment or tool, including its size, shape, weight, and composition; manufacturer's name, address, phone number, and email; a picture of the equipment or tool; the general mechanism of operation; sample volume collected; chemical and physical compatibility concerns; labor requirements; cost; and other requirements such as electrical power or specialized training.

Sampling methodologies included in this investigation are grab or core types of sampling devices, as these types are most typically used in collecting surface sediments. In this review, 40 samplers were identified that included 13 grab samplers and 27 core samplers. Grab samplers included in the review are the Ponar, Birge-Ekman, Van Veen, Peterson, Mud Snapper, Scoopfish, Shipek, Smith-McIntyre, and others. Core samplers included in the review are the piston, splitcore, box, Vibracore, Mackereth, Ballchek, Craib, Gomex, Phleger, and others. These technologies were identified through contacts with centers of contaminated sediments expertise and included in the study. Vendors were solicited to provide required information for the report.

All information collected in the literature search phase is maintained in an Access® database. Pictures of equipment will be maintained in digital PDF or JPEG file formats in a sediment sampler picture file directory associated with the database. Information contained in the database is provided in the Appendix to this report.

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SURFACE SEDIMENT SAMPLER DATABASE

1.0 INTRODUCTION

This surface sediment sampling technologies report was prepared for the U.S. Environmental Protection Agency's (EPA) Office of Research and Development (ORD), National Exposure Research Laboratory (NERL), Environmental Sciences Division (ESD), Characterization and Monitoring Branch (CMB) in Las Vegas, Nevada. EPA NERL's ESD conducts research programs on environmental exposures to ecological and human receptors, as well as develops methods for characterizing chemical and physical stressors. ESD also conducts analytical chemistry research and applies advanced monitoring technology to issues involving surface and subsurface contamination. CMB develops, evaluates, applies, and validates technologies and approaches for cost-effective monitoring and assessment of surface and subsurface environments. The Branch's research and technical support address questions about monitoring for site characterization, pollution prevention, the detection and assessment of contaminants, and decision support systems for site characterization and the evaluation of exposure. The goal of this study was to conduct a literature review to identify available surface sediment sampling technologies. For the purposes of this investigation, surface sediment is defined as any depth of sediment up to 1 meter from the overlying water/sediment interface.

The surface sediment sampling technologies study was initiated as a result of findings from a study conducted by the Committee on Remediation of PCB-Contaminated Sediments, which was established by the National Research Council (NRC). The findings of this study identified the need for the ability to collect undisturbed surface sediment samples. NRC published a report in 2001 titled "A Risk-Management Strategy for PCB-Contaminated Sediment," which discussed the findings of this study in more detail (NRC 2001). EPA's Environmental Monitoring and Assessment Program and the National Oceanic and Atmospheric Administration (NOAA) National Status and Trends Program are also interested in surface sediment sampling technologies because their studies focus on the characterization of recent environmental impacts to lakes, estuaries, and coastal waters (EPA 2001).

Tetra Tech EM Inc. (Tetra Tech) prepared this report to summarize the results of the surface sediment sampling technologies literature review that will be used by EPA and others in identifying and developing or modifying a sediment sampling device or tool for collecting an undisturbed surface sediment sample. Specifically, Tetra Tech was responsible for the following: (1) conducting a survey using published literature and references, EPA reports, professional sources, journal articles, internet web sites, and other

sources as identified; (2) collecting and reviewing accessible information for each sampling tool or device, including a general description of the equipment or tool, manufacturer information, a picture of the equipment or tool, general mechanism of operation, sample volume collected, compatibility concerns, labor requirements, cost, and other requirements such as electrical power or specialized training; and (3) development of a database in Microsoft Access® format to compile information attained during the literature review.

This section describes the background, purpose, and need for the study. Section 2.0 provides considerations for selection of sediment sampling equipment. Section 3.0 discusses the two most commonly used types of sediment sampling devices, grab and core samplers, which are typically used to assess surficial sediment characteristics. Section 4.0 provides a summary and status of the sediment sampling technologies study. Section 5.0 provides a list of references. The appendix includes a description of each sediment sampling device or tool attained during the literature review and included in the database.

2.0 SURFACE-SEDIMENT SAMPLER LITERATURE SEARCH

This survey was conducted using published literature and references, EPA and U.S. Geological Survey (USGS) reports and documents, professional sources, journal articles, internet web sites, and sales catalogs in order to identify sediment samplers. For each piece of sampling equipment or sampling tool identified during the literature search, Tetra Tech collected the following information: general description of the equipment or tool, including its size, shape, weight, and composition; manufacturer's name, address, phone number, and email; a picture of the equipment or tool; the general mechanism of operation; sample volume collected; chemical and physical compatibility concerns; labor requirement; cost; and other requirements such as electrical power or specialized training. Sampling device vendors were contacted whenever possible to confirm literature search findings and to request additional information needed to complete data gaps.

Candidate samplers identified in the literature review were evaluated to determine whether they possessed sufficiently unique characteristics in order to classify as a new sampler or a different model under an existing classified sampler. Of the 85 sediment samplers identified in the literature review, there were 40 unique classified samplers that included 13 grab samplers and 27 core samplers.

All information collected in the literature search was maintained in an ACCESS database. Pictures of equipment will be maintained in digital PDF or JPEG file format as a bound object within a sediment sampler picture file directory associated with the database.

The database maintains each of the 40 unique sediment sampler types in a separate record. Different identified models of a classified sampler are presented in a single record. Details of a specific sampler are presented in a specially designed screen that contains sampler data property fields as well as feature fields that discuss general description, operation, chemical and physical compatibility, and training and other requirements. A section that presents the manufacturer information and cost data is at the bottom of the screen. A JPEG file icon is embedded in this screen in order to permit a call up of a sampler picture file by placement of the cursor and clicking on the mouse. The screen also provides the ability to change to a printer friendly format in order to download a hard copy of sampler data records.

The database possesses a search function table that appears upon opening the database. The database can be searched according to sampler category (core or grab) or type. Searchable core samplers include the gravity, box, piston, manual push, mechanical push, and mechanical oscillation devices. Searchable grab samplers include the small dredge, clamshell bucket, mechanical trap, and manual trap devices. Starting with a general idea of a type of sampler, a user of the database can display specific records of samplers that correspond to the input sampler type.

3.0 SELECTING DEVICES OR TOOLS FOR SEDIMENT SAMPLE COLLECTION

Selection of the appropriate sediment sampling device or tool must first be determined based on the data quality objectives for the project. No individual sediment sampler is appropriate for every objective and environmental setting. More than one sampling approach may be required for an investigation involving an assessment of the horizontal and vertical distribution of sediment contaminants of concern or benthos. Studies indicate that most samplers were designed primarily for collection of sediments for benthos or particle-size analysis and generally are inadequate for collecting undisturbed samples for chemical and mineralogical analysis. Studies have also shown that most sediment sampling equipment is not designed for collecting samples from the water/sediment interface (USGS 1997). Considerations for selecting a sampler for sediment collection are discussed in more detail below.

When selecting the sediment sampling equipment, consideration must be given to the safety of the field team, which may involve accessibility to the sampling site and sampling platform. Accessibility to the sampling area is an important factor in selection of the sampling equipment. When working in remote areas, considerations may include a boat, plane, helicopter, bridge, ice, scuba, wading, or a cable way. Other considerations may include the weight of equipment to be transported and the lifting capacity of winch, boom, crane, A-frame, or other support equipment that can be safely operated from a platform where sampling will take place (EPA 2001).

Limitations of sampling equipment are another factor that needs to be evaluated and may include physical disturbance of sediments, retention of fine-grained sediments, penetration depth, and limitations due to the physical character of the sediment type, such as particle size and degree of consolidation. Studies have shown that most sediment samplers are capable of recovering relatively undisturbed samples in soft, fine-grained sediments, but few can sample consolidated sediments consisting primarily of sand, gravel, firm clay, or till (EPA 2001).

For most studies, the upper 10 to 15 centimeters is typically the desired depth of penetration because most benthic organisms are found in this horizon. To limit physical disturbance and loss of fines during sampling of this upper horizon, a minimum penetration depth of 6 to 8 centimeters is recommended, but 10 to 15 centimeters is preferred. If contaminated sediment is being linked to organism exposure, sampling of specific sediment layers may be required. The feeding habits of the organisms of concern should be considered because some organisms feed at shallow depths and others feed at deeper intervals (EPA 2001).

Samples of specific sediment layers can provide information on the horizontal distribution of the contaminants of concern for the most recently deposited material. This information can be used to map the distribution of contaminants of concern across a body of water. A column of sediment, including the surficial and underlying layers, can be used to document historical changes in vertical distribution of contaminants of concern by characterizing the sediment quality with depth. This information can also be used to correlate organism exposure to specific sediment layers (EPA 2001).

The physical character of the cross-sectional area to be sampled will also be a determining factor in selecting the proper sediment sampler. These physical characters include slope, bathymetry, flow velocity, sampling depth, and size and areal distribution of physically different sediment types across the body of water to be sampled (EPA 2001; USGS 1997).

Sample volume may be a consideration when selecting a sampler because the required volume of sediment is typically dependent on the number and type of benthos and/or chemical sample analyses (EPA 2001). If the sample is collected for chemical analysis, compatibility concerns with the sampler construction materials will also need to be evaluated. Sampler construction materials can leach or be eroded during sample retrieval, which can impact results of sample analysis (USGS 1997).

4.0 SEDIMENT SAMPLERS

Three main types of sediment sampling devices are available: grab samplers, core samplers, and dredge samplers. Grab samplers are most commonly used to collect surface sediment in the determination of horizontal sediment characteristics. Core samplers are used to sample thick sediment deposits or for the collection of sediment profiles to determine the vertical distribution of sediment characteristics or to characterize the sediment column. Dredge samplers are used primarily for collection of benthos (EPA 2001).

Dredge samplers provide inadequate control of sample location, volume, and depth (USGS 1997), cause disruption of sediment and pore water integrity (EPA 2001), as well as a loss of fine-grained sediments (EPA 2001). For these reasons, dredge samplers are not typically used for collecting surface sediments; therefore, only the grab and core samplers are recommended for collecting surface sediments, and are considered in this evaluation. Tetra Tech identified 40 different grab and core sediment samplers during the literature review for this study. A description of each identified sampler is provided in the Surface Sediment Sampler Database, which is provided in the appendix to this report. Grab and core samplers are discussed in more detail below.

Grab Samplers

Grab samplers are used to collect information on horizontal surface distribution of sediments. Grab samplers typically consist of a set of jaws, which shut when lowered to the surface of the sediment or contain a bucket, and rotates into the bottom when reaching the sediment surface. These samplers are easy to handle and operate and can be used in a range of substrata (EPA 2001). Tetra Tech identified 13 grab samplers during the literature review for this study that are presented in the database in the appendix. Table 3-1 lists some general characteristics of select grab samplers. For additional information about the samplers listed in the table or other samplers identified in this study, the sampler database is provided in the appendix.

TABLE 3-1
GENERAL CHARACTERISTICS OF SELECT GRAB SAMPLERS*

Database Record Number	Sampler	Sampler Construction Material	Sampler Dimensions	Sampler Weight (Kg)	Penetration Depth	Sample Volume (L)	Application
2 of 40	Birge-Ekman	Stainless steel	15.2 x 15.2 cm - 30.5 x 30.5 x 30.5 cm	6.8 - 9.1	10 – 30 cm	3.4 - 16	A box-style sediment sampler which includes a messenger-operated release device; overlapping cover plates, loosely hinged at the top of the box, permit an outflow of water during descent, and close tightly to prevent wash out of sediment during ascent.
21 of 40	Ponar	Stainless steel and neoprene rubber	15.2 x 15.2 cm - 22.9 x 22.9 cm	10.0 - 23	10 cm	1- 8.2	The device is used in fresh- and saltwater to collect samples of hard sediments such as sand, gravel, consolidated material, or clay. The sampler is designed for penetrating deep into the substrate.
3 of 40	Van Veen	Stainless steel; neoprene straps; zinc-plated chain	35 x 70 x 100 cm	14.0 - 120	30 cm	8 - 75	The device can be used in surging or rough seas without premature closure; designed to descend vertically through strong underwater currents and collects samples without excessively disturbing the sediment.
22 of 40	Petersen	Zinc-plated heavy steel	30.5 x 30.5 cm	5 - 61.2	30 cm	9.45 – 9.89	The device is used in freshwater for collecting sediment samples from sandy, gravel, or clay substrates; vent holes permit water to flow through while the grab is being lowered, minimizing diagonal movement as well as reducing the frontal shock wave generated by descent.

TABLE 3-1
GENERAL CHARACTERISTICS OF SELECT GRAB SAMPLERS* (CONTINUED)

Database Record Number	Sampler	Sampler Construction Material	Sampler Dimensions	Sampler Weight (Kg)	Penetration Depth	Sample Volume (L)	Application
31 of 40	Smith-McIntyre	Stainless steel	70 x 70 x 60 cm	40 -100	30 cm	10 - 20	The device automatically collects a sediment sample upon contact with the substrate and can be used for sampling in either shallow or deep waters.
23 of 40	Shipek	Stainless steel; cast alloy steel	10.2 x 15.2 x 15.2 cm	5 - 61.2	10 cm	0.5 - 3	Sampler is designed to collect unconsolidated sediments from deep lakes and near offshore.

Notes:

*Adapted from USGS 1997.

Kg Kilogram
L Liter
cm Centimeter

Grab samplers are commonly used when the following general factors apply:

- Large volumes of sediment are needed for analysis
- Consolidated, large-grained sediments are expected to be encountered in substrate
- Large surface area of surficial sediment is needed
- Still water to very low current (small grab samplers) and mild to moderate current (large grab samplers)

The Van Veen, Ponar, Petersen, and Birge-Ekman devices are the most commonly used grab samplers because they are effective in most types of substrate and can be used in a variety of environments including lakes, rivers, estuaries, and marine waters. However, the Birge-Ekman is limited to sampling unconsolidated, soft sediments. The Van Veen is selected for several estuarine monitoring programs because it (1) can sample most types of substrate, (2) is less susceptible to blockage and loss of sample, (3) is less susceptible to forming bow waves during descent, and (4) provides high sample integrity compared to other grab samplers (EPA 2001).

Grab samplers have varying penetration depths depending on the size, shape, and underlying substrate. Large capacity grab samplers, including the Smith-McIntyre, Hammond, large Birge-Ekman, Van Veen, Nemag Valstar, and Petersen devices, can collect samples from a depth of 30 centimeters. Smaller grab samplers including the Scoopfish, Mud Snapper, small Birge-Ekman, standard and petite Ponar, and Shipek devices can collect samples from a depth of 10 centimeters. Grab sampler volumes can range from 0.5 liters to 95 liters.

Grab samplers are susceptible to washout of fine-grained sediments and dispersion of material in front of the bow wave created by the sampler during descent. This washout can significantly impact chemical or benthos sample analysis, since some organisms can detect the pressure wave of the approaching sampler. The Ponar, Van Veen, and Ted-Young modified Van Veen grab samplers are equipped with mesh screens and rubber flaps to cover the jaws to allow water to pass through the sampler during descent. This feature reduces disturbance from bow waves at the water/sediment interface and washout of sediment samples during ascent (EPA 2001).

Core Samplers

Core samplers are used to collect vertical profiles of the sediment. This information can be used to characterize geologic conditions in substrate and document historical changes in vertical distribution of contaminants of concern with depth. Core samplers typically use weights or piston devices to drive a hollow tube into the sediment surface, where a core of sediment is retrieved. The core samplers generally consist of a removable core liner, which fits into the core barrel and retains the sediment sample. Most core samplers can be used with different liner materials, including polyvinyl chloride (PVC), brass, Lexan®, or stainless steel. Compatibility of sample liner material with intended sample analysis should be determined prior to use. Tetra Tech identified 29 core samplers during the literature review for this study. Table 3-2 provides general characteristics of a representative selection of core samplers. For additional information about the samplers listed in the table or other samplers identified in this study, the sampler database is provided in the appendix.

Core samplers are commonly used when the following general factors apply:

- Characterization of contamination in deeper sediments is needed
- Documentation of historical changes in vertical distribution of contaminants is needed
- Reduced oxygen exposure needed for sample analysis
- Soft, fine-grained sediments are expected to be encountered in substrate

These samplers come in various designs, lengths, and diameters and are generally described as hand-held, gravity, vibracore, box, or piston-core samplers. Most core samplers, with the exception of the hand-held core samplers, require the use of a winch or crane depending on the size and weight of the sampler (EPA 2001). Some commonly used hand-held core samplers include the Russian-Type Borer, Ogeechee, and KC Hand-Operated Sediment Corer. These samplers can be used in a wide range of sediment types including soft- to fine- and medium-grained sediments, semi-compacted material, as well as peat and plant roots in shallow bodies of water (EPA 2001).

TABLE 3-2
GENERAL CHARACTERISTICS OF SELECT CORE SAMPLERS*

Database Record Number	Sampler	Sampler Construction Material	Sampler Dimensions	Sampler Weight (Kg)	Penetration Depth	Sample Volume (L)	Application
7 of 40	Russian-Type Borer	Stainless steel	5 cm O.D. x 50 cm in length - 7.5 cm O.D. x 75 cm in length	Unavailable	1 meter	1 – 3.3	Device is manually driven, chambered-type, side-filling core sampler designed to collect discrete, relatively uncompressed sediment samples.
37 of 40	Ogeechee	Stainless steel core tube; stainless steel or Lexan® nose piece; stainless steel or plastic core catcher	50.8 cm x 5 cm x 243.8 cm x 5 cm	4.5 - 27.2	243.8 cm	5	The sampler is effective for firm or sandy sediments and can be used in fast-moving water up to 4.5 m (15 feet) deep with the use of an extension handle.
33 of 40	Kajak-Brinkhurst	Stainless steel	50.8 x 5 cm - 76.2 x 5 cm	5.9 - 21.8	70 cm	1.37 – 1.5	Designed to collect sediment samples from ocean floors and large deep lakes in most substrates.
34 of 40	Phleger	Stainless steel	50.8 x 3.6 cm	8 - 15	50 cm	0.48 – 0.65	Consists of a weighted hollow tube that is used to penetrate the bottom sediment layers so that the deposition of sediments can be studied.
9 or 40	Piston	Stainless steel frame and core tube; Lexan® or stainless steel nose piece; stainless steel or plastic core catcher	1.5 x 0.5 m – 2 x 0.5 m	11.3 - 1,174.8	3 – 20 m	5 - 40	The Piston provides pressure for greater sample retention and can collect sediment samples up to 20 m deep.
18 of 40	Vibracore	Stainless steel	102 cm - 5 cm - 1270 x 7.6 cm	45.4 - 136.1	3 – 13 m	1.35 – 37.7	Designed to collect sediment samples from lakes, bays, and estuaries; constructed of stainless steel and can be powered by a portable generator.

TABLE 3-2
GENERAL CHARACTERISTICS OF SELECT CORE SAMPLERS* (CONTINUED)

Database Record Number	Sampler	Sampler Construction Material	Sampler Dimensions	Sampler Weight (Kg)	Penetration Depth	Sample Volume (L)	Application
38 of 40	Boomerang	Stainless steel	203.2 x 29.8 x 8.1 cm	74.8	1 m	3.52	A free-falling sampler designed to collect sediment cores without the use of cable connections and can be dropped overboard from small or large boats without winch or deck equipment with minimal sediment disturbance.
36 of 40	Alpine	Stainless steel	182.9 x 41.1 cm	110 - 155	2 m	1.92 - 3	Sampler has interchangeable core barrels that allow for different penetration depths. Can collect samples in soft, fine-grained semi-consolidated sediments.

Notes:

*Adapted from USGS 1997.

Kg Kilogram

L Liter

O.D. Outside diameter

cm Centimeter

m Meters

Gravity core samplers are typically used in loosely consolidated, soft- to fine-grained sediments and can collect core samples up to 3 meters long (EPA 2001). Commonly used gravity samplers include the KC Sediment Trap, Slide-Hammer Corer, Kajak-Brinkhurst Corer, Phleger, Benthos, Alpine, Boomerang Corer, and Ballchek Corer. These samplers are usually deployed using a winch that suspends the sampler about 5 meters above the sediment to be sampled and allowed to free fall, penetrating the sediment and forcing the material into the sample liner. Some gravity core samplers, such as the Ballchek Corer, are equipped with stabilizing fins to provide balance and stability during corer descent.

Vibracorers are the most commonly used core samplers because they can retrieve deep core samples in most types of sediment. Vibracore samplers have an electrically powered vibrating head, which vibrates vertically along the axis of the sampler to penetrate the sediment. The core barrel and liner are inserted into the head of the vibrator and the entire assembly is lowered into the water. A vibracore sampler can penetrate compact sediments and collect core samples up to 10 meters long depending on the horsepower of the vibrating head and weight of the sampler. Larger vibracore samplers require the use of a large boat to maintain balance and provide adequate lift to break the head of the corer out of the sediment for sample retrieval (EPA 2001).

Box core samplers are designed to collect samples of mud, silt, and other soft sediments from lakes, riverine, and lagoon environments. Box core samplers consist of a box that is equipped with a frame to add stability during sampling penetration. Box core samplers come in various sizes and are typically constructed of stainless steel, aluminum, PVC, or fiberglass. Box core samplers are generally used for water/sediment interface studies or when large volumes of sediment need to be collected from the depth profile. Due to the size of box core samplers, most are deployed from a boat or other vessel that has a large deck or platform, using a winch or crane with a large lifting capacity (EPA 2001).

Piston-core samplers can collect samples from shallow streams to ocean floors and large lakes up to 20 meters deep. The piston-core sampler comes in a variety of designs and sizes that basically consist of a cylinder with a piston that is pushed into the streambed. As the cylinder is pushed into the sediment, the piston is retracted, which creates a suction holding the sediment sample in the cylinder. Piston-core samplers can be used in most sediment types and can recover relatively undisturbed sediment cores in deep waters (EPA 2001).

5.0 SUMMARY OF FINDINGS

A variety of samplers are available for sampling surficial sediments, and sampler selection should be based primarily on the data quality objectives established for the project. Other factors to consider may include, but are not limited to, accessibility of sampling area, weight of equipment, type of substrate, sample depth, sample volume, and potential for physical disturbances of substrate. Grab and core samplers are the preferred samplers for use during most surficial sediment sampling projects, however, dredge samplers are acceptable for collecting sediment samples for benthos analysis. Grab samplers are used when large volumes of sediment are required and where accuracy of surficial sediment sampling depths is not critical. Core samplers are recommended for use when accurate surficial sediment sampling depths are important, vertical profiles are needed to assess quality of sediment at depth, and it is important to maintain an oxygen-free environment.

In the consideration of water depth as a factor during sediment sampling, for circumstances where the water level is less than 4 meters and under low tide conditions, samplers that may be selected include the Birge-Ekman, Petite Ponar, Van Veen, or Petersen. If water depth is greater than 4 meters, samplers such as the Ponar or the Van Veen can be selected. In a limited sampling area it may not be possible to launch devices off of a boat, or the ability of a boat-launched sampler to reach subsurface may be limited, so it may be more appropriate to use a manually operated device, with diver assistance as required in collection of the sample.

Sediment properties must also be considered in the selection of a sampler. Soft sediments can be sampled with any of the variety of the clamshell bucket style of grab samplers. Compacted sediments, on the other hand, may require additional force to bear on the sediment bed for sample collection, such as that provided by the weight of a Smith-McIntyre sampler. The nature and properties of sediment should be considered during sample planning.

In the sampling of sediments to depths that are less than 10 centimeters, the Birge-Ekman, Ponar, and Shipek devices are able to provide appropriate sample collection. For sampling of sediment that is up to 30 centimeters in depth, the Smith-McIntyre, Van Veen, or Petersen devices might instead by considered for use since these samplers possess a wider bucket and heavier frame to collect the lower portion depth level.

The required volume of collected sediment is also an important factor in selection of sampling devices for a specific sampling objective. In collecting sediment sample volumes that are less than 3 liters, the mini Birge-Ekman, Petite Ponar, and mini-Shipek samplers can be used. If sample volume requirements are at least 3 liters and up to 10 liters in volume, the Birge-Ekman, Ponar, or Petersen samplers that possess larger buckets can be used. If more than 10 liters of sample is required, the Van Veen or Smith-McIntyre samplers should be considered for use as these types of samplers have the weight to bear into the sediment and a larger bucket to collect the sediment sample.

Of the variety of sediment samplers available for collecting surficial sediments, most of the innovative technological progress has been focused on the following: (1) construction materials that are more durable and compatible, and facilitate deployment; (2) accuracy and discreteness of sample depth; (3) sample volume; (4) ability to sample various types of substrate; and (5) ability to minimize physical disturbance and retain fines. Several vendors offer different options for currently available surficial sediment samplers. Extensive information is available about most of the surficial sediment samplers identified during this study, including sampler use, construction materials, effectiveness, size, penetration depth, sample volume, costs, and advantages and disadvantages of each sampler.

This study was conducted by EPA to determine if technologies are currently available that can or have the potential to collect undisturbed surface sediments. Grab samplers are designed to collect horizontal surface distribution of sediments. However, surface samples collected using this type of sampler are perturbed during the sampling process from the water column bow wave induced by descent of the sampling device. As a result of this perturbation, fine grain particulates in the surface sediment are washed out from the sample that is collected. Core samplers, while primarily focused on collection of vertical profiles, may be useful in collecting surficial sediment; however, in the sample collection process, disturbance will also occur from washout of fine grains caused by the water column bow wave induced by descent of the sampling device. Sediment being collected in the core will also be subjected to compression and consolidation.

The ability to collect and analyze an undisturbed sediment layer at the water-sediment interface that is 0.5 to 1.0 centimeters in thickness will provide better information for contaminated sediment impact on water column and biota risk assessment. To accomplish this sample collection requirement, it will be necessary to develop new or modified sampling technologies. The successful technology will be the one that eliminates or minimizes the deployment bow wave impact on the water column which results in washing out of fine grain sediments during grab sample collection. This will require development of grab sampling

technology that is hydrodynamically designed or deployed to eliminate or minimize the effect. New technology must also be successful at eliminating consolidation and compaction that occurs in core sampling. This will require the development of a core sampling technology that eliminates or minimizes the impact of the core wall on the sediment that causes the compression. The new or modified sampler focused on these areas will provide a more accurate representative sample for evaluation which in turn will provide better information for risk assessment investigations.

6.0 REFERENCES

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APPENDIX
SURFACE SEDIMENT SAMPLER DATABASE

Sampler Details

Sampler Category Core

Sampler Type Gravity Corer (Core) **Name** Alpine

Number of Personnel Required

Dimensions Inner diameter: 4.1 cm; **to** NA
Length: 1.83 m

Weight (Kg) 110 **to** 155

Volume (Liters) 1.9 **to** 3

General Description

The Alpine Corer is a steel framed corer for placement in collection of sediment cores. The sampler provides a maximum penetration depth of approximately 2 meters into the sediment.

Advantages:
- The sampler allows variable penetration depths.

Disadvantages:
- The sampler is best operated in a low energy environment
- The device is effective only on loosely consolidated, fine grained sediments
- Inconsistent penetration can be obtained with the use of this device.
- The device compacts sediment samples.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

Steel core tube, nose piece, core catcher. Stainless steel is compatible organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

Neoprene valve- Neoprene is compatible with acids and bases, peroxides, hydrocarbons, alcohols, and phenols, but is not preferred for use with halogenated and aromatic hydrocarbons.

Operation

Suspended from a winch and cable, the sampler, housed in a steel frame, is lowered into the sediment until the sampler comes to rest. The neoprene valve on he sampler permits release of water from the core during deployment.

When the sampler is retrieved, the core catcher retains the sediment within the body of the sampler.

Training and Other Requirements

A boat with winch and crane is required for sample operations. Proper training and licensing is required for boat operation during sample collection.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

Alpine Ocean Seismic Survey, Inc.
70 Oak Street
Norwood NJ 07648 USA
Phone 201-768-8000 **Fax** 201-768-5750 **URL** www.alpineocean.com/
Email alpine@alpineocean.com

Cost Information

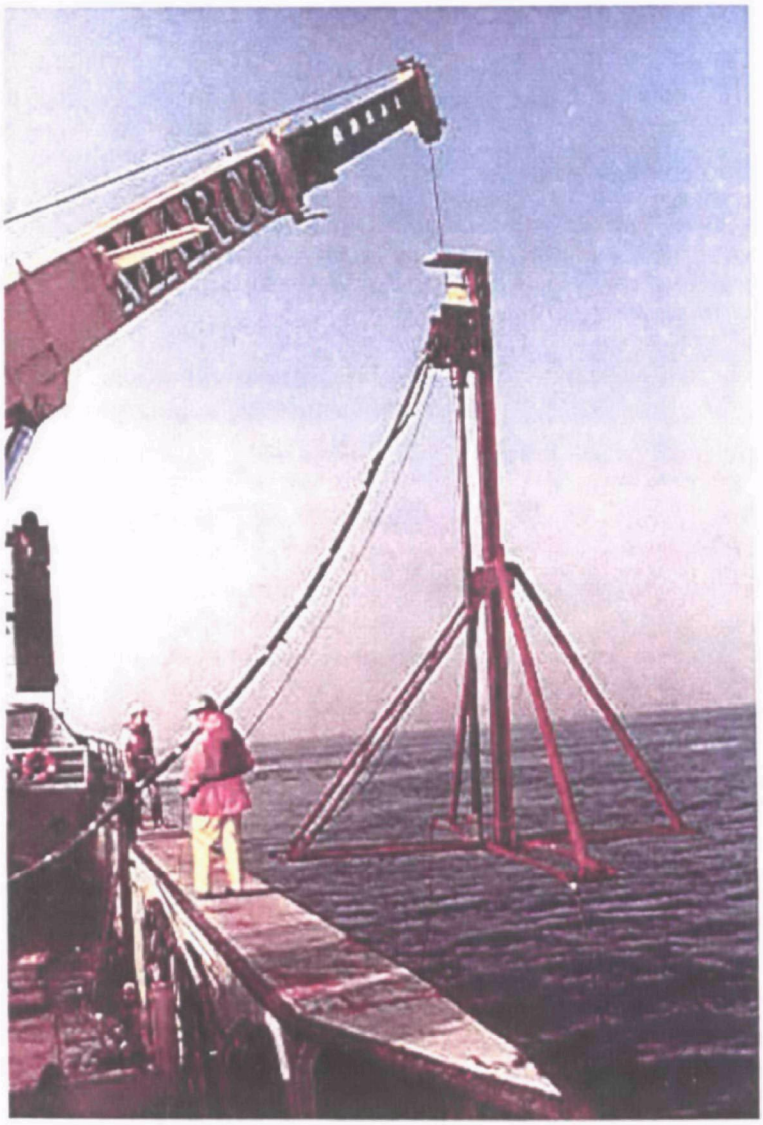
Base Cost Min	Base Cost Max	Cost Description
		Not available

Manufacturer Information

Sea Surveyor, Inc.
960 Grant Street Suite C
Benicia CA 94150 USA
Phone 707-746-1853 **Fax** 707-746-0184 **URL** www.seasurveyor.com/
Email info@seasurveyor.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available



ALPINE CORER

Sampler Type Gravity Corer (Core) **Name** Ballchek Corer

Number of Personnel Required 2 **Dimensions** Inner diameter: 5.1 cm.; Length: 76.2 cm. **to** Inner diameter: 12.7 cm; Length 2.44 m

Weight (Kg) NA **to**

Volume (Liters) 12 **to**

General Description

The Ballchek Gravity Corer can be used in water depths from 3 to up to 200 meters, when water/bottom interface is not part of study.

The sampler consists of a 2-inch head assembly with a valve, including a bronze central cylinder for attaching eye hook and stabilizing fins and PVC stabilizing fins to provide balance and stability during corer descent.

This sampler is not considered to be effective for collecting surface sediment samples. The sampler becomes versatile when collecting at deeper depth of sediments.

Advantages:
-The device collects a large sample volume.

Disadvantages:
- The device is only effective in low energy environment.
- The sampler is effective only for collection of loosely consolidated, fine grain sediment.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

The sampler uses PVC stabilizing fins and an acrylic core tube. Plastics are not preferred for use with organic contaminants, but is compatible with metals.

Operation

When the Ballechek corer is deployed into the sediment surface the seal prevents the sample from leaving the tube during retrieval. A semi-rigid silastic ball, held by a polyurethane ring seat, automatically seals the top of the core tube as it is raised. All parts that contact the sample are made of inert plastic. Both the silastic ball and ring seat slide out for cleaning when the core tube is removed.

Training and Other Requirements

No special training specified by manufacturer.

A boat with winch is used for sample collection operations. Proper training and licensing is required for boat operation during sample collection.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

Wildlife Supply Company (Wildco)
95 Botford Place
Buffalo NY 14216 USA
Phone 800-799-8301 **Fax** 800-799-8115 **URL** www.wildco.com
Email goto@wildco.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$1,359.00	$1,359.00	(March 2003) Sampler only

BALLCHEK CORER

Sampler Type Mechanical Trap (Grab) **Name** Bed Material Sampler

Number of Personnel Required 1-2 **Dimensions** 55.6 cm (length) **to**

Weight (Kg) 13.6 **to** 45.4 **Volume (Liters)** 0.2 **to**

General Description

The Bed Material Sampler is designed to collect samples from the bed of a stream, lake, or reservoir. Penetration into the bed is approximately 1.75 inches. The sampler can be suspended from a handling or sounding reel. The body of the sampler is made from aluminum or cast steel, depending on the weight requirement, and is equipped with tail fins for stabilization.

Advantages:
- The sampler is light weight.

Disadvantages:
- The sampler collects a relatively small sample volume.
- The device may not be appropriate for sampling sediments contaminated with metals.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Operation

The sampler is supported by a steel cable, and is lowered with the sampling bucket in the open position. When the tension in the cable is released by resting the sampler on the sediment bed, the bucket snaps shut, collecting the sample.

Chemical and Physical Compatability

Aluminum is acceptable for use with organic-contaminated sediments, but is not preferred for use with metals-contaminated sediments.

Cast Steel is not preferred for use with contaminated sediments.

Training and Other Requirements

Boat operation may be required. Requires a hand reel or small winch. Proper training is required for small boat operations.

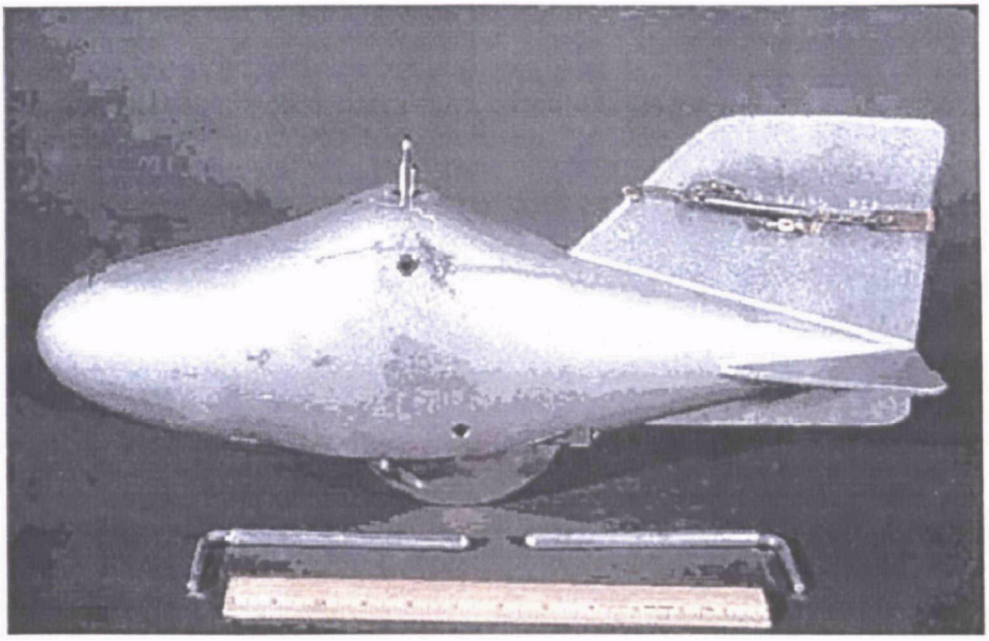
Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

Rickly Hydrological Company
1700 Joyce Avenue
Columbus OH 43219 USA
Phone 614-297-9877 **Fax** 614-297-9878 **URL** www.rickly.com
Email sales@rickly.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$385.00	$2,730.00	(March 2003) Cost for sampler only; 30 or 100-pound designs.



BED MATERIAL SAMPLER

Sampler Type Gravity Corer (Core) **Name** Benthos

Number of Personnel Required 2 **Dimensions** Inner diameter: 6.6 cm; Length: 3 m. **to**

Weight (Kg) 25 **to** 145

Volume (Liters) 8 **to** 10.3

General Description

The Benthos Sampler is designed for collection of benthic matter in sediment. The sampling device penetrates to approximately 10 feet and can be used in deep water environments.

Advantages:
- The sampler provides good sample retention.
- The device provides good vertical penetration of the sediments.

Disadvantages:
- The sampler is effective only on soft, fine grained, semi-consolidate material.
- The device is relatively heavy and can be difficult to maneuver.
- The device has a tendency to compact the sediment sample.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

Stainless steel core tube, nose piece, and core catcher. Stainless steel is compatible organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

Operation

Suspended from winch and cable, the sampler is lowered into the sediment bed until the device comes to rest, causing sediment to fill up the core chamber. When the sampler is retrieved the core catcher retains the sediment within the body of the sampler.

Training and Other Requirements

A boat with winch and crane is required for sampling operations. Proper training is required for boat operation during sample collection.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

Kahl Scientific Instrument Corporation
P.O. Box 1166
El Cajon CA 92022-11 USA
Phone 619-444-2159 **Fax** **URL**
Email kahl@kahlsico.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available

NO

PICTURE

AVAILABLE

Sampler Type Clamshell Bucket (Grab) **Name** Birge Ekman Sampler (multiple models)

Number of Personnel Required 1-2 **Dimensions** 15.2 x 15.2 x 15.2 (cm) **to** 30.4 x 30.4 x 30.4 (cm.)

Weight (Kg) 6.8 **to** 9.1 **Volume (Liters)** 3.4 **to** 16

General Description

The Birge-Ekman Sampler is a box-style device that includes a messenger-operated release device. It is fabricated of stainless-steel or brass, which is durable and increases weight for deeper penetration into the sediment. Overlapping cover plates, loosely hinged at the top of the box, permit outflow of water during descent, and close tightly to prevent wash-out of sediment during ascent.

The larger model has an overall height of 20 inches, and the smaller model has an overall height of 15 inches.

Advantages:
- The device does not require crane or winch for operation.
- The device is capable of sampling soft sediments.
- Sub-sampling can easily be accommodated with the use of this sampler.
- The sampler can be deployed in shallow water.
- The device can be used to sample coarse sediments.

Disadvantages:
- The sampler jaws may not close completely.
- The metal frame can cause cross contamination of the collected samples.
- Sample collection is only effective under low flow conditions.
- The jaws may not close if sampler encounters substantial vegetation.
- Collected sample is susceptible to loss of fine grained materials.
- Sampler requires perpendicular penetration to effectively sample sediment.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Operation

The jaws are held open by flexible wires, which fasten to the release holding pins at the top of the framework. These are freed when the messenger, dropped down the line, strikes the release bar. External coil springs snap the jaws shut, trapping the sediment within.

Chemical and Physical Compatability

Stainless steel construction is sturdy, and will not interfere with most contaminant measurements. Stainless steel is compatible with organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

Brass is not preferred for contaminated sediments because it can absorb analytes or react with samples, thus effecting analytical results.

Training and Other Requirements

This device is easy to operate and requires minimal training.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

Duncan & Associates

Jeeves Bank Fernleigh Road

Grange-over-Sands Cumbria LA11 7H UK

Phone +44 (0) 15395 33 **Fax** +44 (0) 15395 34963 **URL** www.duncanandassociates.co.uk/

Email info@duncanand associates.co.uk

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available

Manufacturer Information

GENEQ
8047 Jarry East
Montreal QC H1J 1H6 USA
Phone 514-354-2511 **Fax** 514-354-6948 **URL**
Email info@geneq.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description

Manufacturer Information

Halltech Environmental Inc.
129 Watson Road South
Guelph Ontario N1L 1E4 Canada
Phone 866-425-5832 **Fax** 519-766-0729 **URL** www.htex.com
Email sales@htex.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available

Manufacturer Information

Kahl Scientific Instrument Corporation
P.O. Box 1166
El Cajon CA 92022-11 USA
Phone 619-444-2159 **Fax** **URL**
Email kahl@kahlsico.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$655.00	$715.00	(March 2003) Sampler only: Minimum cost- model 214WC180 (small); Maximum cost- model 214WC170 (large)

Manufacturer Information

KC Denmark
Holmbladsvej 19 - DK - 8600
Silkeborg Denmark
Phone +45 86828347 **Fax** +45 86824950 **URL** http://www.kc-denmark.dk/
Email kc@kc-denmark.dk

Cost Information

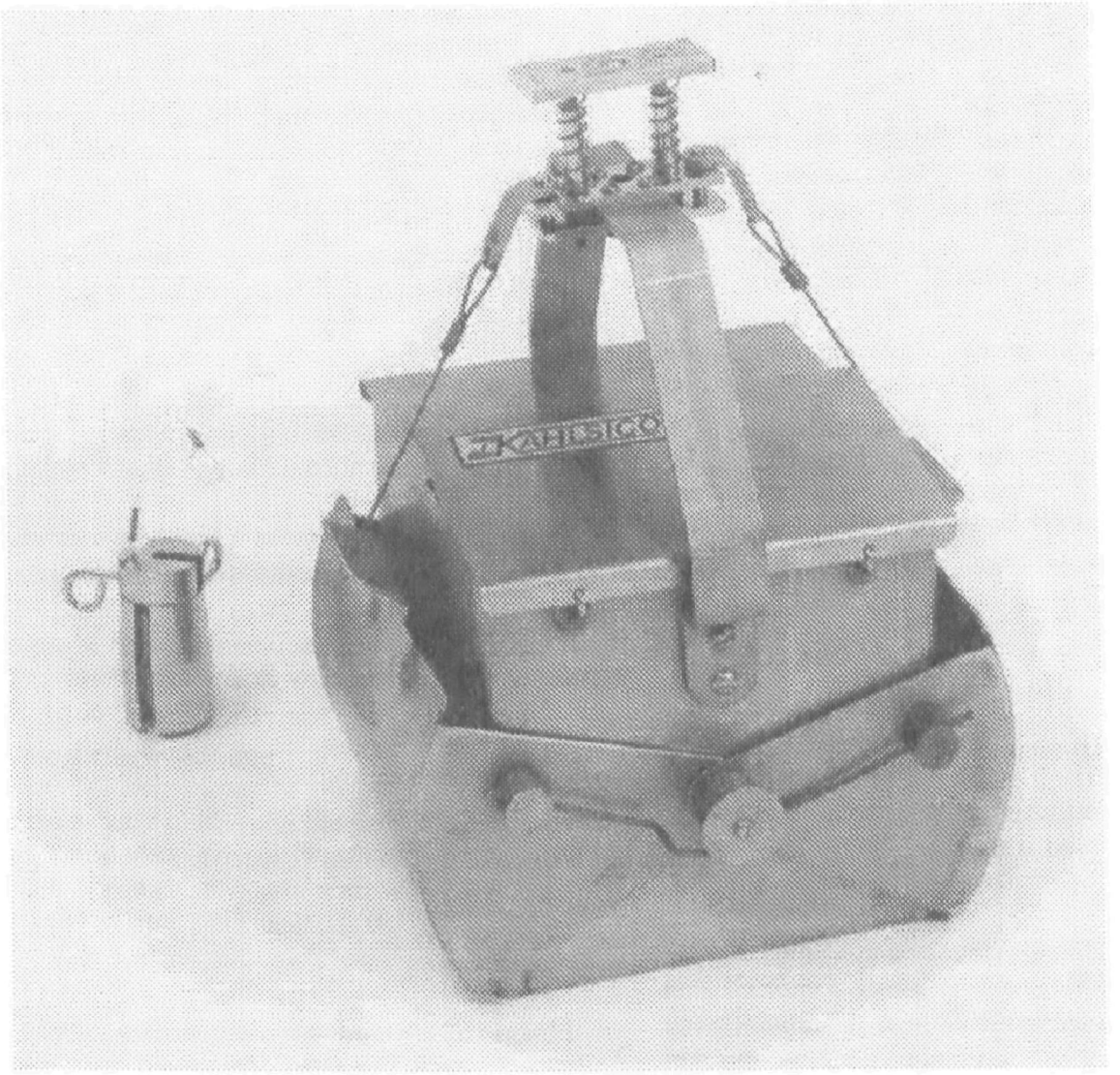
Base Cost Min	Base Cost Max	Cost Description
$1,324.00	$2,298.00	(March 2003) Sampler only

Manufacturer Information

Wildlife Supply Company (Wildco)
95 Botford Place
Buffalo NY 14216 USA
Phone 800-799-8301 **Fax** 800-799-8115 **URL** www.wildco.com
Email goto@wildco.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$299.00	$874.00	(March 2003) Minimum cost- 6x6x6" Ekman (instrument only); Maximum cost- 9x9x9" Ekman with case and extension handle



BIRGE-EKMAN SAMPLER

Sampler Type Gravity Corer (Core) **Name** Boomerang Corer

Number of Personnel Required 2 **Dimensions** Length= 2 m; Shroud O.D= 30 cm; Core O.D.= 8.1 cm **to**

Weight (Kg) 74.8 **to**

Volume (Liters) 3.5 **to**

General Description

The Boomerang Corer consists of an expendable ballast portion and a recoverable float portion. The ballast portion includes a nose cone, pilot weight, core barrel, ballast, float release mechanism, and a protective shroud for the glass floats. The float portion consists of two glass spheres in a nylon net bag attached via a tether to a core liner assembly composed of a 1.2 meter clear plastic tube with a stainless steel core catcher on one end and a valve/release on the other. The glass spheres allow core retrieval from depths to 6,700 meters.

Advantages:
- Minimal shipboard equipment is required for sample operations.
- The rapid rate of decent makes corer less susceptible to drift during sampling.

Disadvantages:
- The sampler requires low energy environment for operation.
- Substantial sample loss can be encountered in sampling.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

The device is constructed of a mild steel core barrel, nose cone, ballasts, and shroud. Mild steel is not preferred for contaminated sediments because it can absorb analyst or react with samples, thus effecting analytical results. Mild steel has the potential to form rust.

Plastic core tube. Plastics are not preferred for use with organic contaminants, but are compatible with metals and other inorganic species.

Operation

This device is a free-falling sampler designed to collect sediment cores without use of cable connections to a ship. The corer can be dropped overboard from small or large vessels without winch or deck equipment. Achieves a relatively rapid fall rate, resulting in minimal sediment disturbance.

A winch is not necessary to deploy the sampling device. Several corers can be dropped in a line, saving ship time. The sampler can be deployed for high impact velocities, with degree of disturbance of sediment core sample minimized.

The device possesses an electronic flash for recovery that has a 5 km (3 mile) visible range. The sampler also has a low profile flotation package that minimizes wind drift during recovery. The sampler has a reusable float, valve and core catcher. The sampler is designed for use to 9000 meters (29500 feet).

Training and Other Requirements

A boat is required for sample collection activities. Proper training and licensing is required for boat operation during sample collection.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

Mooring Systems Inc.

PO Box 413 1227 Route 28 A

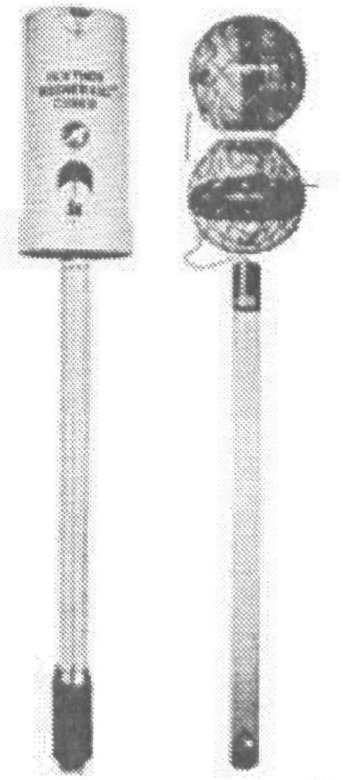
Cataumet MA 02534 USA

Phone 508-564-4770 **Fax** 508-564-4773 **URL** www.mooringsystems.com

Email msisales@mooringsystems.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$4,127.00	$4,127.00	(March 2003) Sampler only



BOOMERANG CORER

Sampler Type Box (Core) **Name** Box Corer (multiple sizes and designs) (also HAPs corer)

Number of Personnel Required 2-3 **Dimensions** 20 cm x 20 cm x 35 cm (sample box); 55 cm overall height **to** 50 cm x 50 cm x 75 cm (sample box);

Weight (Kg) 14 **to** 750

Volume (Liters) 5.2 **to** 188

General Description

The Box Corer consists of a stainless steel, coated-steel, or anodized or coated aluminum sampling box fixed inside a steel frame, with a sharpened spade attached to a lever arm. The sampling box comes in many sizes, and the footprint and height of the frame vary depending on the size of the sampling box. The depth to which to box penetrates the sediment (and the sample size) depends on the speed at which the device is allowed to descend, and the weight of the device. Weights can be added to most models.

Advantages:
- The device uses an acrylic liner, that limits cross contamination.
- The sampler is effective for collection of most sediments.
- Generally good sample recovery is obtained from collection of sediments.
- Large sample volumes can be collected from this sampler.

Disadvantages:
- The sampler provides limited penetration of the sediment surface.
- The device is relatively expensive.
- The sampler is relatively heavy, especially for the larger models, and be difficult to handle.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

The sampler is constructed of a stainless steel frame, and uses acrylic liners are to collect the cores within the sampler.

Stainless steel is compatible for use with organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

Plastics are not preferred for use with organic contaminants, but are compatible with metals and other inorganic species.

Do not use alcohol for cleaning acrylic parts.

Operation

The device is typically deployed from a boat by a cable and winch or small crane. The unit is allowed to drop through the water to the sediment. A depth pinger or indicator is often used to determine when the box is completely filled. Once the box is filled, the sample is secured by moving the spade-closing lever arm to lower the cutting edge of the spade into the sediment, until the spade completely covers the bottom of the sediment box. Once the unit is recovered onboard, the sampling box can be detached from the frame and taken to a laboratory for analysis.

The HAPS corer works in a similar fashion, however the HAPS' core tube is cylindrical, as opposed to box shaped on box corers.

Training and Other Requirements

A boat with winch and crane is required for box core sampling operations. Proper training and licensing is required for boat operation during sample collection.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principles prior to using sampling equipment.

Manufacturer Information

Duncan & Associates

Jeeves Bank Fernleigh Road

Grange-over-Sands Cumbria LA11 7H UK

Phone +44 (0) 15395 33 **Fax** +44 (0) 15395 34963 **URL** www.duncanandassociates.co.uk/

Email info@duncanand associates.co.uk

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available

Manufacturer Information

KC Denmark
Holmbladsvej 19 - DK - 8600
Silkeborg Denmark
Phone +45 86828347 **Fax** +45 86824950 **URL** http://www.kc-denmark.dk/
Email kc@kc-denmark.dk

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$13,151.00	$17,138.00	(March 2003) Minimum cost is for a 400 sq cm corer; the maximum cost is for the 1,000 sq cm corer

Manufacturer Information

Ocean Instruments
5312 Banks St.
San Diego CA 92110-40 USA
Phone 619-291-2557 **Fax** 619-296-2240 **URL** www.oceaninstruments.com
Email sales@oceaninstruments.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$4,725.00	$30,000.00	(March 2003) Base cost is for the sampler itself and typically does not include extras such as weights or additional sample boxes, and does not include cables or winch setup

Manufacturer Information

OceanTest Equipment, Inc.
2021 SW 70th Ave., Bldg. B1
Fort Lauderdale Fl 33317 USA
Phone 954-474-6603 **Fax** 954-474-6605 **URL** www.oceantestequip.com/
Email oceantestequip@aol.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available

Manufacturer Information

OKTOPUS GmbH

Kieler Str. 51 P.O. Box 1115, 24594

Hohenwestedt Germany

Phone 49-(0)4871-4903 **Fax** 49-(0)4871-490315 **URL** www.oktopus-mari-tech.de

Email schriever@oktopus-mari-tech.de

Cost Information

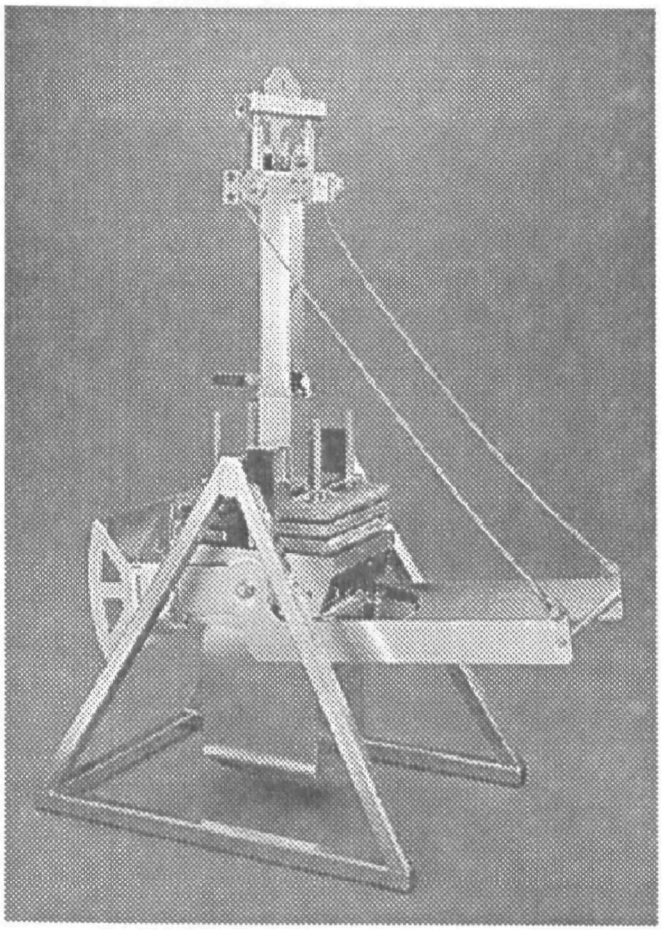
Base Cost Min	Base Cost Max	Cost Description
		Not available

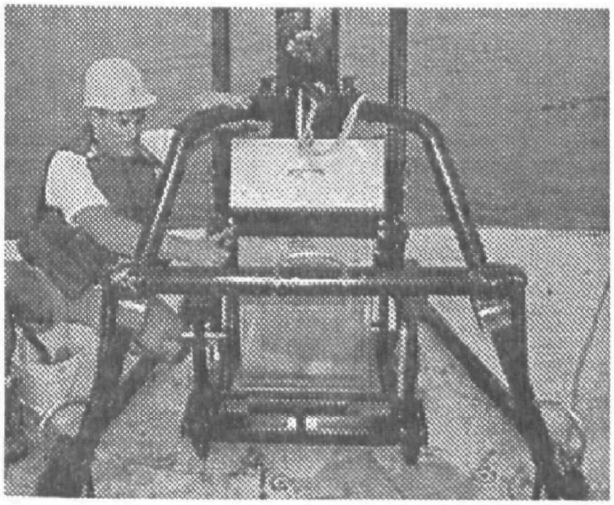
Manufacturer Information

Wildlife Supply Company (Wildco)
95 Botford Place
Buffalo NY 14216 USA
Phone 800-799-8301 **Fax** 800-799-8115 **URL** www.wildco.com
Email goto@wildco.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$2,995.00	$3,214.00	(Marh 2003) Minimum cost includes sampler only; the maximum cost includes four additional 9lb weights





BOX CORER

Sampler Type Gravity Corer (Core) **Name** Craib Corer

Number of Personnel Required 2 **Dimensions** 247mm (tube length) x 59mm (tube diameter) **to** 425 mm (tube length) x 59mm (tube diameter)

Weight (Kg) 44 **to**

Volume (Liters) 0.7 **to** 1.16

General Description

The Craib Corer is a single tube coring device which collects undisturbed sediment cores up to 30 cm length. The Craib is supported on a tubular steel frame and has long and short corer tubes.

The device can function for marine applications to an operating depth up to 3,000 meters.

Advantages:
- The device is relatively light weight.
- The device is able to sample in deep water.

Disadvantages:
- The sampler collects a relatively small sample volume.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Operation

The sampler is set up for operation prior to deployment. Retaining rings are placed over the bottom of the corer tube prior to installation into the barrel of the corer, and then fastened.
The corer tube is positioned above the steel support frame and held into place with locking rings.

The hydraulic damper and the arm supporting the ball closure is positioned followed by the trigger plate on the ball closure arm. The
closure mechanism on the top of the core barrel is locked in the open position. A pin is inserted into the hole in the end of the trigger arm to hold this position.

The Craib Corer is then lowered slowly through the water column until the support frame comes to rest on the sea bed.

The corer tube sinks at a pre-determined rate into the sediment. The rate is controlled by the speed at which the water escapes from the bottom of the hydraulic damper.

As the core tube penetrates the sediment, the two releaser cords triggering the bottom and top closures are automatically released, tripping the bottom and very shortly afterwards the top closure mechanisms.

The corer is hauled to the surface slowly. As the corer is raised from the sediment, the weight of the ball closure arm pushes the ball down the outside of the corer tube and the bungee cord attached to the stirrup holding the ball, pulls the ball over the base of the corer tube engaging the ball into the tube, holding the sediment in the tube.

Chemical and Physical Compatability

Predominantly constructed from brass with stainless steel components; stops and washers constructed of PVC. The device is mounted on a mild steel frame (galvanized finish). The corer tubes are acrylic.

Stainless steel is compatible for use with organic-contaminated sediments, but is not preferred for metals-contaminated sediments.

Acrylic plastics are not preferred for use with organic

Training and Other Requirements

A boat with winch and crane is required for sampling operations. Proper training and licensing is required for boat operation during sample collection.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

contaminants, but are compatible with metals and other inorganic species.

Mild steel used in the assembly will have a tendency oxidize to form rust from contact with the water environment. This could be a source of contamination of the sample.

Manufacturer Information

Duncan & Associates

Jeeves Bank Fernleigh Road

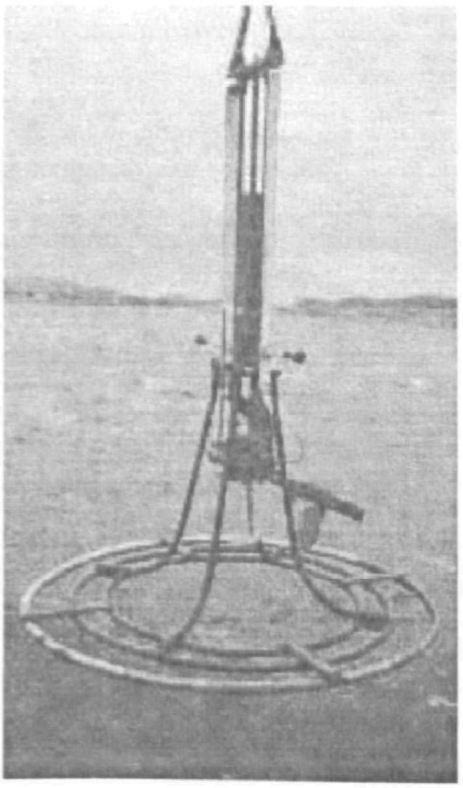
Grange-over-Sands Cumbria LA11 7H UK

Phone +44 (0) 15395 33 **Fax** +44 (0) 15395 34963 **URL** www.duncanandassociates.co.uk/

Email info@duncanand associates.co.uk

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available



CRAIB CORER

Sampler Type Manual Push (Core) **Name** Dormer Undisturbed Sediment and Wet Soil Sampler

Number of Personnel Required 1 **Dimensions** 48 mm O.D. x 1m; 33 mm core diameter. **to** 48 mm O.D. X 1 m with a 33 mm core diameter

Weight (Kg) NA **to**

Volume (Liters) 0.3 **to**

General Description

The Dormer Sampler is a hand-held coring device that collects a sediment sample in a plastic sleeve. Some similar sample devices (multistage core sampler) have multiple sections to increase the length of the sample collected.

Advantages:
- The sampler can be extended for collection of cores to various depths.

Disadvantages:
- The sampler only collects a relatively small volume of sediment sample.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

Plastics are not compatible for organic-contaminated sediments, but are compatible for metals-contaminated sediments and sediments contaminated with other organic species.

Operation

The sampler is pushed into sediments by hand using either a T-handle and extensions or a slide hammer. After collecting the sediment sample, the device is pulled out of the sediment and the nose of the sampler is removed. The plastic tube containing the sediment sample is then removed from the sampler.

Training and Other Requirements

Minimal training required.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

EnviroEquip Pty Ltd.
Ground Floor, 16/380 Eastern Valley Way
Chatswood New South Wales 2067 Australia
Phone 02 9417 1513 **Fax** 02 9417 7669 **URL** www.enviroequip.com
Email sydney@enviroequip.com

Cost Information

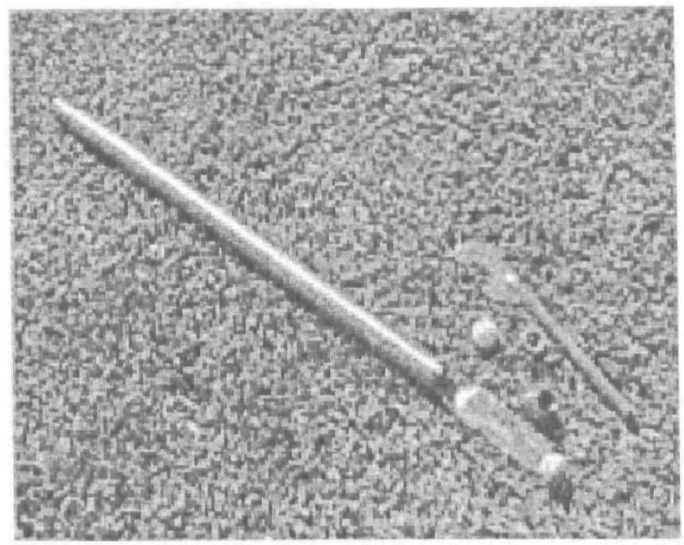
Base Cost Min	Base Cost Max	Cost Description
		Not available

Manufacturer Information

GENEQ
8047 Jarry East
Montreal QC H1J 1H6 USA
Phone 514-354-2511 **Fax** 514-354-6948 **URL**
Email info@geneq.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$580.00	$580.00	(March 2003) Sampler only.



DORMER UNDISTURBED SEDIMENT AND WET SOIL SAMPLER

Sampler Type Gravity Corer (Core) **Name** Free Fall Corer (single tube)

Number of Personnel Required 1-2 **Dimensions** OD= 50mm; ID= 46 mm x0.77m (tube) **to** OD= 60mm; ID= 53 mm x1m (tube)

Weight (Kg) 47.6 **to** 86.2 **Volume (Liters)** 0.8 **to** 1.66

General Description

The Free Fall Corer consists of a single sampling tube made of stainless steel. The corer is designed to collect sediment samples in hard, sandy sediment. PVC or acrylic liner tubes are used for sample collection and are placed inside the sample tube.

Advantages:
- The device is effective in hard substrates.

Disadvantages:
- The sampler collects a relatively small sample volume.
- The device is relatively heavy, making it more difficult to handle.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

Stainless steel is compatible for organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

A PVC sample liner can be used for sample collection. Plastics are not preferred for use with organic-contaminated sediments, but are compatible for metals-contaminated sediments and sediments contaminated with other inorganic species.

Operation

The stainless steel tube is installed by placing the upper part of the corer horizontal and attaching the tube to the upper part of the corer. The device is next locked into place. A PVC liner and orange peel system is placed into the stainless steel tube and fastened. The moveable portion of the upper part of the corer is held upwards until the 2 lock-arms slide into the notch on the bar. After assembly the sampler is lowered into the water to the sediment interface and the weight of the sampler forces the sediment into the collection core.

In removing the sample, the corer is placed on the deck of the boat and dismount the carver and orange peel system. The PVC liner can then be removed, and the sample retrieved.

Training and Other Requirements

A boat with winch and crane is required for free fall corer sampling operations. Proper training and licensing is required for boat operation during sample collection.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

Aquatic Research Instruments
P.O. Box 93
Lemhi ID 83465 USA
Phone 1-800-320-9482 **Fax** 208-756-8434 **URL** www.aquaticresearch.com
Email hydrobio@aol.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$595.00	$595.00	(March 2003) Includes sampler and all accessories

Manufacturer Information

KC Denmark
Holmbladsvej 19 - DK - 8600
Silkeborg Denmark
Phone +45 86828347 **Fax** +45 86824950 **URL** http://www.kc-denmark.dk/
Email kc@kc-denmark.dk

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$2,463.00	$2,640.00	(March 2003) Minimum cost is for the small gravity corer; the maximum cost is for the free fall corer (gravity corer)

Manufacturer Information

Limnos Ltd.
Rossinkatu 2 E- 20380
Turku
Findland
Phone +358 2 2538 335 **Fax** +358 2 2383 305 **URL** www.limnos.fi/index.htm
Email info@limnos.fi

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$970.00	$970.00	(March 2003) Includes frame, six weights, slicing tube with 60 rings, slicing equipment, and transport casing

Manufacturer Information

Mooring Systems Inc.

PO Box 413 1227 Route 28 A

Cataumet MA 02534 USA

Phone 508-564-4770 **Fax** 508-564-4773 **URL** www.mooringsystems.com

Email msisales@mooringsystems.com

Cost Information

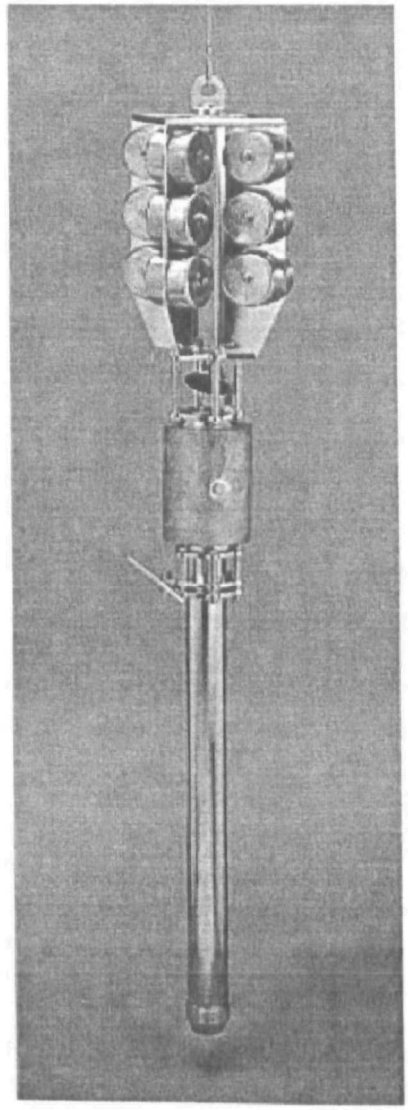
Base Cost Min	Base Cost Max	Cost Description
$4,386.00	$4,386.00	(March 2003) Gravity corer model 2171

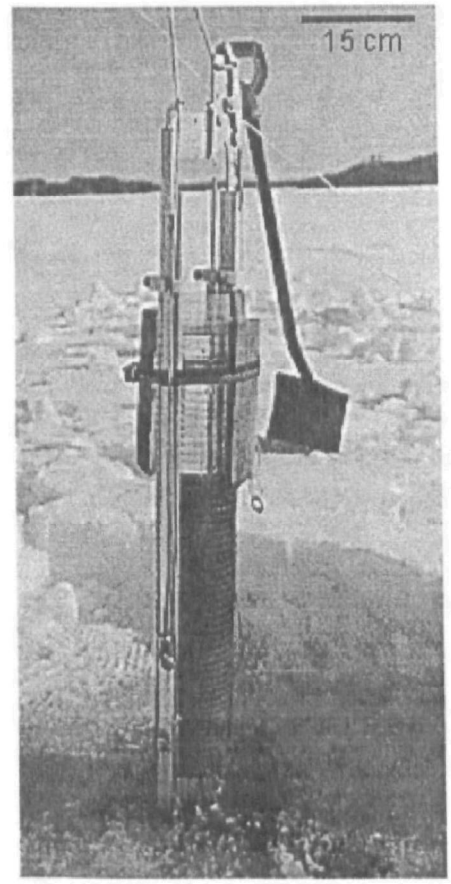
Manufacturer Information

Seabed
Visseringstraat 10 1975 BR Ijmuiden
Denmark
Phone 00 31 (0) 255 53 **Fax** 00 31 (0) 255 533945 **URL** www.seabed.nl
Email seabed@seabed.nl

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$8,950.00	$8,950.00	(March 2003) Sampler only





FREE FALL CORER

Sampler Type Gravity Corer (Core) **Name** Gilson Corer

Number of Personnel Required 1 to 2 **Dimensions** Core tube length 300mm x 55mm diameter **to** Core tube length 470mm x 55mm diameter

Weight (Kg) 11 **to**

Volume (Liters) 0.7 **to** 1.12

General Description

The Gilson Corer can be used in both fresh water and coastal marine environments. The device is normally supplied with a plain ended tube, but also available with core catchers. In addition, the sampler is normally supplied as a single corer unit, but also available in configurations of 4 core tubes or 6 core tubes.

Advantages:
- The sampler is relatively light weight.

Disadvantages:
- The brass construction of the sampler is not desirable for sampling contaminated sediments.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

The device is manufactured in brass and mounted on a stainless steel frame (when being deployed by a rope). The poles that are used when necessary to deploy the sampler are constructed of aluminum. All of the fasteners are stainless steel. The corer tubes are acrylic.

Stainless steel is compatible organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments. Brass is not preferred for contaminated sediments because it can absorb analytes or react with samples, thus effecting analytical results.

Acrylic plastic is not preferred for use with organic contaminants, but are compatible with metals and other inorganic species.

Do not clean acrylic parts with alcohol.

Operation

The sampler is deployed via a rope or by a pole. The manufacturer recommends when sampling in water depths greater than 3 meters, the sampler should be deployed using the pole. The sampler is slowly lowered to the sediment. During deployment, water passes through the corer tube and exits through the boss on the top of the corer head. After the corer has penetrated the sediment, the sampler remain in the sediment momentarily before removal. When the sampler is removed, a vacuum will form in the top of the corer tube preventing displacement of sediment.

Training and Other Requirements

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

The multi-core configuration may require a boat with a winch, depending on site-specific conditions.

Manufacturer Information

Duncan & Associates

Jeeves Bank Fernleigh Road

Grange-over-Sands Cumbria LA11 7H UK

Phone +44 (0) 15395 33 **Fax** +44 (0) 15395 34963 **URL** www.duncanandassociates.co.uk/

Email info@duncanand associates.co.uk

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available

NO

PICTURE

AVAILABLE

Sampler Type Box (Core) **Name** Gomex Corer

Number of Personnel Required 2 or more **Dimensions** Frame: 40x45x55 cm; Sample box: 25x25x50 cm **to** Frame: 2x1.5x2.7m

Weight (Kg) 35.8 **to** 1200

Volume (Liters) 31 **to** 42

General Description

The Gomex Corer is constructed of stainless steel. The corer is stored on a stand, measuring 40 x 45 x 55 cm high that supports the weight trays. The stand keeps the corer in the open position prior to coring.

Advantages:
- This sampler is suitable for many sediment types.
- The device collects a relatively large sample volume.

Disadvantages:
- The device requires multiple operators are required due to the weight of the device.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

Stainless steel is compatible organic-contaminated sediments, but is not preferred for metals-contaminated sediments.

Operation

The corer consists of four interconnected units: (1) the sample box, (2) the exterior fixed-support framework, (3) the structural linkage that attaches the vertical sliding bar to close the spades and (4) the release mechanism. The weight trays hold several lead weights on each side of the sampler. The lead serves as both ballast and the driving force that closes and holds the spades in the closed position.

As the sampler hits the bottom surface, sediment enters the box chamber collection area. To retrieve the sample the lead is activated which closes the spades, and seals the chamber for retrieval.

Training and Other Requirements

A boat with winch and crane is required for sample operations. Proper training and licensing is required for boat operations during sample collection.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

Duncan & Associates

Jeeves Bank Fernleigh Road

Grange-over-Sands Cumbria LA11 7H UK

Phone +44 (0) 15395 33 **Fax** +44 (0) 15395 34963 **URL** www.duncanandassociates.co.uk/

Email info@duncanand associates.co.uk

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available

Manufacturer Information

Kahl Scientific Instrument Corporation
P.O. Box 1166
El Cajon CA 92022-11 USA
Phone 619-444-2159 **Fax** **URL**
Email kahl@kahlsico.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available

Manufacturer Information

Ocean Instruments
5312 Banks St.
San Diego CA 92110-40 USA
Phone 619-291-2557 **Fax** 619-296-2240 **URL** www.oceaninstruments.com
Email sales@oceaninstruments.com

Cost Information

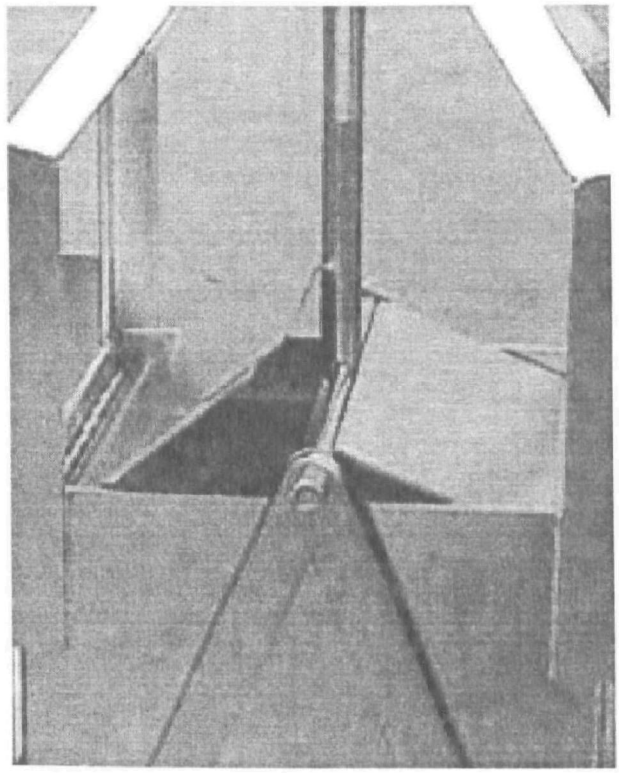
Base Cost Min	Base Cost Max	Cost Description
$4,725.00	$5,405.00	(March 2003) Minimum cost is the sampler only; the maximum cost includes a weight set, storage box, and stand.

Manufacturer Information

Seabed
Visseringstraat 10 1975 BR Ijmuiden
Denmark
Phone 00 31 (0) 255 53 **Fax** 00 31 (0) 255 533945 **URL** www.seabed.nl
Email seabed@seabed.nl

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$22,500.00	$22,500.00	(March 2003) Sampler only



GOMEX CORER

Sampler Type Piston (Core) **Name** Hammond (Hamon) grab

Number of Personnel Required 2 **Dimensions** 1.5 x 1.5 x 2.1 meters **to**

Weight (Kg) 350 **to**

Volume (Liters) 36 **to**

General Description

The Hammond Grab Sampler uses a square frame to support a bucket that can rotate through an angle of 120 degrees. Mild steel frame and bucket, stainless steel bucket optional. Sampling area 0.1 meter sq. Especially effective for sandy and gravely sediments.

Advantages:
- The sampler collects a large sample volume.
- The device is effective for coarse grained sediments.

Disadvantages:
- The sampler is relatively heavy, and may be difficult to handle.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

The device is constructed in mild steel with a galvanized finish with stainless steel fasteners. There is, however, the option of using a stainless steel bucket.

Mild steel is not preferred for contaminated sediments because it can absorb analytes or react with samples, thus effecting analytical results. Mild steel may form rust.

Stainless steel is compatible organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

Operation

The bucket can rotate through an angle of 120 degrees, after being released by a gravity trigger system. During this rotation, activated by the hoisting cable, the sampler penetrates 30 cm into the sediment. At the end of its movement, the bucket mouth opening closes into a rubber covered steel plate, sealing the bucket mouth to prevent wash out.

Training and Other Requirements

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

Duncan & Associates

Jeeves Bank Fernleigh Road

Grange-over-Sands Cumbria LA11 7H UK

Phone +44 (0) 15395 33 **Fax** +44 (0) 15395 34963 **URL** www.duncanandassociates.co.uk/

Email info@duncanand associates.co.uk

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available

NO

PICTURE

AVAILABLE

Sampler Type Clamshell Bucket (Grab) **Name** Jenkin Surface Mud Sampler

Number of Personnel Required 2 **Dimensions** 6.9 cm diameter x 50.6 cm length **to**

Weight (Kg) NA **to**

Volume (Liters) 1.9 **to**

General Description

The Jenkin Surface Mud Sampler is designed specifically for freshwater use, profiling the upper strata of sediment and the water surface interface.

The corer is designed to collect intact sediment samples (about 20 cm deep) with a minimum of disturbance.

Advantages:
- The sampler provides minimal sediment disturbance.

Disadvantages:
- The device was designed for freshwater use only.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

Construction of the sampler is from aluminum castings. Aluminum is compatible with organic-contaminated sediments, but is not preferred for use with metals-contaminated sediments.

Fasteners are predominantly 316 stainless steel with some also in brass. The removable corer tubes are acrylic with stainless steel saddles and aluminum top and bottom closure caps with silicone rubber gaskets. Stainless steel is compatible with organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

Acrylic coring tubes are not preferred with organic-contaminated sediments, but are compatible with metals-contaminated sediments.

Operation

The sampler is deployed from a boat. When the sampler hits the sediment surface the arms are activated to close. The closing-arms are prevented from closing rapidly by a shock absorber-like "dashpot," preventing disturbance of the sediments.

Training and Other Requirements

A boat is required for sampling operations. Proper training and licensing is required for boat operation during sample collection.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

Duncan & Associates

Jeeves Bank Fernleigh Road

Grange-over-Sands Cumbria LA11 7H UK

Phone +44 (0) 15395 33 **Fax** +44 (0) 15395 34963 **URL** www.duncanandassociates.co.uk/

Email info@duncanand associates.co.uk

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available

NO

PICTURE

AVAILABLE

Sampler Type Manual Push (Core) **Name** Kajak-Brinkhurst Corer

Number of Personnel Required 2 **Dimensions** Inner diameter: 5.1 cm; Length: 50.8 cm **to** Inner diameter: 5.1 cm; Length: 76.2 cm

Weight (Kg) 5.9 **to** 21.8 **Volume (Liters)** 1.4 **to** 1.5

General Description

The Kajak-Brinkhurst Corer uses a relatively large core tube (2 in diameter) and, therefore, collects a relatively large sample volume. All parts are made of stainless steel, but a PVC liner tube can be used for sample collection.

Advantages:
- The device collects a larger sample volume than similar gravity corers (i.e.. Phleger corer).
- The sampler can be used effectively in deep water.

Disadvantages:
- The sampler requires a low energy environment for operation.
- The device is only effective in loosely consolidated, fine grained material.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

Stainless steel is compatible organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

Plastics are not preferred for use with organic contaminants, but are compatible with metals and other inorganic species.

Do not use alcohol for cleaning acrylic parts.

Operation

Mounted from hand line or a winch and cable. The upper part of the line operated sampler can be exchanged with a shaft in order to sample by manual insertion of the tube.

The sampler can be assembled by means of the tent pole principle to a maximum length of 6 meters.

The valve is locked open during decent to minimize frontal wave to the water column. Sample closure is messenger operated, maintained under full control, and can keep sampler open until the proper sample is collected.

Training and Other Requirements

A boat with winch and crane is required for sampling operations. Proper training and licensing is required for boat operation during sample collection.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

KC Denmark
Holmbladsvej 19 - DK - 8600
Silkeborg Denmark
Phone +45 86828347 **Fax** +45 86824950 **URL** http://www.kc-denmark.dk/
Email kc@kc-denmark.dk

Cost Information

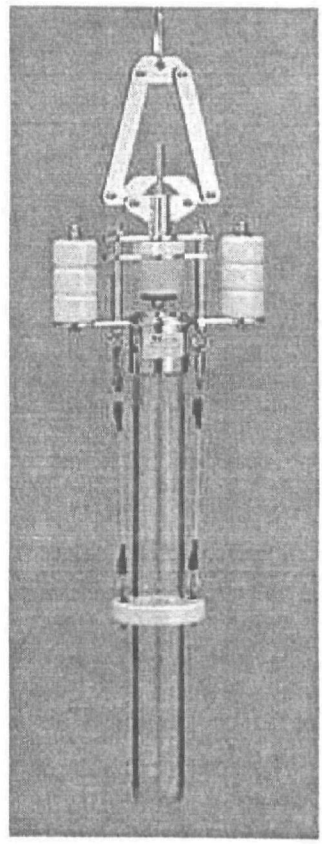
Base Cost Min	Base Cost Max	Cost Description
$950.00	$993.00	(March 2003)

Manufacturer Information

Wildlife Supply Company (Wildco)
95 Botford Place
Buffalo NY 14216 USA
Phone 800-799-8301 **Fax** 800-799-8115 **URL** www.wildco.com
Email goto@wildco.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$1,219.00	$1,395.00	(March 2003) Minimum cost is for the medium K-B corer model; the maximum cost is for the heavy K-B corer model.



KAJAK-BRINKHURST CORER

Sampler Type Manual Trap (Grab) **Name** KC Hand Operated Sediment Corer

Number of Personnel Required 2 **Dimensions** Core tube: 80 mm O.D./72 mm I.D.; 450 mm length **to**

Weight (Kg) 54.9 **to**

Volume (Liters) 1.8 **to**

General Description

The KC Sediment Corer uses tubes as sediment traps that are placed in holders. The device also has fins for sample collection that are made of stainless steel. The tubes are made of transparent acrylic.

The sediment trap was been developed with Professor Michael Olesen, from the Marine Biological Laboratory, University of Copenhagen, Denmark.

Advantages:
- The sampler is easy to operate.
- The device provides for good vertical penetration.

Disadvantages:
- The sampler is less effective in soft sediment.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Operation

The construction of the sediment trap array ensures a permanent vertical position of the sampling tubes during deployment. The fin and the pivot joints force the array to be held at a right angle to the current. The sediment trap consists of two detachable cylindrical sampling tubes mounted with lead weights at the bottom. During penetration the non-return flap and a shovel will be held open manually by a 5mm polyester line. After withdrawing the corer from the sediment, the hand held line has to be released and the non-return flap and the shovel under the corer tube will close.

Chemical and Physical Compatability

The tube holders and fin are made of stainless steel. Stainless steel is compatible with organic-contaminated sediments, but is not preferred for metals-contaminated sediments.

Plastics are not compatible with organic contaminants, but are compatible with metals and other inorganic species.

Do not use alcohol for cleaning acrylic parts.

Training and Other Requirements

No special training was noted by manufacturer.

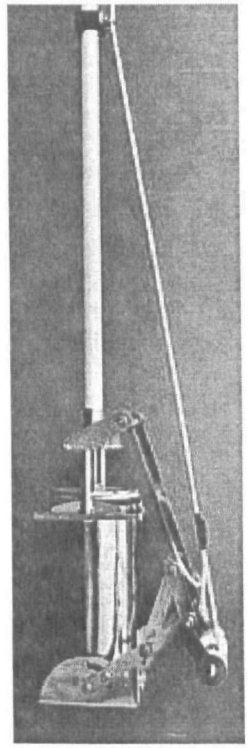
Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

KC Denmark
Holmbladsvej 19 - DK - 8600
Silkeborg Denmark
Phone +45 86828347 **Fax** +45 86824950 **URL** http://www.kc-denmark.dk/
Email kc@kc-denmark.dk

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$453.00	$453.00	(March 2003) Sampler only



KC HAND OPERATED SEDIMENT CORER

Sampler Type Manual Push (Core) **Name** KC Sediment Trap (2- or 4-tube models)

Number of Personnel Required 1-2 **Dimensions** 7.9 cm OD/ 7.1 cm ID **to** 78.7 cm long (tubes)
45 cm long (tubes)

Weight (Kg) 5.4 **to**

Volume (Liters) 4.6 **to** 9

General Description

The KC Sediment Trap consists of transparent acrylic or polycarbonate tubes attached to a stainless steel fin. The tubes are open at the top to allow water to pass through, and are equipped with weights and a catcher at the bottom to hold in sediment.

Advantages:
- Light weight

Disadvantages:
- Not preferred for sampling sediment with organic contamination

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

Stainless steel is compatible for use with organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

Acrylic plastics are not preferred for use with organic contaminants, but are compatible with metals and other inorganic species.

Do not use alcohol for cleaning acrylic parts.

Operation

The assembly is attached to a hand-held line and allowed to drop to the bottom of a shallow body of water. Impact with the bottom forces sediment into the tubes. The sediment sample is held in the tube by the polyethylene core catcher.

Training and Other Requirements

Minimal training is required.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principles prior to using sampling equipment.

Manufacturer Information

KC Denmark
Holmbladsvej 19 - DK - 8600
Silkeborg Denmark
Phone +45 86828347 **Fax** +45 86824950 **URL** http://www.kc-denmark.dk/
Email kc@kc-denmark.dk

Cost Information

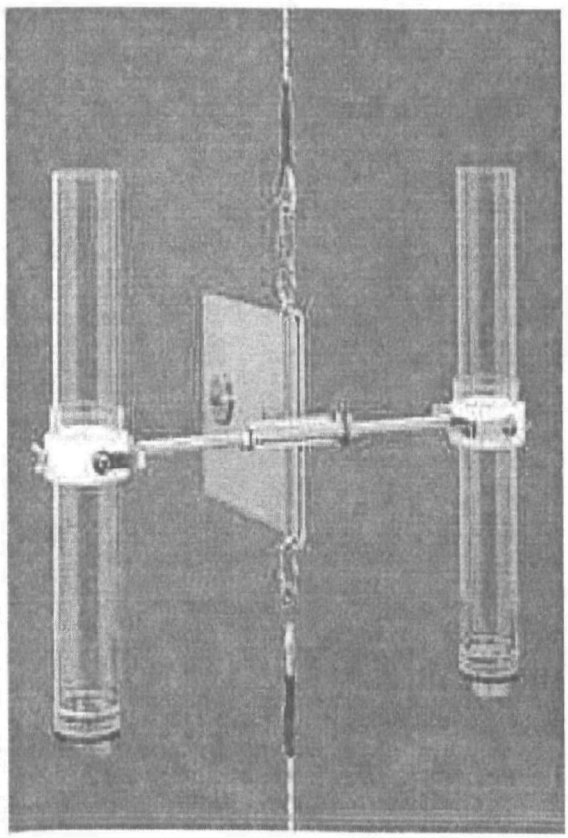
Base Cost Min	Base Cost Max	Cost Description
		Not available

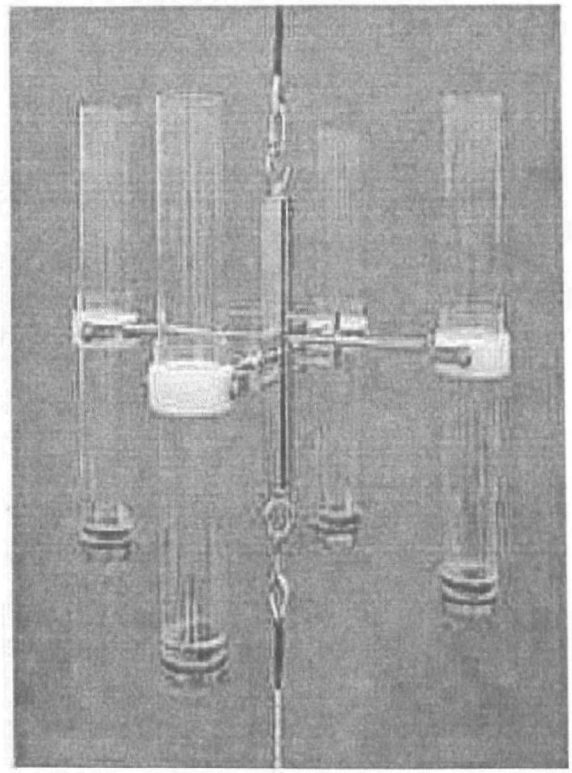
Manufacturer Information

Trident Sensors
1 Forestry Cottages, Fisher Lane
Chiddingfold Surrey GU8 4FT England (UK)
Phone +44 1428 682995 **Fax** +44 1428 684827 **URL** http://ourworld.compuserve.com/homepages/tridentsensors/
Email tridentsensors@btopenworld.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$13,949.99	$13,949.99	(March 2003) Dual gravity corer





KC SEDIMENT TRAP

Sampler Type Manual Push (Core) **Name** Large Bore Sediment Corer

Number of Personnel Required 1 **Dimensions** 50 cm (length) x 9.5 cm (inner diameter) **to** 50 cm (length) x 14.5 cm (inner diameter)

Weight (Kg) NA **to**

Volume (Liters) 3.5 **to** 8.3

General Description

The Large Bore Sediment Corer is designed to collect undisturbed large diameter sediment cores. The sampler consists of a PVC coring head, one-way check valve and ball valve vacuum release; stainless steel hose clamp and hex-driver, and comes with 1.0 m aluminum extension rods.

Advantages:-
The device collects a large sediment sample volume.

Disadvantages:
-The sampler may not be appropriate for collecting sediments containing organics

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Operation

The universal core head is designed to recover long undisturbed cores. The core head drives clear polycarbonate barrels to a maximum length of 2.4 m into the sediment. A one way check valve seated in the core head allows water and sediment to free flush through core barrel during deployment. Upon retrieval the check valve automatically seats, creates a partial vacuum and retains the sample in the core barrel.

Chemical and Physical Compatability

Sampler is constructed of PVC coring head and polycarbonate or PVC core tube. Plastics are not preferred for use with organic-contaminated sediments, but are compatible for metals-contaminated sediments and sediments contaminated with other organic species.

Training and Other Requirements

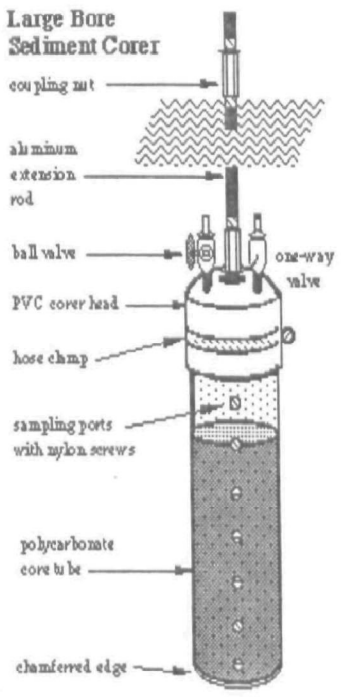
Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

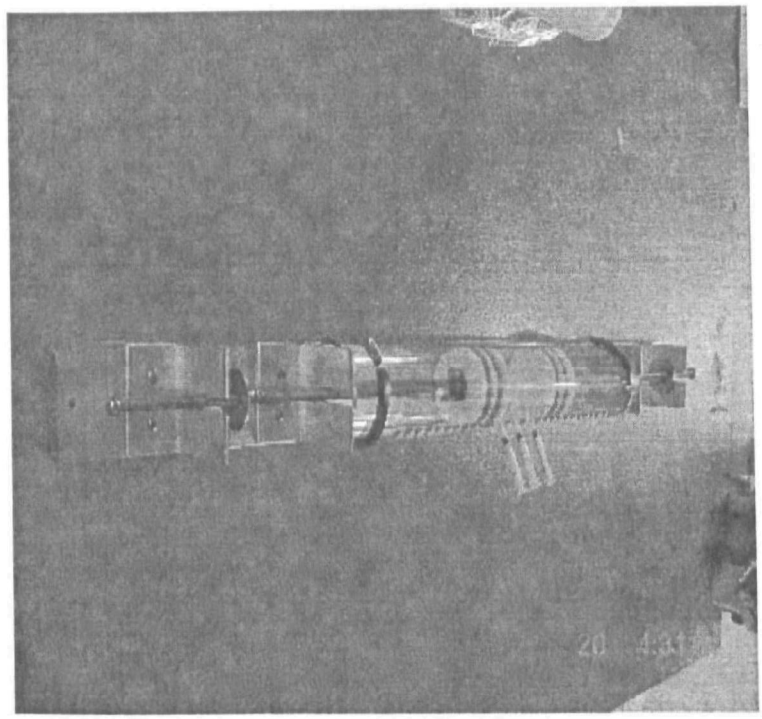
Manufacturer Information

Aquatic Research Instruments
P.O. Box 93
Lemhi ID 83465 USA
Phone 1-800-320-9482 **Fax** 208-756-8434 **URL** www.aquaticresearch.com
Email hydrobio@aol.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$255.00	$255.00	(March 2003) Entire corer





LARGE BORE SEDIMENT CORER

Sampler Type Piston (Core) **Name** Mackereth Pneumatic Corer

Number of Personnel Required 2 or more **Dimensions** 1000 mm x 65 mm diameter **to** 6000 mm x 50 mm diameter

Weight (Kg) NA **to**

Volume (Liters) 3.3 **to** 11.8

General Description

The Mackereth Corer enables profiled core samples to be taken to depths of up to 6 meters in length. A compressed air pneumatic control system is used for piston control of sample collection operations.

The types of this style of device are Mackereth Pneumatic Corer and Mackereth Mini Corer.

Advantages:
- The device collects a large volume of sediment.

Disadvantages:
- The sampler is designed only for freshwater use.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

The drum at the base of the corer is stainless steel, the pistons are brass, with stainless steel internal rods. Other components are PVC, rubber, and brass. The control panel is manufactured from aluminum and proprietary airlines and valves are used. The corer tubes that come in contact with the sample are clear acrylic.

Plastics are not preferred for use with organic contaminants, but are compatible with metals and other inorganic species.

Rubber is compatible with all contaminants of concern.

Do not use alcohol for cleaning acrylic parts.

Operation

The manufacturer recommends that depth sounding be conducted prior to deployment of the sampler to determine the depth of water. The sampler is then lowered slowly to the sediment. Free fall may be required for the last two meters above the sediment if the sediment to be sampled is compacted.

Compressed air is then used to activate a piston that pushes the acrylic core tube into the sediment. After the core tube has reached its total penetration length, the vacuum from the compressed air will be released. The compressed air supply should be shut off. The sampler can then be retracted.

Training and Other Requirements

A boat with winch and crane is required for sampling operations. Proper training and licensing is required for boat operation during sample collection.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

Duncan & Associates

Jeeves Bank Fernleigh Road

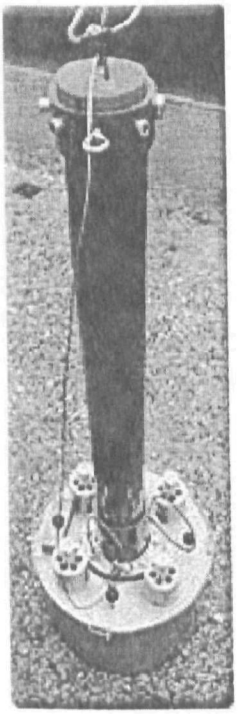
Grange-over-Sands Cumbria LA11 7H UK

Phone +44 (0) 15395 33 **Fax** +44 (0) 15395 34963 **URL** www.duncanandassociates.co.uk/

Email info@duncanand associates.co.uk

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available



MACKERETH PNEUMATIC CORER

Sampler Type Mechanical Push (Core) **Name** Macro-Core Sampler

Number of Personnel Required 2 **Dimensions** 3.8 cm diameter x 5.1 cm length **to** 3.8 cm diameter x 12.7 cm length

Weight (Kg) NA **to**

Volume (Liters) 0.7 **to** 1.7

General Description

The Marco-Core Sampler consists of a disposable acetate liner tube, which is inserted into a steel casing tube with nose cone. The device is driven into the sediment using a direct-push hydraulic rig. The samplers come in 0.61 through 1.52 meter lengths, and perform best in medium to fine-grained cohesive materials. Use of a core-catcher insert will allow for sampling of coarser-grained sandy materials.

Advantages:
- the sampler is relatively inexpensive.

Disadvantages:
- The device collects a relatively small sample volume.
- the sampler may not be appropriate for sampling sediments contaminated with organics.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

Acetate liners may potentially cause interference with organic analyses. Plastics are not preferred for use with organic contaminants, but are compatible with metals and other inorganic species.

Operation

The macro core sampler is placed into a direct-push rig for use in sediment sampling operations. Direct-push rigs "push" tools into a surface without drilling to remove sediment in order to make a path for the tool. The rig relies on a relatively small amount of static (vehicle) weight combined with percussion to advance the sampler. The sampler remains closed until the desired sampling depth is reached. A stop-pin is used to release the sampler above the desired depth, where it is then advanced to the depth for sample collection.

The acetate tube can be cut open to obtain samples after extracting from the steel sampling device.

Training and Other Requirements

The Macro-core sampler is used with a direct-push rig. Rig training is required prior to operation.

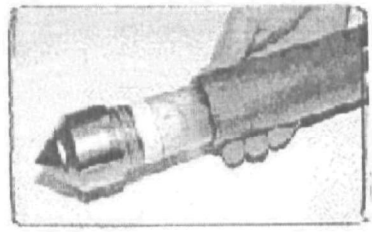
Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principles prior to using sampling equipment.

Manufacturer Information

Geoprobe Systems Inc.
601 N. Broadway
Salina KS 67401 USA
Phone 1-800-436-7762 **Fax** 785-825-2097 **URL** www.geoprobe.com
Email info@geoprobe.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$68.15	$78.15	(March 2003) Cost for the outer steel casing tube and nose cone. Cost of acetate liner tubes is minimal.



MACRO-CORE SAMPLER

Sampler Type Clamshell Bucket (Grab) **Name** Mud Snapper and Heavy-Duty Bottom Snapper

Number of Personnel Required 1-2 **Dimensions** 9.1 cm x 5.1 cm jaws; **to** 73.7 cm long 33 cm long

Weight (Kg) 3.2 **to** 27.2 **Volume (Liters)** 0.3 **to**

General Description

The Mud Snapper and Bottom Snapper are constructed of bronze and stainless steel, and are equipped with an automatic foot-trip closure mechanism. Two spring-tensioned jaws snap shut upon impact with the sediment to retrieve the sample.

The sampling assembly can be attached to a long, hand-held rod for shallow water, a sounding weight for intermediate water, or to a lowering line for deep water.

Advantages:
- The sampler's spring tension can be adjusted to sample hard and soft sediments.

Disadvantages:
- A relatively small sample volume is collected.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

The spring tension can be adjusted for sampling soft or hard sediments. The Mud Snapper can be deployed through small (6-inch) openings.

Stainless steel is compatible with organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

Bronze is compatible for organic-contaminated sediments, but is not preferred for metals-contaminated sediments.

Operation

This device has a long threaded post with a compression spring surrounding it, which presses against the jaws at one end and is seated inside a cap at the upper end. Spring tension can be adjusted by turning the cap. Upon impact with the sediment, the foot-trip is pushed upward, disengaging the pivoted locking arm and allowing the spring-tensioned jaws to snap shut.

Training and Other Requirements

Larger models require a hand reel or small winch. Boat operation may be required. Proper training is required for small boat operations.

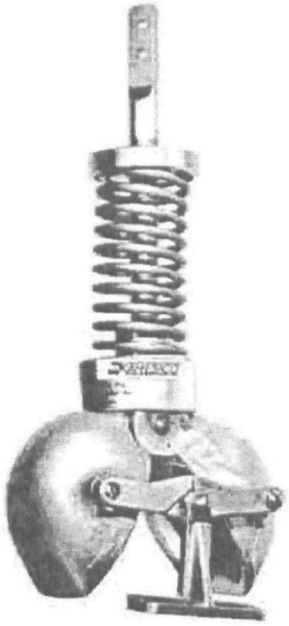
Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

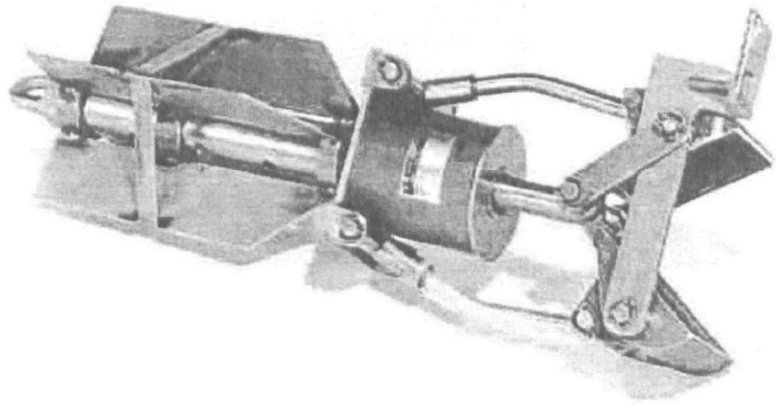
Manufacturer Information

Kahl Scientific Instrument Corporation
P.O. Box 1166
El Cajon CA 92022-11 USA
Phone 619-444-2159 **Fax** **URL**
Email kahl@kahlsico.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$615.00	$1,985.00	(March 2003) Minimum cost is for the small mud snapper; maximum cost is for the heavy duty mud snapper.





MUD SNAPPER

Sampler Type Gravity Corer (Core) **Name** Multi-Corers (multiple models)

Number of Personnel Required 2-3 **Dimensions** 62.5 cm x 32.5 cm (sample tube); 1.97 m x 1.77 m (overall) **to** 10 cm x 70 cm (sample tube); 2.76 m x 2.45 m

Weight (Kg) 77.1 **to** 500

Volume (Liters) 2.5 **to** 52

General Description

The Mulit-Corer consists of a steel or aluminum frame, which holds 4 to 12 polycarbonate sampling tubes. The tube vary in size, but typically have sealable tops and sediment catchers in the bottom. For stiffer sediments, weights can be added to provide additional force. Some models are equipped with additional features such as penetration stops, spring loaded lid to seal sediments after collection, a pretrip safety pin, and guide slides and slowdown cylinder for smoother core penetration.

A specially designed flow-through sample tube designed by one of the manufacturers reduces cover bow wake effect.

Various models include: deep sea multi-corer, mini multi-corer, lake shelf shallow water multi-corer.

Advantages:
- The device collects a large sample volume.

Disadvantages:
- The sampler may not be appropriate for sampling sediments contaminated with organics

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Operation

This device is deployed from a boat with a cable and winch. The tube seals remain open during decent to allow flow-through, and seal tight for retrieval and delivery to a laboratory for analysis.

At the top of each sample tube is mounted a spring-loaded lid, which is in open position during the sample collection. For each core, a spring loaded horizontally placed plate is mounted at the bottom plate and when the sampling is completed, they are pressed in position under the sample tubes. At the same time, the 6 top-lids close. Both will function to secure the sample. At the top of the corer is a weight station with a capacity of 30 pieces of 10 kg star-metal weights. The 600 mm long tubes are attached by a double lock-clamp and a close-fitting device giving a good fastening and a quick tube change.

Chemical and Physical Compatability

Polycarbonate tubes used to collect sample will not interfere with most contaminant measures. Plastics are not preferred for use with organic contaminants, but are compatible with metals and other inorganic species.

Aluminum is compatible with organic-contaminated sediments, but is not preferred for use with metals-contaminated sediments.

Training and Other Requirements

A boat with a winch and crane is required for boat operations during sampling operation. Proper training and licensing is required for boat operations during sample collection.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principles prior to using sampling equipment.

Manufacturer Information

Duncan & Associates

Jeeves Bank Fernleigh Road

Grange-over-Sands Cumbria LA11 7H UK

Phone +44 (0) 15395 33 **Fax** +44 (0) 15395 34963 **URL** www.duncanandassociates.co.uk/

Email info@duncanand associates.co.uk

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available

Manufacturer Information

KC Denmark
Holmbladsvej 19 - DK - 8600
Silkeborg
Denmark
Phone +45 86828347 **Fax** +45 86824950 **URL** http://www.kc-denmark.dk/
Email kc@kc-denmark.dk

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$22,473.00	$22,473.00	(March 2003) Includes 6 tubes, rack, hydraulic damper, six 10 kg weights.

Manufacturer Information

Ocean Instruments
5312 Banks St.
San Diego CA 92110-40 USA
Phone 619-291-2557 **Fax** 619-296-2240 **URL** www.oceaninstruments.com
Email sales@oceaninstruments.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$9,800.00	$36,000.00	(March 2003) Cost is typically for frame and sampling tubes only. Weights, spare parts, etc. are additional costs.

Manufacturer Information

OceanTest Equipment, Inc.
2021 SW 70th Ave., Bldg. B1
Fort Lauderdale Fl 33317 USA
Phone 954-474-6603 **Fax** 954-474-6605 **URL** www.oceantestequip.com/
Email oceantestequip@aol.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available

Manufacturer Information

OKTOPUS GmbH

Kieler Str. 51 P.O. Box 1115, 24594

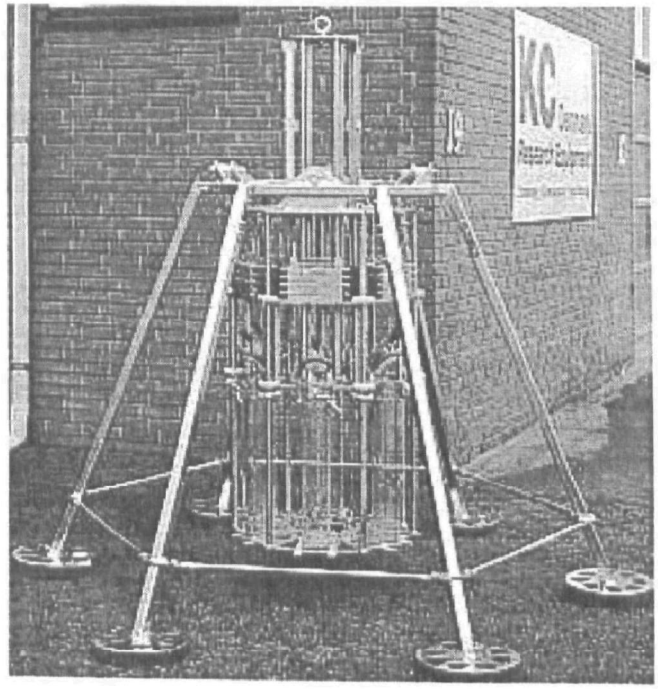
Hohenwestedt Germany

Phone 49-(0)4871-4903 **Fax** 49-(0)4871-490315 **URL** www.oktopus-mari-tech.de

Email schriever@oktopus-mari-tech.de

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available



MULTI-CORER

Sampler Type Manual Push (Core) **Name** Ogeechee

Number of Personnel Required 1 **Dimensions** Inner diameter: 5.1 cm; Length: 50.8 cm **to** Inner diameter: 5.1 cm; Length: 2.4 m.

Weight (Kg) 4.5 **to** 27.2 **Volume (Liters)** 5 **to**

General Description

The Ogeechee Corer is a hand held device that is effective for collection of firm or sandy sediments. The device uses a closing line to control a closure valve in the head assembly permitting isolation of the sampling material. The user can adjust the valve tension so it seals tightly and does not leak air. The sampler can be used in fast-moving water up to 4.5 m (15 feet) deep with the use of an extension handle.

Advantages:
- The device is light weight.
- The sampler can be used in high energy environments for sediment sampling.
- The sampler can provide sealed isolation of collected sediments from the environment.

Disadvantages:
- The sampler is only designed for relatively shallow use.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

Stainless steel core tube; Stainless steel or Lexan nose piece; Stainless steel or plastic core catcher

Stainless steel is compatible organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

Plastics are not preferred for use with organic contaminants, but are compatible with metals and other inorganic species.

Operation

Operation of this sampler includes twisting and pushing the sampling downward into the sediment. Extension handles come in three lengths. For deeper water, the manufacturer suggests the use of a drive hammer which drives the sampler into the bottom by repeated lifting and dropping. A long sample of clays or heavy soils may be hard to remove and may require a power winch.

Six core tube lengths are available: 50.8 cm, 76.2 cm, 91.4 cm, 1.2 m, 1.5 m, and 2.4 m.

Training and Other Requirements

No special training is required.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

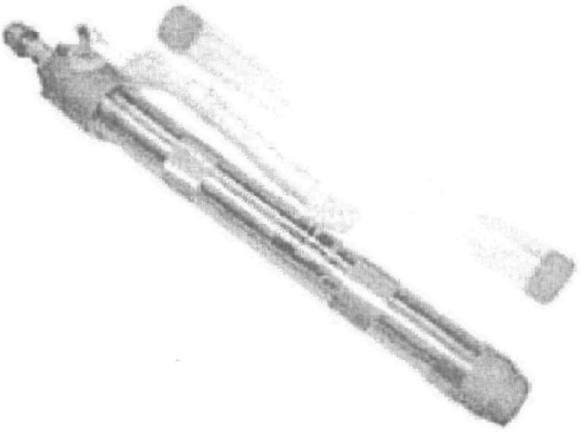
Collection of long cores will require a boat with winch. Proper training and licensing is required for boat operation during sample collection.

Manufacturer Information

Wildlife Supply Company (Wildco)
95 Botford Place
Buffalo NY 14216 USA
Phone 800-799-8301 **Fax** 800-799-8115 **URL** www.wildco.com
Email goto@wildco.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$429.00	$1,089.00	(March 2003) The minimum cost is for the 20 inch core length; the Maximum cost is for a 96 inch corer.



OGEECHEE CORER

Sampler Type Clamshell Bucket (Grab) **Name** Orange Peel Bucket Dredge

Number of Personnel Required 1-2 **Dimensions** 61 cm x 38.1 cm x 38.1 cm **to**

Weight (Kg) 25 **to**

Volume (Liters) 7 **to**

General Description

The Orange Peel Bucket Dredge Sampler uses a hemispherical bucket with 4 "flaps" that comprise the jaws of the sampler. The jaws resemble segments of a peeled orange.

Advantages:
- The device collects large volume of sample.
- The sampler is corrosion resistant in sea water.

Disadvantages:
- The device may not be appropriate for sampling sediments contaminated with metals.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

The sampler has ductile iron jaws, which are not preferred for contaminated sediments because it can absorb analytes or react with samples, thus effecting analytical results.

Stainless steel pins, shaft, link-chains, splash-plates, wire-Stainless steel is compatible organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

Operation

The sampler is lowered to the sediment with the jaws open using a single wire. When the buckets hits the sediment, the jaws penetrate the sediment, the wire slackens, and the suspension hook disengages from the counter-weighted bucket hook. As the winch rewinds the lowering wire and the sampler jaws pivot shut.

Training and Other Requirements

A boat is required for sampling operations. Proper training and licensing is required for boat operation during sample collection.

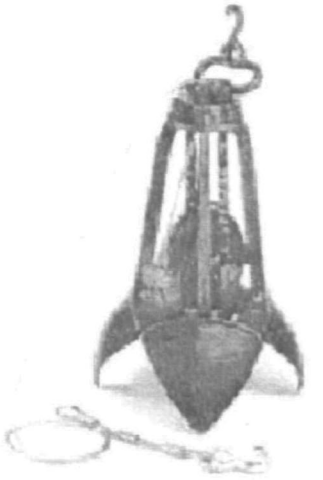
Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

Kahl Scientific Instrument Corporation
P.O. Box 1166
El Cajon CA 92022-11 USA
Phone 619-444-2159 **Fax** **URL**
Email kahl@kahlsico.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available



ORANGE-PEEL BUCKET

Sampler Type Mechanical Oscillati (Core) **Name** Oscillating Sand Corer

Number of Personnel Required 1 or 2 **Dimensions** 100 mm diameter. x 66 mm (sample tube); 1.5 x 1 x 1.5 m **to**

Weight (Kg) 50 **to**

Volume (Liters) 4.7 **to**

General Description

The Oscillating Sand Corer is a piston corer that is designed for sampling associated with coastal zones, continental shelves, coral atolls/lagoons, pollution studies, dredging operations, and alluvial mining surveys. The corer, which is constructed of stainless steel, uses an acrylic or polycarbonate core tube and requires a deployment cable at least 4 mm in diameter. The device has a 12 volt DC motor and uses sealed lead acid battery.

Advantages:
- The sampler collects a large sample volume.

Disadvantages:
- This device may not be appropriate for sampling sediments contaminated with organic contaminants.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

The sampler has a stainless steel frame. Stainless steel is compatible for use with organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

Acrylic or polycarbonate core tubes are used for collecting the sediment cores. The core tubes are not preferred for use with organic-contaminated sediments. The tubes are compatible with metals contaminated sediments, as well as sediments contaminated with other organic species.

Operation

The device is deployed by a wire. An acrylic or polycarbonate core tube is driven into the sediment and the tube is oscillated at 15 to 20 degrees using a spring loaded lever. When the corer reaches the sediment to be sampled, the motor is started using a magnetic switch on the lifting harness.

Additional weight may be added to the frame of the sample to increase stability and sediment penetration.

Training and Other Requirements

A boat with a winch and crane is required to deploy this sampling device. Proper training and licensing is required for boat operation during sample collection.

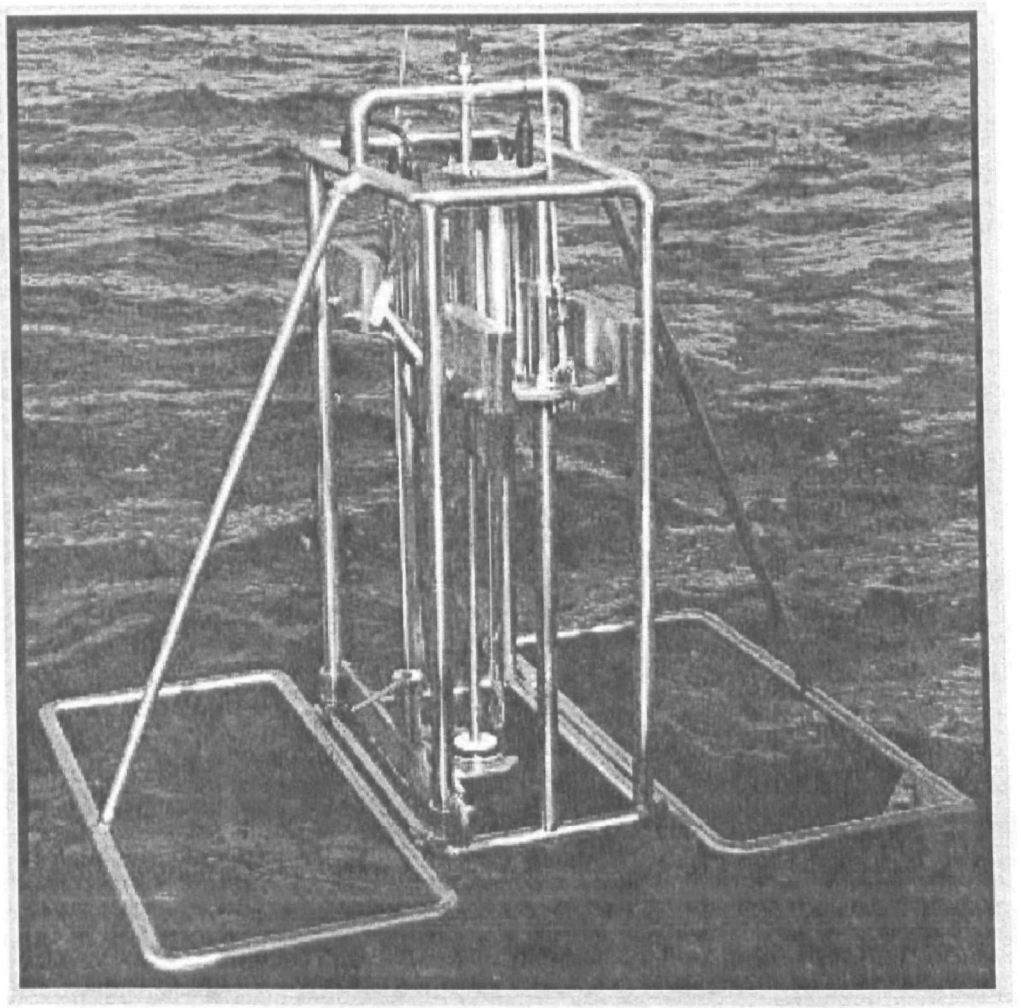
Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principles prior to using sampling equipment.

Manufacturer Information

Trident Sensors
1 Forestry Cottages, Fisher Lane
Chiddingfold Surrey GU8 4FT England (UK)
Phone +44 1428 682995 **Fax** +44 1428 684827 **URL** http://ourworld.compuserve.com/homepages/tridentsensors/
Email tridentsensors@btopenworld.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$15,065.98	$15,065.98	(March 2003) Oscillating sand corer



OSCILLATING SAND CORER

Sampler Type Box (Core) **Name** PBC-100

Number of Personnel Required 2 **Dimensions** 20cm x 20cm x 84cm; **to** Sample box- 15cm x 15cm x 46cm

Weight (Kg) 5.9 **to** 12.7 **Volume (Liters)** 10 **to**

General Description

The PBC-100 box-style sediment sampler is designed to sample silts, mud, and other soft sediments from lakes, riverine, and lagoon environments. The sampler is constructed of acrylic, PVC, fiberglass and derlin. All fasteners and other metallic fittings are stainless steel.

Advantages:
- The manufacturer indicates the sampler is effective in acid rain and heavy metals research projects.
- The sampler is relatively light weight and is easy to handle.

Disadvantages:
- The device may not be suitable for sampling sediments contaminated with organic contaminants.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

The sampler is constructed of acrylic, PVC, fiberglass, and derlin, while the line is constructed of polypropylene.

Plastics are not preferred for use with organic contaminants, but are compatible with metals and other inorganic species.

Do not use alcohol to clean acrylic parts.

Fasteners and other metallic fittings constructed of stainless steel. Stainless steel is compatible organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

Operation

Due to the relatively small size and light weight of this device, the PBC-100 sampler can deployed from a small boat. The PBC-100 is deployed by hand and does not require a winch for retrieval. A battery-powered puller can be used to retrieve the sampler.

The box corer is deployed into the sediment surface using a lead line. The lead is pulled to activate the closure for retrieving the sample.

Training and Other Requirements

A small boat may be used for sample collection. Proper training in boat operations should be provided prior to sampling.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

Duncan & Associates

Jeeves Bank Fernleigh Road

Grange-over-Sands Cumbria LA11 7H UK

Phone +44 (0) 15395 33 **Fax** +44 (0) 15395 34963 **URL** www.duncanandassociates.co.uk/

Email info@duncanand associates.co.uk

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available

Manufacturer Information

Ocean Instruments
5312 Banks St.
San Diego CA 92110-40 USA
Phone 619-291-2557 **Fax** 619-296-2240 **URL** www.oceaninstruments.com
Email sales@oceaninstruments.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
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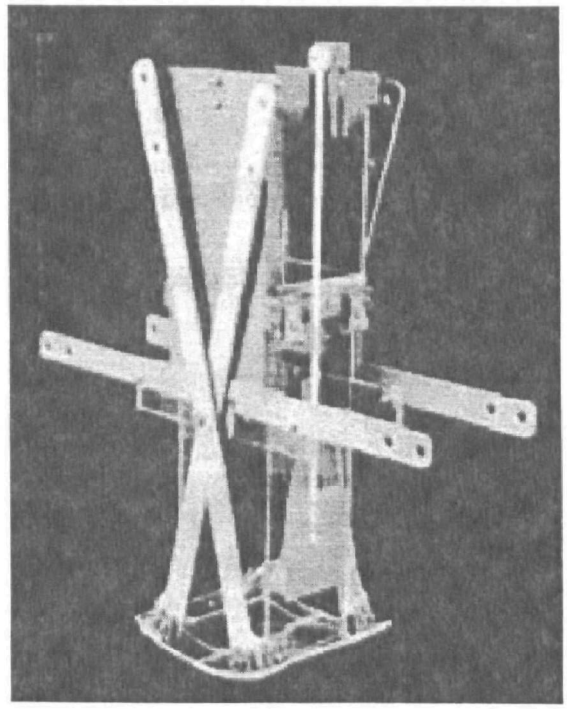


PCB-100 CORER

Sampler Type Clamshell Bucket (Grab) **Name** Petersen Grab Sampler

Number of Personnel Required 1 to 2 **Dimensions** 30.5 cm . x 30.5 cm. **to**

Weight (Kg) 17.7 **to** 42.2 **Volume (Liters)** 95 **to** 9.89

General Description

The Petersen Sampler is a grab type of sampler used in fresh water for collecting sediment samples from sandy, gravel, or clay-like substrates.

Advantages:
- A large sample volume can be collected.
- The sampler can be used for most substrates

Disadvantages:
- The sampler is only effective only for low energy environments.
- The sampler jaws may not close completely.
- The metal frame can cause cross contamination.
- If used in salt water, it must be painted for protection.
- The sampler may exceed target sampling depth.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

Zinc-plated heavy steel is not preferred for contaminated sediments because it can absorb analytes or react with samples, thus effecting analytical results.

Operation

The jaws of the sampler close in a clamshell fashion. A safety-pin prevents the scoops from closing to prevent injury. The bayonet-style trip mechanism is designed to release only when the sampler is on the bottom and the cable is slack. The sampler holds up to 8 removable weights.

Vent holes permit water to flow through while the grab is being lowered, minimizing diagonal movement as well as reducing the frontal shock wave generated by descent.

Training and Other Requirements

A boat is required for sampling operations. Proper training and licensing is required for boat operation during sample collection.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

Duncan & Associates

Jeeves Bank Fernleigh Road

Grange-over-Sands Cumbria LA11 7H UK

Phone +44 (0) 15395 33 **Fax** +44 (0) 15395 34963 **URL** www.duncanandassociates.co.uk/

Email info@duncanand associates.co.uk

Cost Information

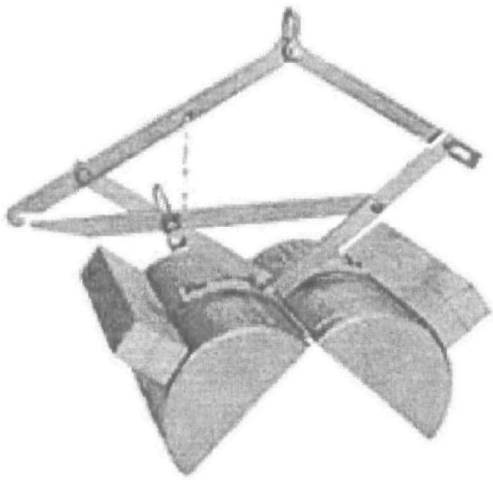
Base Cost Min	Base Cost Max	Cost Description
		Not available

Manufacturer Information

Wildlife Supply Company (Wildco)
95 Botford Place
Buffalo NY 14216 USA
Phone 800-799-8301 Fax 800-799-8115 URL www.wildco.com
Email goto@wildco.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$1,195.00	$1,563.00	(March 2003) Minimum cost includes sampler only; maximum cost includes two nine lb weights



PETERSEN SAMPLER

Sampler Type Gravity Corer (Core) **Name** Phleger

Number of Personnel Required 2 **Dimensions** Inner diameter: 3.6 cm; to Length: 50.8 cm

Weight (Kg) 8 to 15 **Volume (Liters)** 0.5 to 0.65

General Description

The Phleger Corer is a weighted hollow tube that is used to penetrate the bottom sediment layers so that a study of the deposition of sediments can be made. A coring device is used for obtaining a sample at a greater depth in the bottom sediments. This device consists of a weighted hollow tube that is pushed into the bottom material by gravity. When retrieved, the material trapped in the tube is extruded and sliced lengthwise for examination of the various layers of sediments comprising the bottom material.

This corer can be operated without the use of a winch. It can penetrate to 50 cm depth.

Advantages:
- The device has sharp cutting edge for good sediment penetration.
- The sampler protects sediment well upon retrieval.
- The sampler is effective for a wide range of sediment types, including hard substrates.

Disadvantages:
- The sampler collects a relatively small sample volume.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

Stainless steel core tube, nose piece, and core catcher- Stainless steel is compatible organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

Neoprene valve- Neoprene is compatible with most contaminants of concern.

Operation

The sampler can be suspended from hand line or winch and cable. The corer is lowered to approximately 5 meters from the sediment to be sampled. At this point the winch cable is rapidly deployed to produce rapid free fall. The sharp cutting edge of the nose piece and the metal tube penetrate the sediment, cutting out a cylinder of bottom sediment that is forced into the tube.

A one-way valve inside the sampler prevents from washing or falling out as the corer is retrieved. The metal sampling tube contains a plastic liner, which can be removed with the sediment sample intact.

Training and Other Requirements

A boat with winch is required for sampling operations. Proper training and licensing is required for boat operation during sample collection.

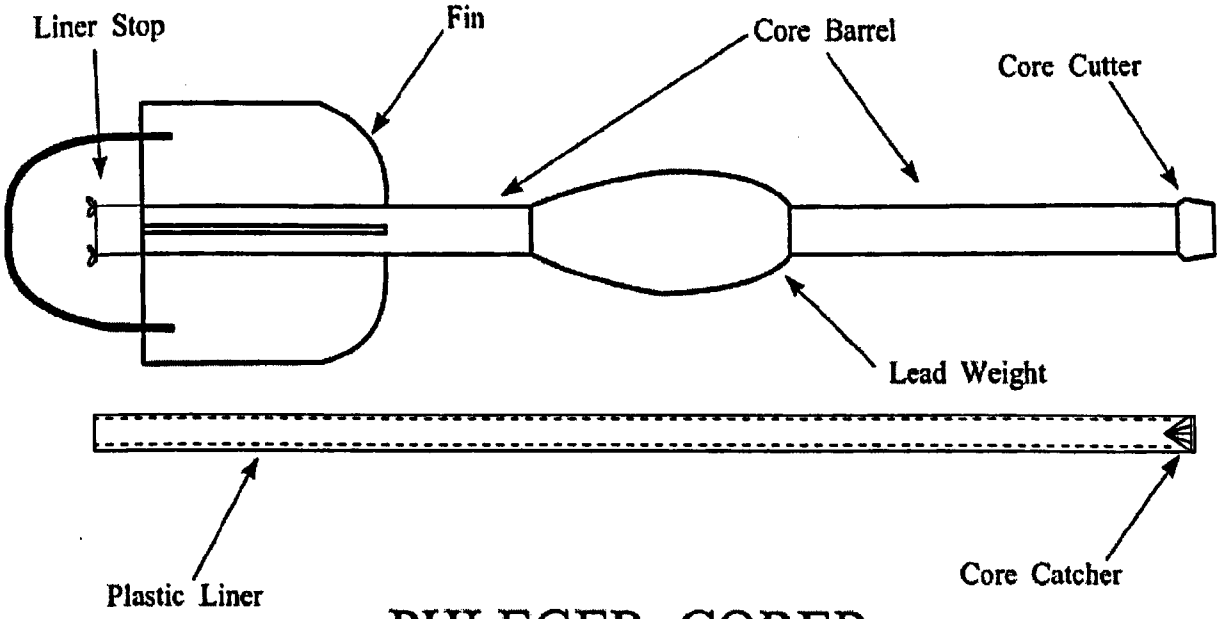
Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

Kahl Scientific Instrument Corporation
P.O. Box 1166
El Cajon CA 92022-11 USA
Phone 619-444-2159 **Fax** **URL**
Email kahl@kahlsico.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$1,590.00	$1,590.00	(March 2003) Includes sampler and 5 liners and caps



PHLEGER CORER

Sampler Type Piston (Core) **Name** Piston Corer

Number of Personnel Required 2 **Dimensions** Transport skid= 3x 0.6x0.8 m; Coring head= 1.5m (L)x0.5m (D) **to** Coring head= 2m (L) x 0.5m (D)

Weight (Kg) 11.3 **to** 1175

Volume (Liters) 40 **to** 390

General Description

A Piston Corer collects sediment samples up to 4 meters deep, using a stainless steel corer tube. The upper part of the corer is constructed of hot galvanized steel, with a stainless steel releaser mounted at the top of the device. Some piston corers can collect a 15.2-meter long samples.

Advantages:
- The distance of free fall can be adjusted to control depth and volume of sediment sample collected.
- The device is capable of collecting harder sediments than gravity corer.

Disadvantages:
- The sampler is best used for collecting soft cohesive sediments.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Operation

The corer tube is released 1.7 meters above the sediment. A wire with about 1 meter of slack allows the corer tube to free fall until the piston is activated prior to the tube entering the sediment. The penetration depth of the corer can be regulated by the total weight load. A piston rod is used to remove the sediment sample from the stainless steel corer.

Chemical and Physical Compatability

The sampler has a stainless steel frame and core tube (or plastic core tube). Stainless steel is compatible for organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments. Plastics are not preferred for sample collection of organic-contaminated sediments.

The sampler consists of a Lexan or stainless steel nose piece, with a stainless steel or plastic core catcher. Plastics are not preferred for use with organic contaminants, but are compatible with metals and other inorganic species.

The sample uses a PVC sample liner- PVC is not preferred for use with organic contaminated sediments, but is well suited for use with metals and other inorganic species contamination.

Training and Other Requirements

A boat with winch and crane systems is required for sampling operations. Proper training and licensing is required for boat operation during sample collection.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principles prior to using sampling equipment.

Manufacturer Information

Aquatic Research Instruments
P.O. Box 93
Lemhi ID 83465 USA
Phone 1-800-320-9482 **Fax** 208-756-8434 **URL** www.aquaticresearch.com
Email hydrobio@aol.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available

Manufacturer Information

EnviroEquip Pty Ltd.
Ground Floor, 16/380 Eastern Valley Way
Chatswood New South Wales 2067 Australia
Phone 02 9417 1513 **Fax** 02 9417 7669 **URL** www.enviroequip.com
Email sydney@enviroequip.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available

Manufacturer Information

KC Denmark
Holmbladsvej 19 - DK - 8600
Silkeborg Denmark
Phone +45 86828347 **Fax** +45 86824950 **URL** http://www.kc-denmark.dk/
Email kc@kc-denmark.dk

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$9,451.00	$9,451.00	(March 2003) Includes main rack, 5 weights, piston head, wire, and releaser

Manufacturer Information

Mooring Systems Inc.

PO Box 413 1227 Route 28 A

Cataumet MA 02534 USA

Phone 508-564-4770 Fax 508-564-4773 URL www.mooringsystems.com

Email msisales@mooringsystems.com

Cost Information

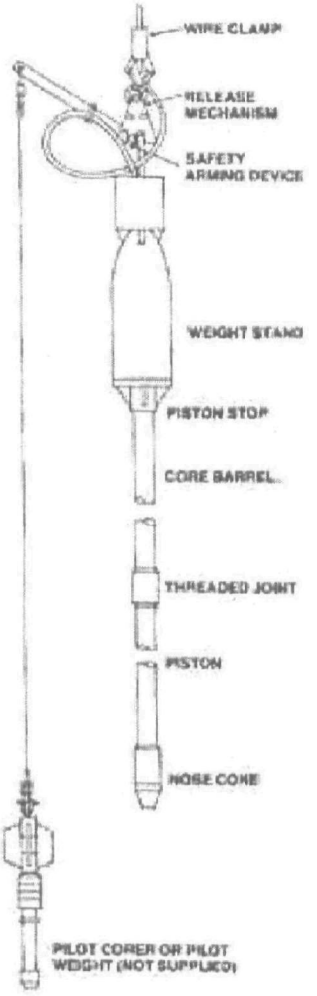
Base Cost Min	Base Cost Max	Cost Description
$9,665.00	$41,299.00	(March 2003) The minimum cost is for the Utility Piston Corer model; the maximum cost is for the Large Piston Corer model

Manufacturer Information

Seabed
Visseringstraat 10 1975 BR Ijmuiden
Denmark
Phone 00 31 (0) 255 53 **Fax** 00 31 (0) 255 533945 **URL** www.seabed.nl
Email seabed@seabed.nl

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$19,500.00	$19,500.00	(March 2003) Corer with trigger mechanism and trigger



PISTON CORER

Sampler Type Piston (Core) **Name** Piston Multi-Corer (eight sample tubes)

Number of Personnel Required 2 **Dimensions** Sample tubes: 0.1 m x 0.65 m; Frame: 1.4 m diameter x 1.4 m **to**

Weight (Kg) 300 **to**

Volume (Liters) 41 **to**

General Description

The Piston Multi-Corer is similar in operating principle to the Piston Corer, except that the tube sampler consists of eight acrylic sample tubes in a stainless steel frame. The device collects a large sample volume through the multiple sample collection tubes.

Advantages:
The sampler collects a large volume of sample.

Disadvantages:
The sampler is relatively heavy, and can be difficult to handle.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

Stainless steel frame- Stainless steel is compatible for organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

Acrylic core tubes- Plastics are not preferred for use with organic contaminants, but are compatible with metals and other inorganic species.

Do not use alcohol for cleaning acrylic parts.

Operation

The sampler is activated at a distance five meters below the surface of the water. Two of three no-load switches then need to be turned on for 30 seconds when the sampler reaches the sediment to be sampled in order to start the motor. The motor then pushes the lead screw, which pushes the core tubes into the sediment. When the maximum core penetration has been reached, the "catchers" close. The sampler is then retracted.

Training and Other Requirements

A boat with winch and crane is required for sampling operation. Proper training and licensing is required for boat operation during sample collection.

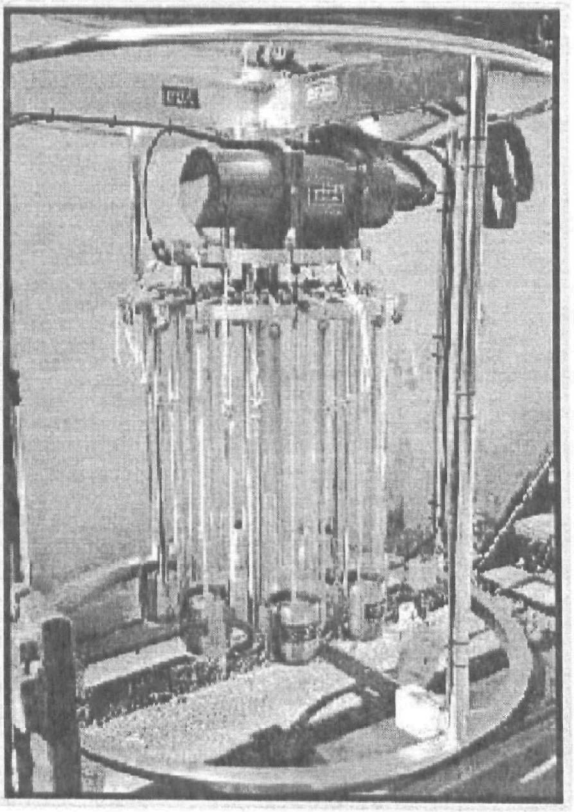
Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principles prior to using sampling equipment.

Manufacturer Information

Trident Sensors
1 Forestry Cottages, Fisher Lane
Chiddingfold Surrey GU8 4FT England (UK)
Phone +44 1428 682995 **Fax** +44 1428 684827 **URL** http://ourworld.compuserve.com/homepages/tridentsensors/
Email tridentsensors@btopenworld.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$51,814.92	$51,814.92	(March 2003) Piston multi-corer only



PISTON MULTI-CORER

Sampler Type Piston (Core) **Name** Piston-Type Bed Material Hand Sampler (USBMH-53)

Number of Personnel Required 1 **Dimensions** 5.1 cm O.D. x 20.3 cm length; 116.8 cm total with piston rod **to**

Weight (Kg) 3.4 **to**

Volume (Liters) 0.4 **to** 2

General Description

The Bed Material Hand Sampler is used to collect a sample from the bed of a shallow stream that may be waded. The sampler consists of a cylinder with a piston, which is pressed into the stream bed. The sampler has a stainless steel body with a brass piston.

Advantages:
- The device is effective for collection of most sediment types.
- Good sample recovery is generally obtained when using the device.

Disadvantages:
- Samples must be removed from core tube on site.
-The steel barrel of the sampler may cross contaminate sediment sample.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

The sampler has a stainless steel body with a brass piston. Stainless steel is compatible for use with organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments. Brass is not preferred for contaminated sediments because it can absorb analytes or react with samples, thus effecting analytical results.

Operation

The piston rod passes through the sampler frame. As the cylinder is pressed into the sediment, the piston is retracted. The suction created by the piston holds the sample in the cylinder. The sediment is pushed out of the cylinder by the piston to collect samples.

Training and Other Requirements

Minimal training is required.

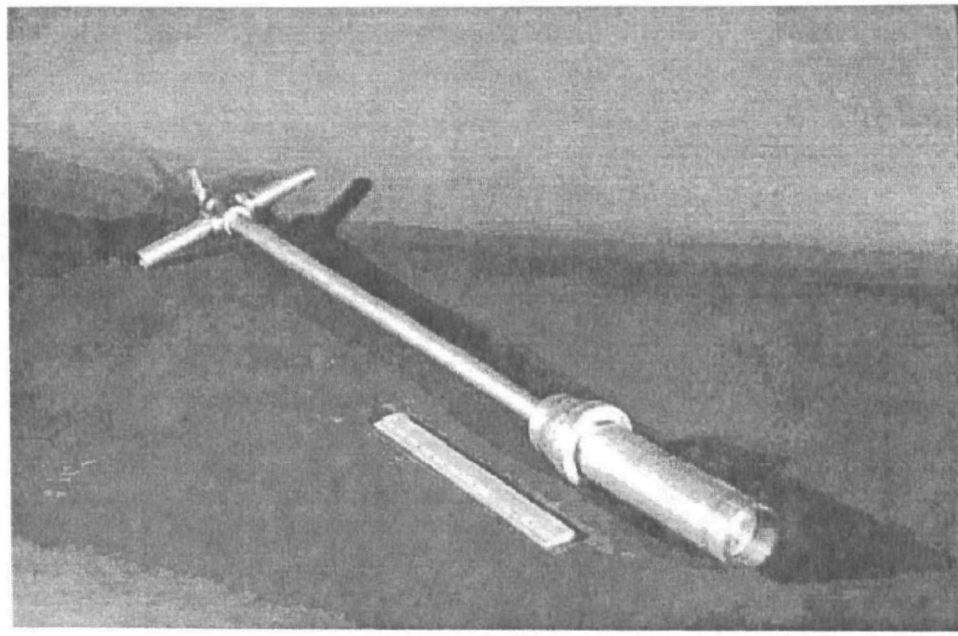
Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principles prior to using sampling equipment.

Manufacturer Information

Rickly Hydrological Company
1700 Joyce Avenue
Columbus OH 43219 USA
Phone 614-297-9877 **Fax** 614-297-9878 **URL** www.rickly.com
Email sales@rickly.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$385.00		(March 2003) Sampler only



PISTON-TYPE BED MATERIAL HAND SAMPLER

Sampler Type Clamshell Bucket (Grab) **Name** Ponar Grab

Number of Personnel Required 1 to 2 **Dimensions** 15.2 x 15.2 cm **to** 22.9 x22.9 cm

Weight (Kg) 10 **to** 22.7 **Volume (Liters)** 1 **to** 8.2

General Description

The Ponar Sampler is used in fresh and salt water to collect samples of hard sediments such as sand, gravel, consolidated silt or clay. The device is a deliberately heavy for biting deep into the bottom. Hinges and hinge pins can absorb thousands of bottom impacts.

The two types of Ponar grab samplers are (1) standard and (2) petite. The standard Ponar collects a larger volume of sample than the petite Ponar; however the construction is basically the same.

Advantages:
- This device can be used for most sediment types.
- A large sample volume can be collected with this sampler.
- This sampler is effective for coarse sediment collection.

Disadvantages:
- The device may not close completely.
- The metal frame of the sampler can cause cross contamination.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

Constructed of stainless steel and neoprene rubber. Stainless steel is compatible for organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

Neoprene rubber- Neoprene is compatible with most contaminants of concern.

Operation

The sampler possesses self-closing scoops that have a center pivot closing action. When the scoops strike the bottom, their tapered cutting edges penetrate with little sample disturbance. An attached under-lip clears the scoop of pebbles and cobble that may interfere with closing. Removable side plates prevent the lateral loss of sample as scoops close. The sampler uses a spring-loaded pin that releases when cable or line slackens.

Removable screens on top of each scoop allow water to flow through as it descends, diminishing the frontal shock wave and reduces surface disturbance. Both screens are covered with neoprene rubber flaps that close during retrieval.

Training and Other Requirements

A boat with winch is required for sample operations. Proper training and licensing is required for boat operation during sample collection.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

Duncan & Associates

Jeeves Bank Fernleigh Road

Grange-over-Sands Cumbria LA11 7H UK

Phone +44 (0) 15395 33 **Fax** +44 (0) 15395 34963 **URL** www.duncanandassociates.co.uk/

Email info@duncanand associates.co.uk

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available

Manufacturer Information

GENEQ
8047 Jarry East
Montreal QC H1J 1H6 USA
Phone 514-354-2511 **Fax** 514-354-6948 **URL**
Email info@geneq.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$450.00	$745.00	(March 2003) Minimum cost is for lightweight 6x6 inch ponar; maximum cost is for heavy weight 9x9 inch ponar.

Manufacturer Information

Halltech Environmental Inc.
129 Watson Road South
Guelph Ontario N1L 1E4 Canada
Phone 866-425-5832 **Fax** 519-766-0729 **URL** www.htex.com
Email sales@htex.com

Cost Information

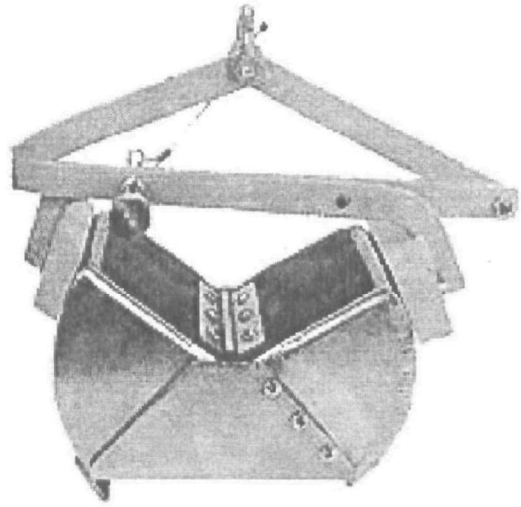
Base Cost Min	Base Cost Max	Cost Description
		Not available

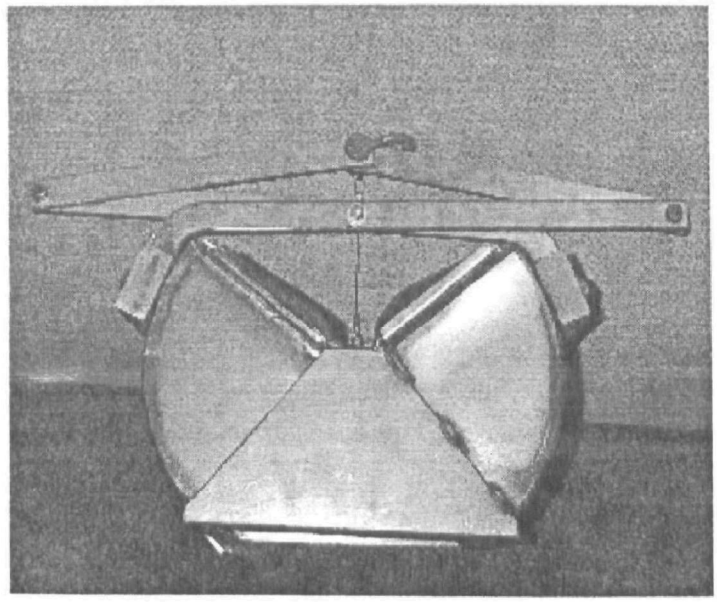
Manufacturer Information

Wildlife Supply Company (Wildco)
95 Botford Place
Buffalo NY 14216 USA
Phone 800-799-8301 **Fax** 800-799-8115 **URL** www.wildco.com
Email goto@wildco.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$699.00	$1,075.00	(March 2003) Minimum cost is for petite ponar; maximum cost is for standard ponar. Each cost includes all accessories.





PONAR SAMPLER

Sampler Type Manual Push (Core) **Name** Russian Peat Borer

Number of Personnel Required 1 **Dimensions** 5 cm O.D. x 50 cm in length **to** 7.5 cm O.D. x 75 cm in length

Weight (Kg) NA **to**

Volume (Liters) 1 **to** 3.3

General Description

The Russian Peat Borer is a side-filling, chambered-type sampling device consisting of a stainless steel tube equipped with a bottom point and cover plate that is sharpened and rotates inside the tube. It is capable of sampling from discrete intervals, and is operated using extension rods and a "T" handle.

Advantages:
- One operator can collect sediment samples.

Disadvantages:
- Sampler application is limited to shallow water applications only.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

The stainless steel construction of the device will not interfere with most contaminant measurements. Stainless steel is compatible for use with organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

Operation

The sampler is driven to the desired depth in the closed or sealed position. At the target depth, the "T" handle is turned clockwise 180 degrees, which causes the sharpened cover plate to rotate and cut and semi-cylindrical-shaped sediment sample, until the cover plate contacts the opposite side of the tube. The contained samples can then be recovered without risk of contamination from overlying material.

Training and Other Requirements

Minimal training is required.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principles prior to using sampling equipment.

Manufacturer Information

Aquatic Research Instruments
P.O. Box 93
Lemhi ID 83465 USA
Phone 1-800-320-9482 **Fax** 208-756-8434 **URL** www.aquaticresearch.com
Email hydrobio@aol.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$725.00		(March 2003) Includes sampler, "T" handle, 1.2 meters of extension rods,and carrying case.

Manufacturer Information

Duncan & Associates

Jeeves Bank Fernleigh Road

Grange-over-Sands Cumbria LA11 7H UK

Phone +44 (0) 15395 33 **Fax** +44 (0) 15395 34963 **URL** www.duncanandassociates.co.uk/

Email info@duncanand associates.co.uk

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available

Manufacturer Information

EnviroEquip Pty Ltd.
Ground Floor, 16/380 Eastern Valley Way
Chatswood New South Wales 2067 Australia
Phone 02 9417 1513 **Fax** 02 9417 7669 **URL** www.enviroequip.com
Email sydney@enviroequip.com

Cost Information

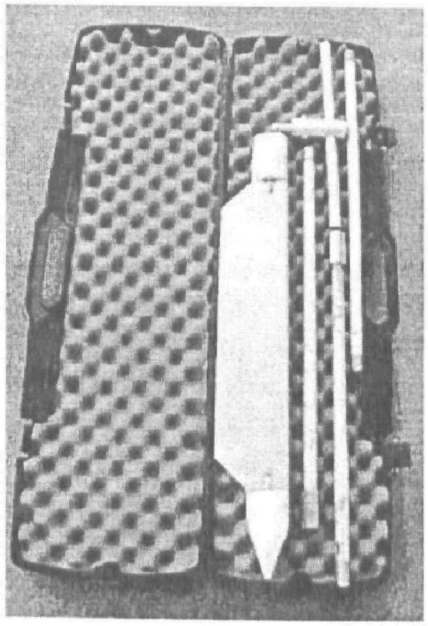
Base Cost Min	Base Cost Max	Cost Description
		Not available

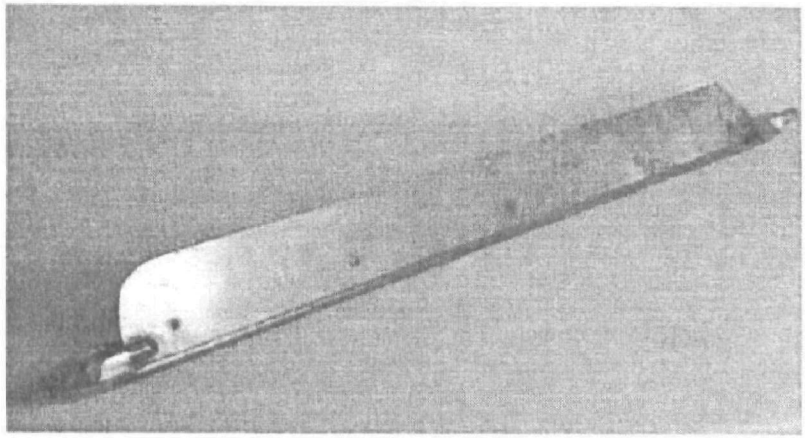
Manufacturer Information

Halltech Environmental Inc.
129 Watson Road South
Guelph Ontario N1L 1E4 Canada
Phone 866-425-5832 **Fax** 519-766-0729 **URL** www.htex.com
Email sales@htex.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available





RUSSIAN-TYPE BORER

Sampler Type Mechanical Trap (Grab) **Name** Underway Bottom Sampler (Scoopfish)

Number of Personnel Required 1 **Dimensions** 4.4 cm diameter., 38.1 cm length **to**

Weight (Kg) 5 **to**

Volume (Liters) 0.08 **to**

General Description

The Scoopfish is used for rapid collection of sequential sediment samples while traversing a water body by boat without stopping. The sampler can be attached to a hand line or oceanographic wire and allowed to free fall to depths of 200 meters. It is equipped with a fin tail to maintain alignment, and can collect samples of soft to hard sediments.

Advantages:
- The sampler allows for fairly rapid sample collection from a boat in motion.

Disadvantages:
- A relatively small sample volume is collected using this sampler.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

Stainless steel construction will not interfere with most contaminant measures. Stainless steel is compatible with organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

Operation

The device descends nose-downward and the open cup penetrates the sediment. Upon impact, the sediment forces the cup back into the body of the device and releases a spring-tensioned cover plate. The center of gravity shifts as the device is lifted, and it ascends nose-upward.

Training and Other Requirements

Boat operation may be required. Proper training is required for small boat operations.

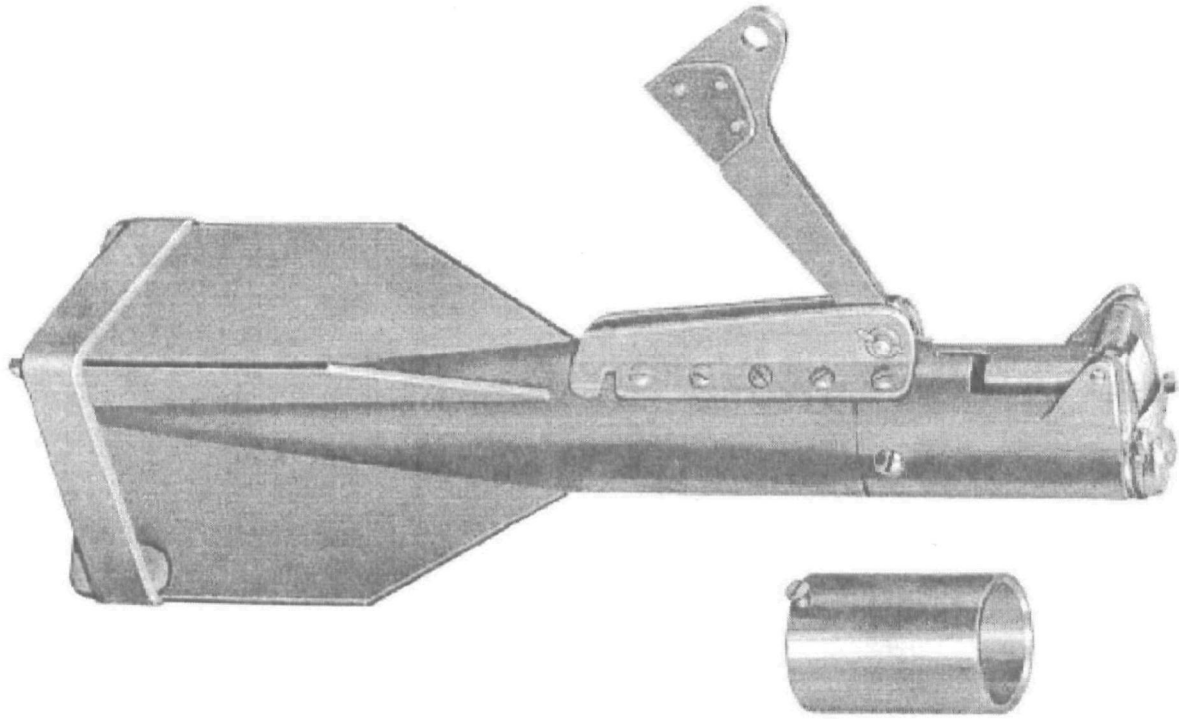
Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

Kahl Scientific Instrument Corporation
P.O. Box 1166
El Cajon CA 92022-11 USA
Phone 619-444-2159 **Fax** **URL**
Email kahl@kahlsico.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$1,760.00	$1,760.00	(March 2003) Underway bottom sampler (scoopfish) No. 214WA120



UNDERWATER BOTTOM SAMPLER (SCOOPFISH)

Sampler Type Mechanical Trap (Grab) **Name** Shipek Grab Sampler

Number of Personnel Required 1 or 2 **Dimensions** 10.2 x 15.2 x 15.2 cm **to** 47.2 x 63.8 x 44.2 cm

Weight (Kg) 5 **to** 61.2 **Volume (Liters)** 0.5 **to** 3

General Description

The Shipek Sampler is designed to sample unconsolidated sediments from deep lakes and near offshore. Maximum depth of penetration is approximately 10 cm.

The two types of Shipek grab samplers are the standard Shipek and the mini Shipek.

Advantages:
- The sample bucket opens to allow sub-sampling.
- The device effectively samples fine grained sediments.

Disadvantages:
- The metal frame may cause cross contamination
- The standard Shipek requires crane or winch for operation.
- The device may close prematurely.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

Mild or stainless steel; cast alloy steel- Mild steel and cast alloy steel is not preferred for contaminated sediments because it can absorb analytes or react with samples, thus effecting analytical results.

Stainless steel is compatible with organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

Operation

The sampling device consists of two concentric half cylinders, the outer of which is the sampler body. A cocking wrench is used for winding the torsion springs. A safety hook prevents premature release of the springs when held in the safety position. Cast into each end of the frame are stabilizing handles which, along with its weight, hold the sampler upright during descent.

Training and Other Requirements

Standard Shipek requires winch; mini Shipek can be deployed without a winch or crane.

A boat may be required for sampling operations. Proper training and licensing is required for boat operation during sample collection.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

Duncan & Associates

Jeeves Bank Fernleigh Road

Grange-over-Sands Cumbria LA11 7H UK

Phone +44 (0) 15395 33 **Fax** +44 (0) 15395 34963 **URL** www.duncanandassociates.co.uk/

Email info@duncanand associates.co.uk

Cost Information

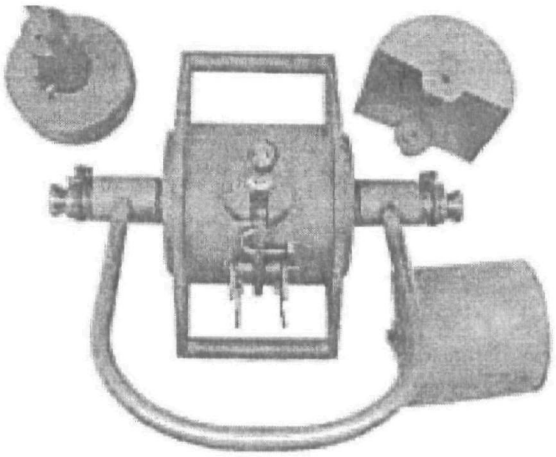
Base Cost Min	Base Cost Max	Cost Description
		Not available

Manufacturer Information

Wildlife Supply Company (Wildco)
95 Botford Place
Buffalo NY 14216 USA
Phone 800-799-8301 **Fax** 800-799-8115 **URL** www.wildco.com
Email goto@wildco.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$5,799.00	$6,594.00	(March 2003) Maximum cost includes extra sampler bucket



SHIPEK SAMPLER

Sampler Type Gravity Corer (Core) **Name** Slide-hammer corer

Number of Personnel Required 1-2 **Dimensions** Core tube inner diameter: 5 cm; Length: 1.25 m **to** Core tube inner diameter: 7.5 cm; Length: 1.25 m

Weight (Kg) 9.1 **to** 40.8

Volume (Liters) 2.2 **to**

General Description

The Slide Hammer assembly is constructed of aluminum, bronze, and stainless steel. The bronze hammer slides on a stainless steel rod. A weight is lifted and dropped to force the corer through hard sediments.

Advantages:
- The device is relatively light weight.
- The sampler is effective on hard substrates.

Disadvantages:
- This sampler may not be appropriate for sampling sediments with organic contamination.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

The sampler is constructed with a bronze slide hammer. Bronze is compatible for organic-contaminated sediments, but is not preferred for metals-contaminated sediments.

The sampler is also constructed with a stainless steel rod. Stainless steel is compatible for organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

The sampler also consists of a derlin and stainless steel core head, polycarbonate core tube and polyethylene end caps. Plastics are not preferred for use with organic-contaminated sediments, but are compatible for metals-contaminated sediments and sediments contaminated with other organic species.

Operation

The bronze slide hammer slides on a stainless steel rod, and is lifted and dropped to force the corer head through harder substrates.

The core head is constructed of derlin and stainless steel. During penetration into the sediment surface, water is passes through the core tube by a one-way check valve. The check valve prevents sediment loss during retrieval by creating a vacuum.

Penetration into the sediments is adjusted by changing the weight of the corer. The corer weight can be adjusted by adding or removing the 4 ballast rings (10 kg each) which slide tightly over the core head.

Training and Other Requirements

No specific training indicated by manufacturer.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

Aquatic Research Instruments
P.O. Box 93
Lemhi ID 83465 USA
Phone 1-800-320-9482 **Fax** 208-756-8434 **URL** www.aquaticresearch.com
Email hydrobio@aol.com

Cost Information

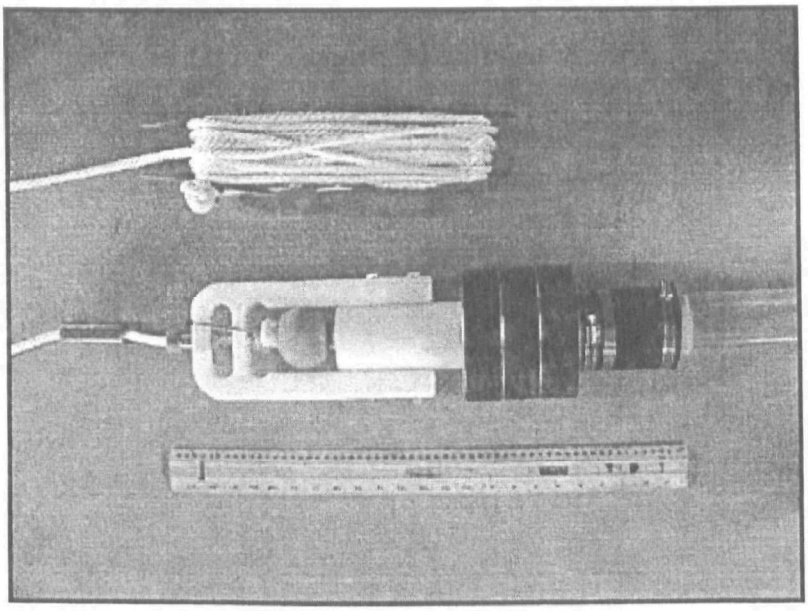
Base Cost Min	Base Cost Max	Cost Description
$633.00	$809.00	(March 2003) Minimum cost is for the 5 cm diameter model; the maximum cost is for the 7.5 cm diameter model.

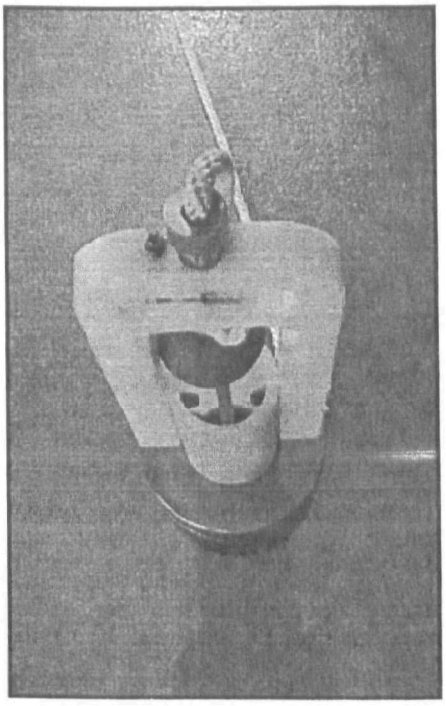
Manufacturer Information

Halltech Environmental Inc.
129 Watson Road South
Guelph Ontario N1L 1E4 Canada
Phone 866-425-5832 **Fax** 519-766-0729 **URL** www.htex.com
Email sales@htex.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available





SLIDE-HAMMER CORER

Sampler Type Clamshell Bucket (Grab) **Name** Smith-McIntyre Grab (also Day Grab)

Number of Personnel Required 2 **Dimensions** H = 60 cm, L = 70 cm, to W = 70 cm.

Weight (Kg) 40 **to** 100 **Volume (Liters)** 10 **to** 20

General Description

The Smith-McIntyre Grab Sampler is an automatic device that collects a bottom sediment sample upon contact with the ocean floor. The device can be used for sampling in either shallow or deep oceanic waters.

Advantages:
- The device has good leverage for sediments with hard substrates.

Disadvantages:
- The device may not be suitable for sampling sediments contaminated with metals.
- Sampling operations require multiple workers for deployment

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Operation

The sampler is mounted on a weighted steel frame, suspended from the lowering wire, with springs to force the two-jaw bucket into the sediment when released. Two tripping pads positioned below the square-based frame on which the bucket is suspended, make contact with the bottom first and are pushed upward to release two latches holding the spring-loaded bucket jaws.

A free-fall from approximately 10 meters above the sediment is sufficient for penetration of most substrates. Raising of the wire exerts tension on cables connected to the end of each bucket-jaw arm and causes the jaws to pivot shut. A removable frame, fitted with a 2.5 mm (0.062") aperture stainless-steel screen, is attached at the top of each jaw. During the lowering operation rubber flaps fastened to the screen frames lift to allow water to flow through the screens and minimize the shock wave disturbing the surface layers of the sediment. The rubber flaps cover the stainless-steel screens during the retrieval operation and prevent wash out of sediments.

Chemical and Physical Compatability

Stainless steel is compatible organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

Training and Other Requirements

A boat is required for sampling operations. Proper training and licensing is required for boat operation during sample collection.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

Duncan & Associates

Jeeves Bank Fernleigh Road

Grange-over-Sands Cumbria LA11 7H UK

Phone +44 (0) 15395 33 **Fax** +44 (0) 15395 34963 **URL** www.duncanandassociates.co.uk/

Email info@duncanand associates.co.uk

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available

Manufacturer Information

Kahl Scientific Instrument Corporation
P.O. Box 1166
El Cajon CA 92022-11 USA
Phone 619-444-2159 **Fax** **URL**
Email kahl@kahlsico.com

Cost Information

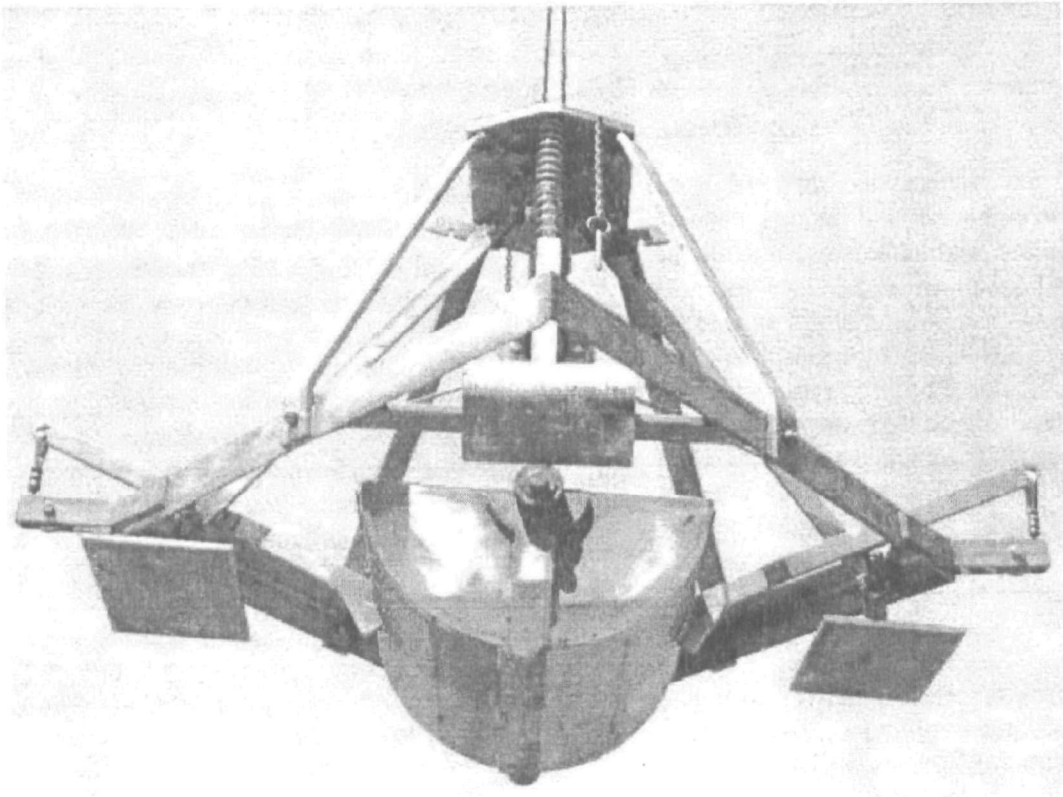
Base Cost Min	Base Cost Max	Cost Description
		Not available

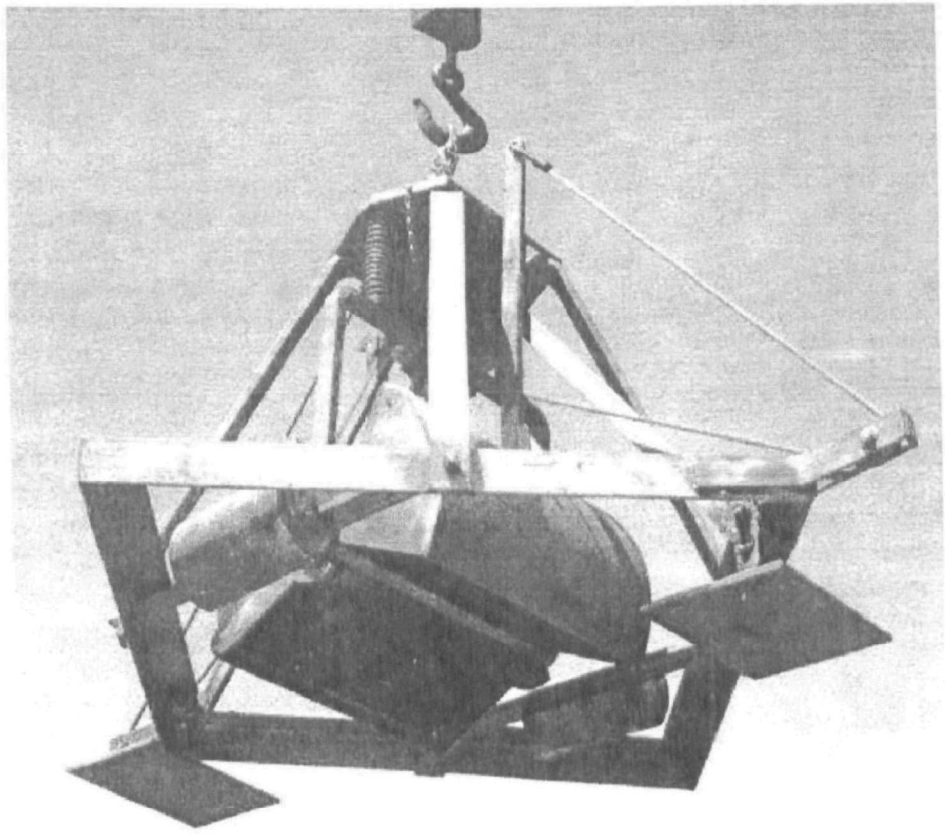
Manufacturer Information

KC Denmark
Holmbladsvej 19 - DK - 8600
Silkeborg Denmark
Phone +45 86828347 **Fax** +45 86824950 **URL** http://www.kc-denmark.dk/
Email kc@kc-denmark.dk

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$4,135.00	$4,135.00	(March 2003) KC Day Grab/Modified Smith and McIntyre.





SMITH-MCINTYRE SAMPLER

Sampler Category Grab

Sampler Type Manual Trap (Grab) **Name** Split Core Sampler

Number of Personnel Required 1 **Dimensions** 3.5 cm **to** 6.35 cm

Weight (Kg) 4.5 **to**

Volume (Liters) 0.05 **to** 2

General Description

The Split Core Sampler is an end-filling sampler designed to collect undisturbed sediment of to a maximum of 1.2 meters below the sediment surface. The sampler collects samples from the sediment surface downward, not at discrete depth intervals. Sampler components include one of more split core tubes, couplings for attachment to additional split core tubes, a ball check valve-vented top cap, a coring tip, one or more extension rods, and a cross handle. The components are manufactured from stainless steel, however carbon steel rods are also available. A retaining cylinder may also be used with the corer, which permits lengthwise opening of the unit for segmenting and storing the sample in a container for laboratory analysis.

The sampler can be purchased in dimensions from 3.5 to 6.4 cm in diameter with 15.2 cm and 30.5 cm depth reach, with extensions to reach a 1.2 meters sediment surface depth.

Advantages:
- Effective in nearly all sediment types
- Relative inexpensive

Disadvantages:
- Variable recovery

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

Based upon the sampler's material of construction and engineering design, the spilt core sample is sturdy. The sediment interface surface with the device is stainless steel. Stainless steel is compatible with organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments. The disposable acetate retaining cylinder provides for minimization of the risk of cross contamination, however, the plastic has the potential to cause interference with organic contaminant measurements of sediments.

Operation

To collect a sediment sample, the device is either manually pushed into the sediment using the cross handle or hammered into the sediment using a slide hammer or an electric hammer. The check valve in the closure of the tube permits water to exit the sampler during deployment and creates a vacuum to help retain the collected sediment core during sample retrieval. The sampler can be retrieved by hand, by reverse hammering using the slide-hammer, or by using a tripod-mounted winch. An electric hammer, which induces vibrations into the sampler can be selected to support this sampler when obtaining maximum recovery of sediment sample.

When used with the acetate core tube liner, the sampler does not require complete disassembly to extrude the sample and reassembly after the sampling event. The coring tip or top cap can be detached to permit removal of the core tube liner containing the sediment core.

Training and Other Requirements

The split core sampler is easy to operate.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principles prior to using sampling equipment.

Manufacturer Information

Arts Manufacturing and Supply Inc.
105 Harrison
American Falls Idaho 83211 USA
Phone 208-226-2017 **Fax** **URL** http://www.ams-samplers.com
Email

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$550.00	$660.00	(March 2003)

Manufacturer Information

Wildlife Supply Company (Wildco)
95 Botford Place
Buffalo NY 14216 USA
Phone 800-799-8301 **Fax** 800-799-8115 **URL** www.wildco.com
Email goto@wildco.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$269.00	$989.00	(March 2003) Minimum cost is for the hand corer with no liner; the maximum cost is for stainless steel model with liner

SPLIT CORE SAMPLER

Sampler Type Clamshell Bucket (Grab) **Name** Van Veen Grabs (when modified called Power Grab and Mo

Number of Personnel Required 2 or more **Dimensions** 35.1 cm x 70.1cm **to** 50 x 100 cm

Weight (Kg) 14.1 **to** 120 **Volume (Liters)** 8 **to** 75

General Description

The Van Veen Sampler comes in several sizes and is constructed of corrosion-protected or galvanized materials, or stainless steel. It can be used in surging or rough seas without premature closure. It is designed to descend vertically through strong underwater currents and collects samples without excessively disturbing the sediment.

Modified versions such as the Power Grab or the Modified Van Veen achieve deeper penetration and sample a larger surface area. Some modified samplers are also referred to as Ted-Young Modified Van Veen or Ted-Young sampler.

Advantages:
- Plastic sample liners are used to prevent cross contamination.
- The sampler is capable of sampling in most sediment types.
- A large, intact sample volume can be collected with this sampler.

Disadvantages:
- The sampler jaws may not completely close.
- The metal frame may cross contaminate samples.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Chemical and Physical Compatability

Type 316 stainless steel is used. Buckets may also be coated with Teflon to provide a more inert surface. May have neoprene flaps; zinc-plated steel chain. Stainless steel is compatible with organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments. The zinc-plated steel chain is not preferred for sampling contaminated sediment.

Teflon and neoprene is compatible with most contaminants of concern.

Operation

In using the Van Veen Sampler, as the lowering wire slackens, the hook on the release device rotates and the short suspension chains fall free. When the retrieved wire is slowly made taut, chains, attached at the top of the release, exert force on the lever arms, causing them to gradually lift. The upward movement of the arms causes the bucket to dig deeper into the sediment as it closes. After retrieval of the bucket, the sediment is released into a container.

Training and Other Requirements

A boat with winch and crane is required for sampling operations. Proper training and licensing is required for boat operation during sample collection.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

Duncan & Associates

Jeeves Bank Fernleigh Road

Grange-over-Sands Cumbria LA11 7H UK

Phone +44 (0) 15395 33 **Fax** +44 (0) 15395 34963 **URL** www.duncanandassociates.co.uk/

Email info@duncanand associates.co.uk

Cost Information

Base Cost Min	Base Cost Max	Cost Description
		Not available

Manufacturer Information

Kahl Scientific Instrument Corporation
P.O. Box 1166
El Cajon CA 92022-11 USA
Phone 619-444-2159 **Fax** **URL**
Email kahl@kahlsico.com

Cost Information

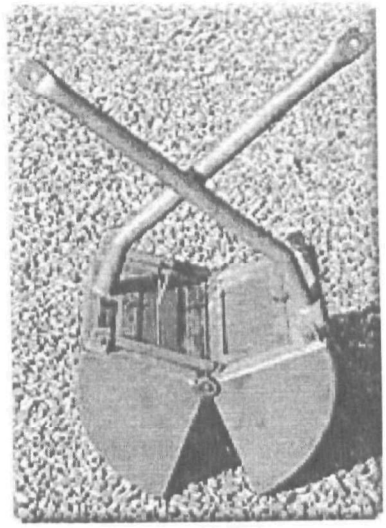
Base Cost Min	Base Cost Max	Cost Description
$952.00	$10,410.00	(March 2003) Minimum cost is for 250 square cm grab; Maximum cost is for a 75 liter grab sampler.

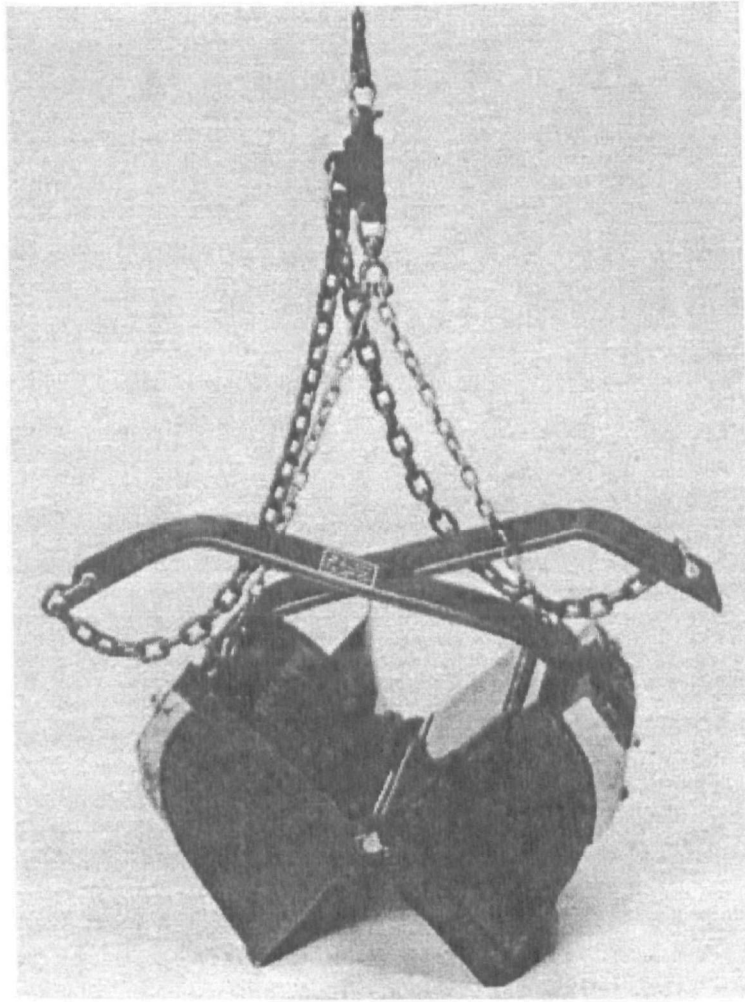
Manufacturer Information

Wildlife Supply Company (Wildco)
95 Botford Place
Buffalo NY 14216 USA
Phone 800-799-8301 **Fax** 800-799-8115 **URL** www.wildco.com
Email goto@wildco.com

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$1,995.00	$1,995.00	(March 2003) Includes sampler only





VAN VEEN SAMPLER

Sampler Type Mechanical Oscillati (Core) **Name** Vibracore

Number of Personnel Required 2 or mor **Dimensions** Inner diameter: 5.1 cm.; Length: 102 cm. **to** Inner diameter: 7.6 cm.; length: 12.7 m.

Weight (Kg) 45.4 **to** 136

Volume (Liters) 1.4 **to** 37.7

General Description

The vibracore Sampler is designed to collect sediment samples from lakes, bays, and estuaries. The device is constructed of stainless steel and uses a PVC core tubes. The device is powered by a portable generator.

Several models available, including VT-1c,P-3c, P-5c, and VT-6. The manufacturer states that these samplers differ in terms of portability, mode of vibration, force, power requirements and depth rating.

VT-1c: Its thin non-armored electro-cable can be handled without mechanical means to an approximate depth of about 150 m (495 feet). A Kevlar-jacketed cable is recommended beyond this depth. The VT-1 operates at a range near "resonant-drive", and in a "vibro-torsional" mode. The high-speed contra-rotating vibrators are positioned along the same axis rather than in parallel.
A buoyant frame can be used to sample sediments in deep waters.

Advantages:
- Generally a good sample recovery can be obtained from the sampler.
- The vibracore can penetrate to nearly 13 meters to collect sediment samples.

Disadvantages:
- The sampler is only effective in collecting soft sediments.
- The device is most effective in low energy environments.
- The device may require underwater assembly.

The use of core collection devices for sampling typically causes compression and/or compaction of sediments.

A wash out of fine grains in the sampled surface sediment can occur, resulting from water column bow wave induced during the decent of the sampling device.

Operation

The vibracorer is designed to obtain cylindrical cores in soft, cohesive sediments to depths of up to 150 meters.

The unit is placed on the floor of the water body, and then the electrical vibration head is activated to drive the core-barrel containing the PVC core-liner into the seafloor. The stationary piston system assists in the intrusion of sediment into the barrel with minimum disturbance. After recovery of the vibration unit the core can be rotated to a horizontal position to facilitate the removal of the liner with the sample. The slide indicator enables you to check the achieved penetration depth.

Chemical and Physical Compatability

The sampler possesses a stainless steel frame and corer. Stainless steel is compatible for organic-contaminated sediments, but is not the preferred choice for metals-contaminated sediments.

PVC core tubes can be used for sampling operations- Plastics are not preferred for use with organic-contaminated sediments, but are compatible for metals-contaminated sediments and sediments contaminated with other organic species.

Training and Other Requirements

Requires a boat with winch and crane. Proper training and licensing is required for boat operation during sample collection.

May require under water assembly by divers.

Sample collection personnel should review all manufacturer's operating instructions and have an understanding of sampler operating principals prior to using sampling equipment.

Manufacturer Information

ROSSFELDER CORPORATION
PO Box 1030
Poway CA 92074-10 USA
Phone 858-679-7361 **Fax** 858-679-7491 **URL** www.rossfelder.com/
Email

Cost Information

Base Cost Min	Base Cost Max	Cost Description
$21,000.00	$41,800.00	(March 2003) Minimum cost is for the VT-1 model; the maximum cost is for the P5c and VT-6 models. Cost includes sampler only, no additional parts.

Manufacturer Information

Seabed

Visseringstraat 10 1975 BR Ijmuiden

Denmark

Phone 00 31 (0) 255 53 **Fax** 00 31 (0) 255 533945 **URL** www.seabed.nl

Email seabed@seabed.nl

Cost Information

Base Cost Min	Base Cost Max	Cost Description
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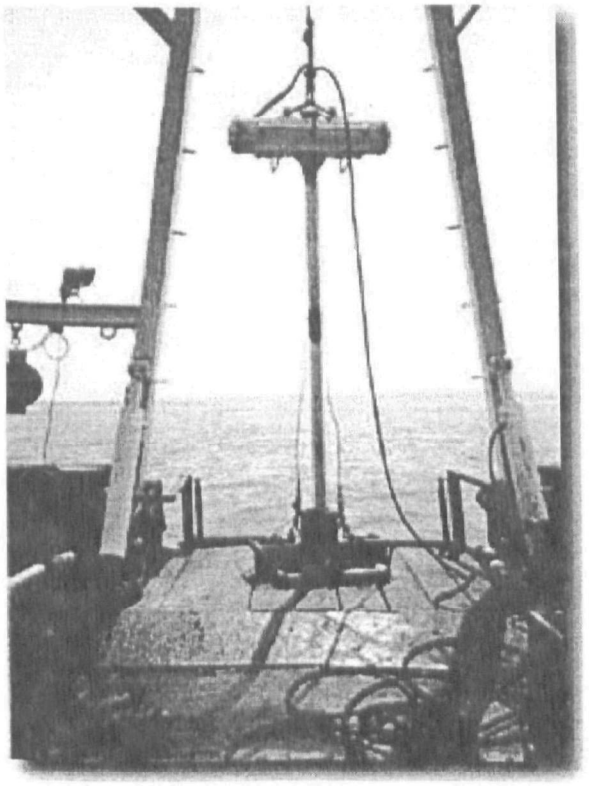

VIBRACORER