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# OCCURRENCE OF *RANGIA CUNEATA* GRAY AND *CRASSOSTREA VIRGINICA* (GMELIN) IN SABINE LAKE, TEXAS-LOUISIANA[1]

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Sabine Lake, a lake estuary (Kane, 1959), is situated in the extreme southeastern corner of Texas and the southwestern corner of Louisiana. The northern boundary of the lake is approximately at lat. 29° 59′ N.; the southern at lat. 29° 45′ N.; the eastern at long. 93° 45′ W.; the western at long. 93° 57′ W.

Field observations and cores to a maximum depth of 9 feet indicate that *Rangia cuneata* Gray, an estuarine genus (Ladd, 1951), occurs in Sabine Lake, mainly north of lat 29° 50′ N. This species apparently occupies the fresher water portion of Sabine and could serve as an index type to this part of the lake. *Rangia* shells are usually scattered throughout the sediments and do not necessarily show any tendency to form reeflike masses. The pattern of core-spacing, however, was too widespread to delineate the geometry of *Rangia* occurrence.

The same data indicate that *Crassostrea virginica* (Gmelin), the common edible oyster, occurs singly or as reefs in Sabine Lake south of lat. 29° 50′ N. This species which apparently is typical of the more saline part of the lake could serve as an index type to this portion of the lake. One large reef of *Crassostrea virginica* (Gmelin) is located along the Louisiana shoreline between Blue Buck Point and Garrison Ridge and another along the Texas shoreline approximately opposite Blue Buck Point. The pattern of core-spacing did not permit delineation of the reef geometry.

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[1] Manuscript received November 28, 1960.

## REFERENCES

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LADD, H. S., 1951, Brackish-water and marine assemblages of the Texas coast, with special reference to mollusks: Pubs. of the Inst. of Marine Sci., Texas Univ., v. 2, no. 1, p. 136.

# THE FREE-CORER: SEDIMENT SAMPLING WITHOUT WIRE AND WINCH[1]

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The free-corer is a simple, inexpensive bottom sediment coring device intended to eliminate the necessity of wire line lowering of gravity corers. The free-corer consists of two basic assemblies: (1) a recoverable core barrel, check valve, buoyant chamber assembly, and (2) an expendable weight and casing assembly. When these two assemblies are combined, the core barrel fits loosely inside of the casing. Operation of the free-corer is accomplished by dropping the device from the ship and allowing it to fall free through the water column to the sea floor. A simple release-delay timer then releases the core barrel and its buoyant float from the weight-casing assembly; the barrel is then lifted up out of the casing and back to the surface by its attached float while the expendable weight-casing remains embedded in the sediments (fig. 1).

[1] Manuscript received November 7, 1960.

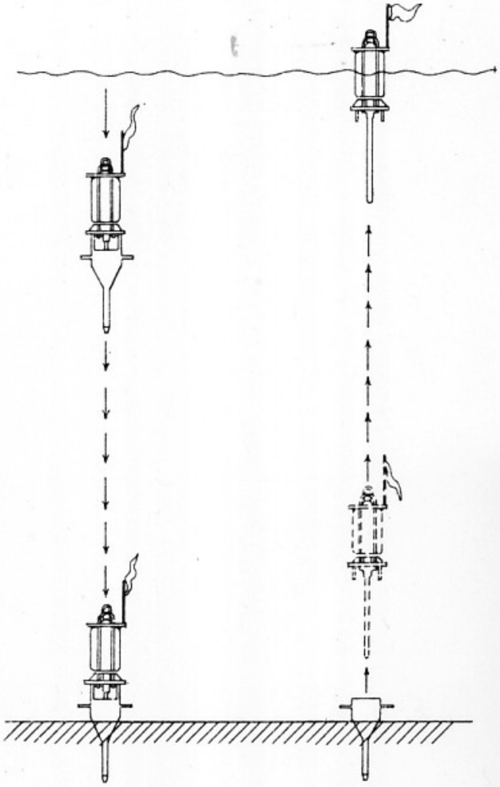

FIG. 1.—Stages in operation of free-corer.

The potential usefulness of a free-coring instrument has long been apparent and the use of recoverable free instrument vehicles (Isaacs and Schick, 1960) has recently been demonstrated as a reliable technique. However, no practical method of extracting a core barrel after it has become firmly embedded in bottom sediment has previously been suggested. This paper is intended to introduce a practical system of overcoming the extraction problem. The system consists of abandoning a casing and weight in the bottom and thereby allowing the encased sediment filled core barrel to break free at its tip and float up out of the embedded casing with only a small excess buoyancy. This process requires no complicated working parts or large buoyant tanks; therefore the entire assembly can be relatively small, easy to handle, and inexpensive.

The free-corer system has been tested at sea with three operational drops using a prototype corer which was assembled mainly to test the effectiveness of the expendable casing idea and was not engineered for optimum core recovery. Two drops were made in San Diego Bay in ten fathoms of water so that divers could observe the attitude of the embedded corer and note any possible flaws in the release process. These shallow drops recovered short silty sand cores, 18 and 60 cm in length. The inherent hydrodynamic stability of the free-corer was well demonstrated in these tests in which the corer was rolled off the edge of the boat on its side and was able to right itself and fall vertically true almost within

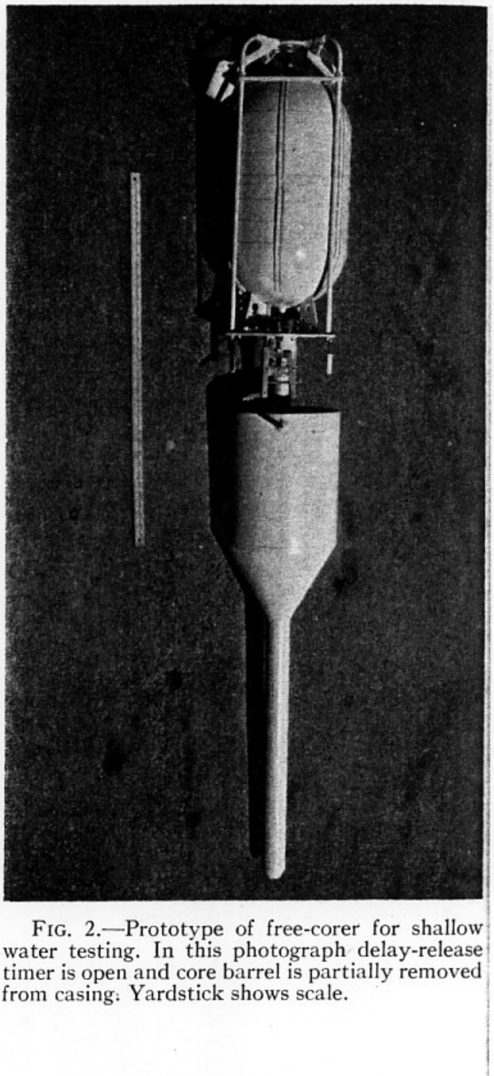

FIG. 2.—Prototype of free-corer for shallow water testing. In this photograph delay-release timer is open and core barrel is partially removed from casing. Yardstick shows scale.

its own length. This stability, which is necessary to insure a vertical attitude on bottom contact, is the result of the forces of the buoyant tank pulling upward while the weight-casing unit exerts a stronger downward force.

The prototype free-corer used in these tests was made from the valve, barrel, and plastic barrel liner of a standard 1-$\frac{3}{8}$ inch gravity corer. An air-filled low pressure oxygen bottle was attached to serve as a buoyant tank (fig. 2). The weight-casing

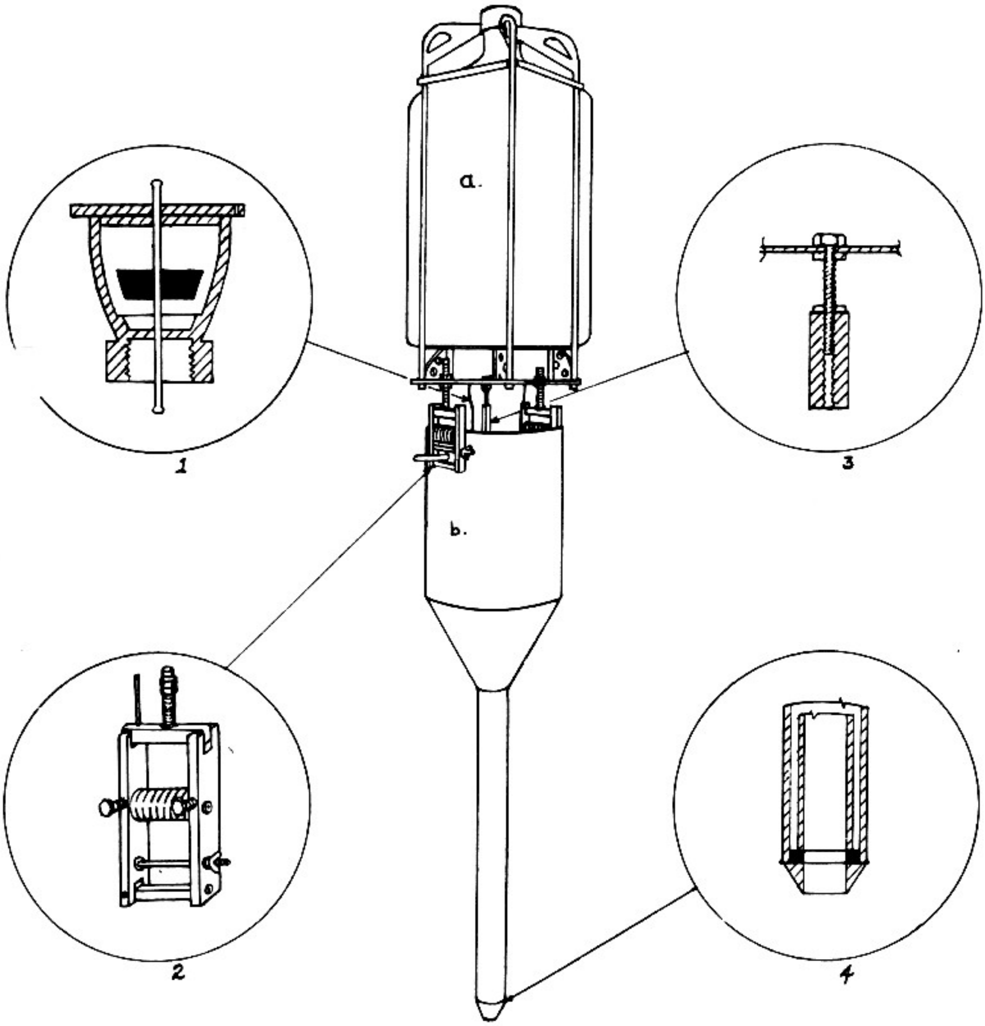


FIG. 3.—Diagram of free-corer with polyethylene bottle (a) which, when filled with gasoline, acts as pressure-proof buoyant chamber. Core barrel attached to buoyant chamber fits loosely inside of expendable weight-casing (b). Circles show details of corer parts: 1. check valve helps prevent loss of core; 2. Van Dorn release-delay timer; magnesium rod, inside of spring coils, holds spring compressed. Wing nut is backed off before lowering to allow latch on lower end of timer to fall open when magnesium r[illegible] naps at prearranged time as a result of galvanic action. Size of rod determines time delay; 3. three [illegible] nuts, as shown here, are adjusted against concrete weight to give rigidity to corer; 4. detail of casing shoe which is tack-welded to bottom of casing; inside diameter of shoe is like that of core barrel shown seated on rubber washer.

unit was a heavy gauge steel pipe with a concrete weight cast around it. Clearance between the barrel and casing, when the two units were combined, was about $\frac{3}{16}$ in. A machined casing shoe was tack-welded to the base of the casing to act as a core cutter and to seat the core barrel inside the casing. A Van Dorn (1953) marine release-delay timer was used to secure the two units together. Threaded spacers were attached to the base plate of the buoyant chamber which were adjustable to seat against the concrete weight and give rigidity to the assembled corer for handling (fig. 3).

The last of the initial test drops was made in 700 fathoms of water off San Diego. The free-corer dropped at a rate of about two fathoms per second, as determined by echo sounder readings, and returned to the surface 18 minutes after drop time with a sandy silt core about 50 cm long. For this deep test, the air filled tank was replaced with a 13 gallon polyethylene bottle filled with gasoline. This gave an ample excess buoyancy of about 30 pounds to the recoverable unit of the corer. In the greatest depths of the oceans the gasoline filled bottle would lose only about 10 percent of its buoyancy as a result of compression and contraction of the gasoline from pressure and cold. The compliancy of the polyethylene bottle easily tolerates this volume change. Thus there is no depth limitation to the use of the free-corer.

The principal problem associated with the use of the free-corer will be the location and recovery of the returned floating core. In water 5000 fathoms deep, for example, the travel time of the corer to the bottom and back will be about two hours. This will allow the ship to drift off the release point for what might be a considerable distance and also permit the corer to be exposed to current action for this period of time. For this reason a small drogue or dye marker is needed to mark the drop position and minimize the effect of wind drift. A flag of high visibility fabric which was attached to the free-corer in the 700 fathom drop off San Diego made the float visible as soon as it surfaced. A small Navy liferaft radar reflector used by Isaacs and Schick (1960) on their free instrument vehicle provided contact to 4 miles by radar.

Operational use of a free-corer is planned for the near future in geological studies to be made by the Sea Floor Studies Section of the Navy Electronics Laboratory. The corer will be used from surface vessels to obtain closely spaced deep-sea cores in which the distance between cores will be accurately known from drop positions. With the free-coring technique it is practical to take a series rather than a single deep-sea core inasmuch as the travel time of any individual core will be great compared to the drop time of the series. It is impossible to obtain a series of closely spaced cores of known relative positions from abyssal depths using wire line lowering.

It is planned to use the free-corer as a sampling system in connection with bathyscaph operations to be conducted by this Laboratory. The corer will be released magnetically and will return to the surface after the submerged bathyscaph has moved to another location. The floating barrel will then be recovered by the surface tender.

Because the free-corer does not require a winch and heavy cable, it can be used from almost any type of boat. It is believed that this will prove to be exceptionally valuable to smaller marine institutions which are unable to afford oceanographic vessels equipped with large deep-sea winches. With the introduction of the free-corer the way is open for a more detailed areal study of deep-sea sediments, and a wider participation of small institutions in deep-sea programs.

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