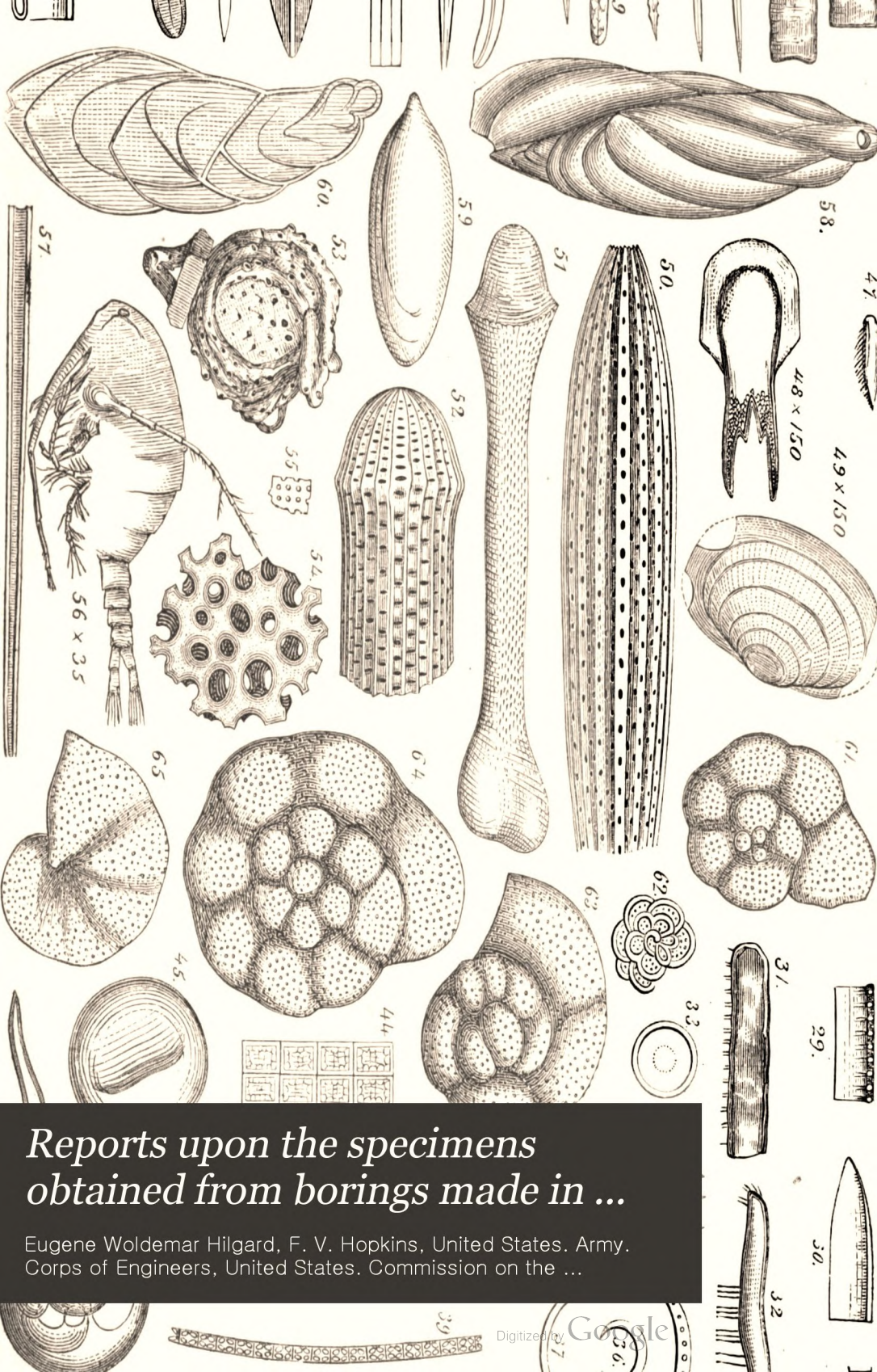


Reports upon the specimens obtained from borings made in ...

Eugene Woldemar Hilgard, F. V. Hopkins, United States. Army. Corps of Engineers, United States. Commission on the ...

ENGINEER DEPARTMENT, U. S. ARMY.

RECLAMATION OF THE ALLUVIAL BASIN OF THE MISSISSIPPI RIVER.

REPORTS

UPON THE

SPECIMENS OBTAINED FROM BORINGS MADE IN 1874 BETWEEN THE MISSISSIPPI RIVER AND LAKE BORGNE, AT THE SITE PROPOSED FOR AN OUTLET FOR FLOOD WATERS,

BY

PROF. EUGENE W. HILGARD

AND

DR. F. V. HOPKINS.

WITH A

LETTER OF TRANSMITTAL FROM BVT. MAJ. GENERAL G. K. WARREN, MAJOR OF ENGINEERS, PRESIDENT OF THE COMMISSION.

BEING A

SUPPLEMENT TO THE REPORT OF THE COMMISSION OF ENGINEERS OF JANUARY 16, 1875.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1878.

OFFICE OF THE CHIEF OF ENGINEERS,
Washington, D. C., February 21, 1878.

SIR: Maj. G. K. Warren, Corps of Engineers, president of the board of commissioners appointed to investigate and report a permanent plan for the reclamation of the alluvial basin of the Mississippi River subject to inundation, has transmitted to this office a report by Prof. Eugene W. Hilgard and Dr. F. V. Hopkins upon the specimens obtained from borings made in 1874, by direction of the commission, between the Mississippi River and Lake Borgne.

The report was intended to accompany my annual report for 1877, but the illustrations were not ready in time.

The report is a valuable contribution to our knowledge of the formation of the delta of the Mississippi, and the description and classification of the specimens obtained have a scientific value making it desirable that it should be printed without delay.

I would therefore recommend that it be printed at the Government Printing Office, and that 1,500 copies be obtained on the usual department requisition.

Very respectfully, your obedient servant,

A. A. HUMPHREYS,
Brigadier-General and Chief of Engineers.

Hon. GEO. W. MCCRARY,
Secretary of War.

LETTER OF TRANSMITTAL.

ENGINEER OFFICE, UNITED STATES ARMY,
Newport, R. I., November 28, 1876.

GENERAL: I have the honor to transmit herewith a report made by Prof. Eugene W. Hilgard in accordance with a resolution adopted by the Commission of Engineers appointed "to investigate and report a permanent plan for reclamation of the alluvial basin of the Mississippi subject to inundation," of which commission I was president. This resolution was passed on the 15th of January, 1875, the second day before adjourning *sine die*, as will be seen by referring to the printed record of the proceedings accompanying the report of the commission, H. Ex. Doc. No. 127, Forty-third Congress, second session, and republished in the annual report of the Chief of Engineers for 1875. It it as follows:

"*Resolved*, That the president of the commission be authorized to transmit the specimens obtained from the borings made under the direction of the commission, at the site of the proposed outlet to Lake Borgne, to Prof. E. W. Hilgard, at Ann Arbor, Mich., for investigation and report; and that an amount not exceeding $400 be set apart from the appropriation for the expenses of the commission to pay for the work.

"*Resolved also*, That Professor Hilgard s report, when completed, be sent to the Chief of Engineers, United States Army, and the final disposition of the specimens be left with that officer."

This report is a valuable contribution to our knowledge of the formation of the delta of the Mississippi, besides the aid it affords us in considering the question of making an outlet for the Mississippi floods between the river and Lake Borgne. Its practical importance in the further consideration of the question of a ship-canal is very considerable, by increasing our reliable information as to the character of the material the canal must be excavated in, and its capability to sustain the weight of suitable locks. Dr. Hopkins says that the specimens show no obstacle to the successful prosecution of excavating a canal prism at this locality; and as the formation near Fort Saint Philip, where the canal would be most desirable, is similar to that where the borings were made, we have reason to expect similar favorable conditions there.

The special report of the survey which furnished these borings will be found in Appendix B to the report of the Commission of Engineers already referred to in this communication.

These reports of Professor Hilgard and Dr. Hopkins have a scientific value which alone justifies their being published in good style.

The specimens were divided into two parcels by Professor Hilgard, one part of which he took with him to California, where he was compelled to go for the benefit of his health, and where he has also specimens of borings made at other places in the Mississippi delta reserved for future comparisons. I would respectfully suggest leaving what he has with him, and sending the others to New Orleans to be deposited there for future reference. The resolution of the commission placed them, however, at your disposal, which, if different from what I suggest, will doubtless be for the better.

Very respectfully,

G. K. WARREN,
Major of Engineers and Bvt. Maj. Gen. U. S. A.

Bvt. Maj. Gen. A. A. HUMPHREYS,
Brigadier-General and Chief of Engineers, United States Army.

REPORT OF PROF. EUGENE W. HILGARD.

UNIVERSITY OF CALIFORNIA,
Berkeley, November 10, 1876.

DEAR SIR: I submit herewith my report of the examination of the specimens collected from the borings made in 1874, between the Mississippi River and Lake Borgne, under the superintendence of Prof. C. G. Forshey, by order of the United States Delta Commission.

These specimens, referred to me by your order, reached me at Ann Arbor, Mich., in February, 1875. As I was then preparing to change my residence to this place, it was thought best not to risk the whole set of specimens on so long a journey. I therefore took samples, amounting to about one-third of the originals, in such a manner as to insure a fair average of each. In a few cases, where it seemed necessary to examine a larger bulk, the larger portion was taken, and the smaller specimen, together with the remaining originals, returned to your custody.

A few of the original (10 ounce) bottles were broken when the set reached me, but in no case was the specimen altogether lost. The set of samples taken by me reached here uninjured.

Unfortunately (as stated to you at the time) the condition of my eyes was such as to preclude microscopic work; but I had reason to anticipate a speedy recovery from the disorder by a change of climate. In this hope I have been disappointed. I found that the identification of the non-microscopic organisms would be quite as much as my eyes could resist, and was fortunate in obtaining the assistance of my former co-worker, Dr. F. V. Hopkins, late of the University of Louisiana, and for several years in charge of the geological survey of that State. Already familiar with the general problem as well as with the materials to be examined, and an expert microscopist and draughtsman, Dr. Hopkins has, I feel assured, accomplished at least all that it would have been in my power to do in the matter of specific determinations, and more in furnishing drawings of the objects, which may serve for future identification. With the conscientiousness of a true scientist, he has furnished the facts themselves, instead of straining them to adapt them to received names, which are but too often as yet based upon partial and hasty observation, and a desire to add another name, however meaningless, to the confused heap of microscopic nomenclature.

The classification of the upper strata is of course based exclusively upon the microscopic characters; while among the marine stages, the larger fossils have in a measure served for distinction, or rather perhaps for identification, in cases where mere differences of material carried with them a correspondingly greater difference of the microscopic than of the larger fossils. Thus the finer sand of the off-shore portions of stratum 4 would, on the basis of microscopic organisms alone, have been classed as a different stratum, had not the absolute identity of the larger fossils forbidden a separation.

The following appendices accompany my report as a part thereof:

Appendix No. 1. Abstract of record of borings.

Appendix No. 2. Report of Dr. F. V. Hopkins on the microscopic examination of the specimens.

Appendix No. 3. Detailed record of the examination of specimens.

Appendix No. 4. List of microscopic organisms, with two plates. By Dr. F. V. Hopkins.

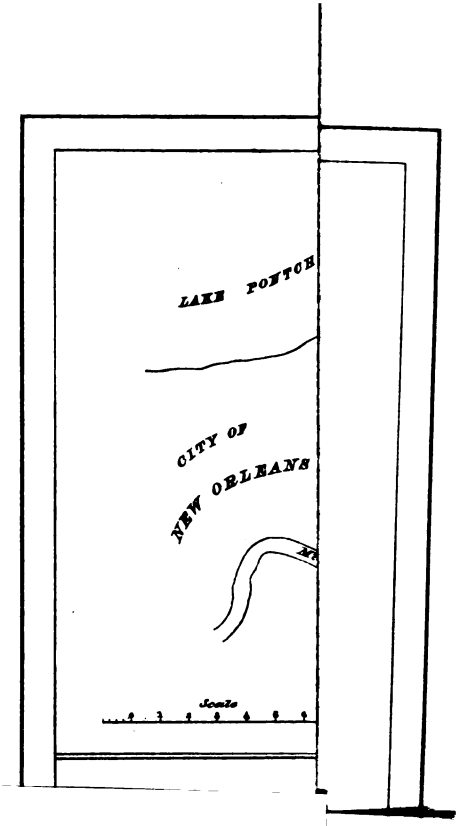
Appendix No. 5. Synoptical table of the larger organisms, and notes on fossils, with one plate. By E. W. Hilgard.

All of which is respectfully submitted.

Very respectfully, your obedient servant,

EUG. W. HILGARD.

Bvt. Maj. Gen. G. K. WARREN,
President of Commission of Engineers, &c.



REPORT.

The ground on which the borings were made (see map) is the neck of land lying between the Mississippi River and Lake Borgne, about 7 miles below the city of New Orleans, and fronting on a portion of what is known as the "English Turn" of the river. The area embracing the borings is of a trapezoidal shape, with a frontage of 6,000 feet on the river and 14,500 on the lake shore, which here trends about N. 12° W., while the course of the river is nearly S. E. Nearly from the points of nearest approach of river and lake (28,200 feet) a line of four borings (Nos. 1, 8, 9, and 14) runs across, bearing about E. 2° N., and forming the southerly limit of exploration; while the northward one is formed by a line about 34,000 feet long, bearing due northeast. Within the trapezoid thus circumscribed, fourteen bore-holes were driven. Of these, the first eight form two rows parallel to the river; one (Nos. 1 to 4,) close to the river bank, borings 2,000 feet apart, on surface about 7 feet above Lake Borgne; the second (Nos. 5 to 8), about 7,500 feet from the river, on ground about two feet above tide, and the bore-holes about 2,500 feet apart. All these lie on the alluvial land of the river, which is partly under cultivation, partly unreclaimed cypress swamp. Of the remaining six bore-holes, one (No. 9) lies near the line between the cypress swamp land and the "Marsh prairie" bordering on the shore of the lake, and varying in width, on the tract here concerned, from one to about four miles; while the rest (Nos. 10 to 14) are located in the sea-marsh, Nos. 12 to 14 being on the lake shore itself, at tide level. Nos. 9 to 11 are in a line trending N. 7° E., and over a mile apart; No. 9 is 7,500 feet from the nearest of the first set of borings (No. 8).

The borings were made by driving down a 2-inch gas-pipe, sharpened at its lower end. Specimens were taken in removing the core by means of a carpenter's spiral auger, whenever the driving indicated a change of material, and ordinarily every five feet or thereabouts; but the specimens were not always preserved separately, unless a change of character seemed to render it desirable. There is therefore in many cases a possible error (inside of five feet) in the depths at which a change of material occured, since such change was not in every case sufficiently obvious to the unassisted senses. On the whole, there is a remarkably close correspondence between the changes of strata as recorded by the boring party and those determined in the microscopic examination of specimens; showing accurate observation in the field, and rendering the results doubly trustworthy and valuable.

As a consequence of the mode of boring and taking specimens, it was not to be expected that the larger fossils should come up in a favorable condition for identification. The shells being mostly in a comparatively fresh state, the larger and firmer ones would be forced out of the way in driving, or, if broken, small fragments only could find their way into the core, to be subsequently cut or ground again by the carpenter's auger. In the latter process especially the smaller and more fragile shells that could readily enter the pipes whole, would almost inevitably be broken or crushed. Thus the task of identification was rendered much more difficult than was the case in my examination of the shells

of the New Orleans artesian well of 1856 (Annual Report Chief of Engineers, United States Army, 1870), and but for the clew to the general facies of the fauna furnished by that investigation, and the fortunate circumstance of my having the original material still in my possession, the present list of species identified with certainty must have been materially smaller. But a few recognizable forms remain undetermined, and may hereafter be identified. For much assistance and valuable suggestions in this connection, based upon personal observation in the imperfectly explored region of the Gulf of Mexico, I am indebted to R. E. C. Stearns, esq., secretary of the University of California, whose contributions to conchological science are well known.

In the examination of specimens containing shell fragments, the material was first, if necessary, disintegrated by boiling with water; then thrown on a sieve whose meshes were a little less than 0.4 mm. in diameter, and the finer material washed through by means of a stream of distilled water. The "larger organisms" thus remaining on the sieve, together with the coarser portion of sand, concretions, &c., were then examined with the lens or microscope, as occasion might require. The examination for properly microscopic organisms (by Dr. Hopkins) had usually preceded this manipulation, so that the possibility of error from contamination in the boiling and sifting process was avoided. Regarding the method pursued by Dr. Hopkins in the investigation of the microscopic characters and organisms, I refer to that gentleman's report. (See Appendix No. II.)

I owe to Dr. Hopkins the suggestion of presenting the general results of our joint investigation in the convenient form of a "perspective section," showing at a glance both the location of the bore-holes and the relation of the strata observed. A cursory inspection of the reference-table shows, in the alternation and recurrence of the fresh-water, fluvio-marine, and marine facies, that the borings have mainly remained within the limits of what might be accounted delta-deposits, though with a rapid increase of the marine character as we descend. In the well profiles the eye discovers at once four leading stages, to which the rest appear to be subordinate, viz, the *marine sand*, No. 4; the *blue fluvio-marine clay*, No. 8; the *cypress-swamp clay*, No. 11, on the river side; and the *sea-marsh clay*, No. 12, extending from the lake shore.

The numbering of the strata adopted by Dr. Hopkins must not, of course, be accepted in the usual sense of absolute succession in every case; nor even must the same number be considered as necessarily implying a continuity of the stratum, or absolute contemporaneousness. Thin sheets like stratum 3 are not at all likely to be continuous over a large area, but it is very probable that a similarity of general conditions at a particular time induced a a deposition of similar materials, not necessarily at the same absolute level, nor in any direct connection. Again, while stratum No. 7 underlies No. 8, in boring 7 it might nevertheless be found overlying a portion of the same bed in the area lying between borings 7 and 8. But while this is possible as regards the subordinate strata, the succession of the principal ones—Nos. 1, 4, 8, and 11 and 12—could not be conceived as being otherwise than represented.

No. 4, usually a light-colored, greenish or drab, micaceous sand, sometimes almost free from clay, at others quite clayey, is exclusively marine, save in so far as it often contains vegetable remains, which, of course, may readily float out so far as to be inclosed in off-shore deposits. These are mostly somewhat rounded by attrition, as is likewise often the case with the shells and a portion of the sand grains. In a few cases we seem to have before us a true beach sand. This stratum is reached at

depths varying from 57 to 72 feet, and is usually from 20 to 30 feet in thickness. Near the lake shore its surface, like that of the other strata in the same region, is remarkably level (52 to 56 feet), while near the river it has a more undulating surface, and is quite variable in thickness. It is undoubtedly identical with the stratum reached at 41 feet at the New Orleans well of 1856 (a profile of which, with signs to correspond, accompanies the perspective section), being altogether similar in its fauna and general nature, but on the whole evidently deposited farther from shore, and more clayey, so as to form in some instances a sandy clay. Such, doubtless, is the stratum marked "No. 5" by Hopkins, in boring No. 12, which is in all respects similar to that marked "4[1]" in boring 9. Smaller layers of such clayey material seem to occur with frequency, since lumps of sandy clay are not uncommonly mixed with the sand specimens of No. 4.

Stratum 3, a rather pure and very compact clay band underlying No. 4 in borings 5, 6, 7, and 8, is likewise represented in the New Orleans well, at 82.5 feet. Like stratum No. 2, presently to be discussed, it contains a fair representation of the larger marine organisms, while the microscopic ones are almost exclusively of a fresh-water facies.

Stratum No. 2, a whitish-drab or locally bluish, rather fine sand or silt, occurring beneath the clay No. 3, in borings 5 and 7, recalls at once similar materials found in the New Orleans well in a corresponding position, especially from 90 to 108 feet. It would doubtless also have been reached in Nos. 6 and 8, had the boring proceeded farther. That notwithstanding its considerable thickness of over twenty feet in boring 5, and of 27 in the New Orleans well, it is but a local feature, is apparent from its non-occurrence in the contiguous rows of borings, where the sand No. 4 is directly underlaid by the floor stratum, No. 1. Indeed, the most natural interpretation suggested by the mode of occurrence of this bed No. 2 is, that it represents the bed of an ancient current flowing between mud flats, as the eastward passes of the Mississippi do to-day.

Bed No. 1, which doubtless corresponds to the 34-foot clay stratum of the New Orleans well, reached there at 112 feet, occurs at from 91 to 97 feet depth in borings 1, 3, 4, and 9, and has not been passed through in any of the present series. It is mostly of a leaden blue or brownish tint, usually quite sandy, and contains abundance of marine shells and marine microscopic organisms.

It will be remembered that below this clay bed I was unable to find any deposit of a fluvio-marine or fresh-water character, in my investigations of the New Orleans artesian boring.

Stratum No. 8, as a rule directly overlying the marine sand No. 4, represents with its subordinate beds Nos. 6, 7, 9, and 10, the deposit of a tide-water marsh, whose surface vegetation prevented the carrying inland of the "larger organisms," while allowing of pretty extensive intermingling of marine and fresh-water microscopic forms, the latter of course increasing landward. That this marsh was traversed by streams carrying fresh water, is indicated by the presence of the minor sandy beds, of which one (No. 7) proves by its thickness, the coarseness of its materials, and its immediate superincumbence to the marine sand (No. 4), that a local current of considerable velocity flowed there for a not inconsiderable length of time. The channel seems to have been finally silted up, and simultaneously somewhat deflected from its course, so as to spread out and deposit the finer materials of stratum 9; ultimately, the current becoming more and more slack, the formation of the clayey sand No. 10 initiated the period of the cypress-swamp deposit No. 11, which still continues to be formed at every overflow of the river, by the

back water. During the deposition of No. 9, and part of 10, the same tide-water marsh continued to cover the rest of the area, as is shown by the level of its deposit in borings 7 and 10. That the surface of stratum 8 has, subsequently to its deposition, been subjected to partial denudation, is apparent from the comparison of its levels in borings 1 and 2.

Stratum No. 6 evidently represents a marine lagoon or inlet which continued to have a deeper connecting channel, so as to allow of the existence, or mechanical sweeping into it by the tides, of the larger marine organisms.

Strata 11 and 12 are still in process of formation: the fact that in boring No. 9, 12 overlies 11, proves that at one period in the past the cypress swamp extended farther out than is the case at present. Similar cases are historically known along the Gulf coast, and are sometimes very prominently demonstrated by the appearance of cypress stumps at and beyond the water's edge. Only a part of these, however, can be referred to as late a period as that of the cypress-swamp alluvium now in progress of formation, as is abundantly manifest from the outcrops at Port Hudson, on Wolf River, Mississippi, and at the five islands on Vermilion Bay.* But whether stratum 8 of the Lake Borgne borings shall be accounted as belonging to the same age, or merely as an older portion of the modern cypress swamp stratum, is a question for the final determination of which the data are thus far inadequate.

THE "BLUE DELTA CLAY."

Dr. Hopkins' investigation of the microscopic character of the strata of dark-colored, brown or blue clays occurring in the borings, throws some welcome light on the vexed question of the "blue delta clay" which is found almost everywhere in the delta and coast region of Louisiana and Mississippi.

In regard to this I have heretofore maintained, on the basis of stratigraphical and partly of palæontological characters, that these clays may be referred substantially to two different epochs, viz. the lower and more continuous and compact strata, to the time at which a slow depression of the southern coasts at least, converted the Lower Mississippi Valley into a swamp or marsh through which the continental waters found their way without any definite main channel representing the Mississippi River of to-day; while there is another class, the same as now in progress of formation, which represent either the cypress-swamp and marsh deposits, or the very peculiar feature of the mud-lumps, which cause the great river to push out its "passes" into the Gulf in a manner wholly without parallel in any other delta of the world. It has heretofore been surmised that even the city of New Orleans might not be above the landward limit of the mud-lump formation. As regards the distinction of the older from the more recent clays, I have held that in most cases it must be determined by stratigraphical and hypsometrical data, since it was not reasonably supposable that there should be much difference in the palæontological or lithological features.

On the question of the mud-lump nature of the clay underlying New Orleans, the microscopic investigation of stratum 11 is quite conclusive. There is no analogy whatsoever between the mud-lump clays examined by me and Mr. Hopkins, and those of stratum 11, all of which contained a large proportion of marine organisms, and the purely fresh-water material examined by Mr. Hopkins. The city undoubtedly stands on a cypress-swamp clay, at least to a depth of about twenty feet.

* Smithsonian Misc. Coll. No. 142, pp. 1 & 2.

It is not usually very difficult for a practised eye to distinguish a sea-marsh clay from the cypress-swamp deposit; and resort to the microscope will always promptly settle the question. But Dr. Hopkins has shown the interesting fact that there is such a marked difference between the microscopic organisms of the ancient and modern sea-marsh (No. 8 and No. 12), that even these can probably be hereafter distinguished with considerable certainty by the aid of the microscope. The following table shows the chiefly important microscopic fossils of the two deposits:

STRATUM NO. 8.

Orbulina universa.
Rotalia, 2 sp.
Grammostomum Americanum.
Grammostomum, sp.
Lenticulum discus.
Rosalina Beccarii.
Campylodiscus, sp.
Melosira distans.
Melosira, 3 sp.
Navicula Gundleri.
Navicula, 2 sp.
Cocconeis, sp.
Pinnularia viridis.
Pleurosigma, 2 sp.
Eunotia gibberula.
Fragillaria capucina.
Fragillaria, 2 sp.
Cocconema lanceolatum.
Triceratium, sp.
Cyclotella punctata.
Coscinodiscus radiatus.
Synedra acuta.
Closterium, sp.
Leptocistinema Kinahani.
Spongolithis acicularis.
Sp. mesogongyla.
Spongolithis sp.
Lithostylidium denticulatum.
Lithostylidium quadratum.

STRATUM NO. 12.

Orbulina universa.
Rotalia pachypleura.
Rotalia, sp.
Planulina elegans.
Globigerina, sp.,
Campylodiscus sp.
Melosira distans.
Navicula viridis.
Navicula fulva.
Fragillaria, sp.
Cocconema lanceolatum.
Rhizosolenia, sp.
Nitzschia, sp.
Cyclotella, sp.
Synedra acuta.
Synedra, sp.
Spongolithis aspera.
Spongolithis inflexa.
Spongolithis acicularis.
Lithostylidium denticulatum.
Lithostylidium crispum.
Lithostylidium quadratum.

A comparison of the detailed record of Dr. Hopkins' observations (Appendix III) will show that the difference shown in this table, together with some lithological ones, runs very fairly through the whole of the specimens examined.

It would, of course, require observations from other points to determine that this difference is a consistent one over large areas, and can be relied upon. Stratum 8 may be a true delta deposit of the present Mississippi, such as it has been since the re-elevation of the continent which determined the erosion of the present trough of the river. The fact that an apparently fluviatile stratum (No. 2) occurs lower down, may be taken as an indication that both Nos. 2 and 4 fall within the modern period of delta formation. Yet it is not to be supposed that during the period of depression some definite channels, such as that indicated by strata Nos. 2 and 7, did not exist here as well as in the region above, at Port Hudson (Smithsonian Contr. No. 248, p. 5), and elsewhere. But in a "drowned" delta in course of depression, such channels would, on the whole, be smaller, shallower, and more shifting than during the period of elevation, or the quiescent one that now prevails.

On the other hand, stratum No. 8 might be regarded as the denuded remnant of a much thicker stratum deposited during the period of depression, and therefore sensibly contemporaneous with the "Port Hudson clay." If, as seems probable, it extends to seaward beneath the

waters of Lake Borgne, it is difficult to conceive it otherwise than as the continuation of the "blue-clay bottom" of Mississippi Sound, about whose antiquity, and connection with the Port Hudson beds proper, there can scarcely be a question. But until actual examination shall have determined these points, and especially the microscopic similarity of the "blue-clay bottom" to stratum 8, speculation as to how the latter came to occupy its present position can hardly lead to any useful conclusions.

It was not, of course, to be expected that borings reaching only to a depth not greater than that sometimes attained by the Mississippi River itself, should throw any direct light on the question of the depth of the delta deposits in the upper delta plain. Yet, in so far as the results of the present investigation corroborate the steady and rapid increase of the marine character as we descend, as well as an appreciable difference of the fauna from that now ordinarily thrown ashore on the delta beaches, they tend to corroborate also my previous conclusion that the delta deposits proper, at least at and above New Orleans, have a comparatively inconsiderable thickness; and that this anomalous structure of the delta of the great river is in direct causal connection with the equally anomalous phenomenon of the mud-lumps.

APPENDIX I.

ABSTRACT OF RECORD OF BORINGS.

Boring No. 1.

(*On river front.*)

	0.	Black soil.
11.	5.	Stiff brown clay.
	10.	Same, more sandy.
	15.	Sandy clay.
	20.	Same.
	25.	Same, with wood chips.
	30.	Do. do.
	35.	Do. do.
8.	40.	Do.
	45.	Do.
	50.	Do.
	55.	Do., harder.
	60.	Pure blue clay.
	65.	Do.
	70.	Do. to 73 feet.
	75.	Quicksand, with fine shells.
	80.	Sand and shells.
4.	85.	Do.
	90.	Do. to 95 feet.
	95.	Blue clay, like first stratum.
1.	100.	Blue clay, as above.

Boring No. 2.

(*On river front,* 2,000 *feet from No.*

	0.	Black soil.
	5.	Sandy.
	10.	Yellowish-brown clay.
	15.	Do.
11.	20.	Blue clay, slightly sandy.
	25.	Do.
	30.	Do.
	35.	Do.
	40.	Do.
	45.	Do., gas jet burning 2 feet high .
	50.	Do.
8.	55.	Do.
	60.	Do.
	65.	Do. to 68 feet.
	70.	Sand and shells.
4.	75.	Do.
	80.	Do. to 82 feet.
	85.	

BORING No. 3.

(*Said to be highest point on river front.*

	0.	Light sandy soil.
	5.	Do.
	10.	Do.
11.	15.	Yellow clayey sand.
	20.	Same, much less sandy.
	25.	Blue clay, no sand, cypress chips.
	30.	Same.
	35.	Sand and mud, bluish.
	40.	Same, more clay.
	45.	Soft blue clay, very slightly sandy.
8.	50.	Same as above.
	55.	Do.
	60.	Do.
	65.	Do.
	70.	Same to 72 feet, strong jet of combustible gas.
	75.	Fine quicksand.
	80.	Do.
4.	85.	Do., with shells.
	90.	Do.
	95.	Do. to 97 feet, thence to
1.	100.	Blue clay.

BORING No. 4.

(*River front.*)

	0.	Stiff, black clay soil.
	5.	Dark-brown mud.
11.	10.	Brown mud, very sticky.
	15.	Same.
	20.	Blue clay, with little sand, wood chips.
	25.	Same as above.
	30.	Do.
	35.	Blue clay, very sandy, with wood chips.
8.	40.	Same, some water.
	45.	Do.
	50.	Do.
	55.	Same, less sandy.
	60.	Blue clay to 64 feet.
	65.	Quicksand.
	70.	Bluish-gray quicksand.
	75.	Do.
4.	80.	Do.
	85.	Do.
	90.	Do. to 91 feet.
1.	95.	Blue clay, with shells.
	100.	Do.

BORING No. 5.

(*In cypress swamp* 7,000 *feet from river, northwest end of second tier.*)

	0.	Black surface soil.
	5.	Light-brown mud, soft.
11.	10.	Same, with wood chips.
	15.	Blue mud, sandy, and chips.
	20.	Do.
10.	25.	Do., driving harder.
	30.	Quicksand, with chips.
	35.	Do.
9.	40.	Do. to 45 feet.
	45.	Blue clay, some sand.
8.	50.	Same to 53 feet.
	55.	Blue clay, harder, to 57 feet.
	60.	Quicksand, with shells.
4.	65.	Do. do.
	70.	Do. to 72 feet.
3.	75.	White soapstone clay to 78 feet.
	80.	White and red sand.
	85.	Do.
2.	90.	Do.
	95.	Do., with fine shells, not separable.
	100.	Continues same.

BORING No. 6.

(*In cypress swamp* 2,500 *feet southeast of No.* 5, *in second tier.*)

	0.	Black surface soil.
11.	5.	Soft brown mud and chips.
	10.	Same, with sand.
10.	15.	Same to 20 feet.
	20.	Gray and black quicksand.
	25.	Do.
9.	30.	Do.
	35.	Do. to 40 feet.
	40.	Same material, more clayey.
	45.	Do. to 50 feet.
8.	50.	Blue clay.
	55.	Same to 59 feet.
	60.	Quicksand, with shells.
	65.	Do.
4.	70.	Do. to 72 feet.
	75.	Quicksand, very fine.
	80.	Same to 81 feet.
3.	85.	Blue clay, driving hard.

BORING No. 7.

(*In cypress swamp* 3,000 *feet southeast from No.* 6, *in second tier.*)

	0.	Black swamp mud.
	5.	Stiff, blue clay.
11.	10.	Do., more sandy.
	15.	Do.
	20.	Do.
8.	25.	Do., sand increasing.
	30.	Do., with much coarse sand.
	35.	Coarse sand only.
	40.	Do., dark-gray tint.
	45.	Coarse sand as above.
	50.	Do.
7.	55.	Do.
	60.	Do.
	65.	Do., hard.
	70.	Same to 72 feet, then indications of blue clay.
4.	75.	Fine sand and shells, with some clay.
	80.	Do.
3.	85.	Same to 87 feet, then blue clay to 88 feet.
	90.	White sand, with little clay, and shells.
2.	95.	Do.
	100.	Same as above.

BORING No. 8.

(*In cypress swamp,* 2,500 *feet southeast of No.* 7, *southeast end of second tier.*)]

	0.	Stiff black cane soil.
	5.	Dark clay, little sand.
	10.	Do. do.
	15.	Same to 17 feet.
11.	20.	Blue clay.
	25.	Same, more sandy.
	30.	Do.
	35.	Do., less sand.
	40.	Blue clay.
	45.	Do.
8.	50.	Do.
	55.	Do.
	60.	Same, sand increasing, to 63 feet.
	65.	Quicksand, with fine shells.
4.	70.	Do. do.
	75.	Same to 77 feet.
3.	80.	Blue clay and shells.

BORING No. 9.

In cypress swamp, 15,000 feet from river front.

0. Soft mud, dark brown.
12. 5. Same to 10 feet.
10. Fine blue clay.
15. Do., with root chips.
20. Same to 24 feet.
25. Coarse gray sand.
30. Do.
35. Do.
40. Sand and clay mixed.
45. Do. do. to 50 feet.
2. 50. Blue clay.
55. Do.
60. Same clay to 64 feet.
4. 65. Sand, stones from log, and shells.
70. Same to 73 feet.
4. 75. Blue clay and shells to 80 feet.
80. Sand and blue clay, shells.
4. 85. Do. do.
90. Same to 91 feet.
1. 95. Blue clay.
100. Same.

BORING No. 10.

(In marsh prairie, bank of bayou, one mile from lake shore.)

0. Dark swamp mud.
12. 5. Same, bluish.
10. Same, and blue mud.
15. Blue mud.
20. Do.
2. 25. Do.
30. Do.
35. Do.
40. Do.
45. Do.
6. 50. Do. to 55 feet.
55. Gray sand and shells, with little clay.
4. 60. Do. do.
65. Do. do.
70. Do. do.

BORING No. 11.

(In marsh prairie, 1.76 mile from lake shore.)

0. Brown mud soil, with cane.
5. Same.
12. 10. Do.
15. Do.
20. Do., and rootlets.
25. Do. to 30 feet.
30. Blue mud.
35. Do. to 40 feet.
8. 40. Blue clay.
45. Do.
50. Do. to 52.
55. Gray sand and shells.
4. 60. Do. do.
65. Do. do.
70. Do. do.

BORING No. 12.

(*On lake shore, in line with Nos.* 5 *and* 11.

	0.	Soil, wet and sticky.
	5.	Brown mud, with matted roots.
12.	10.	Do.
	15.	Do.
	20.	Do.
	25.	Do. to 26 feet.
	30.	Blue clay mud.
	35.	Same to 40 feet.
8.	40.	Blue clay.
	45.	Do.
	50.	Do. to 55 feet.
	55.	Sand and shells, with some clay.
5.	60.	Do. do.
	65.	Do. do.
	70.	Do. do. to 71 feet.

BORING No. 13.

(*Lake shore, mouth of Bayou Chaperon.*)

	0.	Soft wet mud.
	5.	Same, dark colored.
12.	10.	Do.
	15.	Do.
	20.	Do.
	25.	Do., harder.
	30.	Same, with blue clay.
	35.	Do. do.
8.	40.	Blue clay.
	45.	Stiff blue clay.
	50.	Do.
	55.	Same to 56 feet.
4.	60.	Sand, with little blue clay.
	65.	Same, with shells, to 69 feet.

BORING No. 14.

(*On lake shore, in line with Nos*, 1, 8, *and* 9.)

	0.	Surface very wet, soft mud.
	5.	Soft dark mud.
12.	10.	Do.
	15.	Do.
	20.	Do., getting bluer, to 25 feet.
	25.	Blue mud or clay, with little sand.
	30.	Same, less sand.
	35.	Do., no sand.
8.	40.	Same, harder.
	45.	Same, pure light color.
	50.	Same, harder, g .
	55.	Same to 56 feet.
4.	60.	Bluish-gray sand.
	65.	Same, with shells.
	70.	Do. do.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] having completed the examination of the [illegible] from the borings made in the survey between the [illegible] respectfully [illegible] of the results.

[illegible] to obtain a geological section of the tract [illegible] in the survey, it being of course of great practical importance [illegible] construction of an outlet that the character of the beds through which it is to pass should be thoroughly understood.*

But besides the settling of this practical point, the study of these [illegible] of considerable scientific interest [illegible] opportunity has as yet been afforded to learn their [illegible] with accuracy. [illegible] investigation of the Artesian [illegible] is the only contribution yet made to our knowledge of the [illegible] that they contain; and even in [illegible] not closely studied. In the present instance [illegible] of primary importance, for the small specimens that have been preserved from the borings do not present to the naked eye sufficient [illegible] their position and strata from superficial observation alone. In making the section, therefore, after separating the [illegible] from the non-calcareous beds by chemical means, the proportion of clay in each was approximately determined by washing; the [illegible] of the grains of quartz and other minerals, as well as of the vegetable matter present, were noted with the microscope, and finally [illegible] found were carefully figured and tabulated, as a check to [illegible] from other sources.

The washing was conducted upon a fixed plan. A piece of soil as large as a [illegible] was agitated with water four inches deep, in a test tube half an inch in diameter, until its particles were thoroughly separated from each other. The tube was then allowed to stand for five minutes, by which time the sand, organisms, and vegetable matter, with the coarser portion of the clay, had settled to the bottom. The water with the finer portion of the clay was then decanted into another tube, fresh water poured upon the residue to the same depth of four inches, and the agitation repeated. This time the tube was only allowed to rest one minute before decantation, the third time half a minute, and the fourth but fifteen seconds. If at any time the water appeared free from clay at the end of the period allotted to the settling, the deposit was judged to be free from that ingredient also, and the process was not repeated. The number of decantations used is, therefore, a rough measure of the proportion of clay in the soil. The deposits in the different tubes were all examined separately under the microscope; the organisms occurring chiefly in the two last.

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*If the practical question had been the construction of an ordinary canal, the specimens show that no obstacle exists to the successful prosecution of the work. The clays of [illegible] and [illegible] are of a depth and firmness that guarantees the permanence of the canal when once completed. In but two of the borings, Nos. 6 and 9, are they underlaid by sand at a depth likely to be reached by the dredgings, and even here, in No. 6 the sand contains enough clay to render it firm, while that in No. 9, though cleaner, cannot be considered a quicksand in its upper portion.

Not being a specialist in the subject of Diatoms and Desmids, much study was expended in the effort to determine the species observed, but with very partial success. My acknowledgments are due to Dr. Harkness, a member, and to Prof. William Ashburner, the president of the San Francisco Microscopical Society, for obtaining for me access to the excellent library of that institution while prosecuting this research. The only works at hand that were of use were Ehrenberg's "*Microgeologie*," Pritchard's "*Manual of the Infusoria*," Godfrey and Henery's "*Micrographic Dictionary*," Adam Schmidt's "*Monograph upon certain genera of Diatoms*," and the articles of Dr. Brightwell in the "*Microscopic Journal*." With so limited a list of authorities at my disposal, it is very probable that many species marked "undetermined" are described elsewhere, and that the names that have been taken from Ehrenberg may have been superseded ere now by the more accurate labors of recent authors. Under these circumstances it becomes necessary to give my figures, which are carefully drawn from the objects themselves, in order to show what the strata really contain. It is by no means unlikely that a number of the species are new, as so little attention has as yet been paid to these delta deposits by scientific men.

Where several species belonging to the same genus are not determined, they have been numbered; and where even the genus is unknown, they are designated by means of Roman capitals. A brief description of the latter may take the place of the generic name in enabling the reader to understand the figures.

Organism A is a transparent jointed tube, about $\frac{1}{200}$ of an inch in length, and $\frac{1}{1800}$ of an inch in thickness. It generally consists, as in Fig. 40, Pl. I, of four chambers, separated by three partitions; the middle one of which is single, and the two others double. The walls of each chamber are distinctly double, the ends of the tube being open, and armed with two spines. The chambers contain grains, as of food, irregularly distributed. This four-chambered tube, which is the form of the organism most commonly observed, may result from the conjugation of two two-chambered ones, several of the latter having been seen alone. Six, and even eight, chambered ones were also noticed; but in these cases the double partitions were absent, as well as the food granules, though the spines were persistent.

Organism B, Fig. 41, Pl. I, is a jointed filament, apparantly flat, about $\frac{1}{1800}$ of an inch in breadth, and $\frac{1}{400}$ in length. These joints are from four to six in number, shorter than the breadth of the filament, and chambered; the chambers being a little nearer to one side of the joint than the other.

Organism C, Fig. 42, Pl. I, is a cylindrical jointed tube, $\frac{1}{600}$ of an inch in breadth, and of a length dependent upon the number of joints. Each joint is shorter than the breadth of the filament, and has a simple contour. But within each joint are granules, irregularly arranged, generally around the walls of the joint, but sometimes against the partitions. The ends of the tube are closed.

Organism D, Fig. 43, Pl. I, is a sphere, not transparent, and of a somewhat rough contour. One side displays a rough and dark-colored depression. The diameter is about $\frac{1}{200}$ of an inch.

Organism E, Fig. 44, Pl. I, resembles the sash of a window. Each pane, so to speak, is a rectangular cell, transparent, with double walls; and is filled within with indistinct granules of a greenish hue. Only two rows are represented in the figure, but as many as five have been observed.

Organism F, Fig. 45, Pl. I, is shaped like an acid carboy. It is green-

ish in hue, and translucent. The neck of the carboy is delicately lipped, and the body appears to hold a curved partition and other indistinct contents beneath. It is $\frac{1}{280}$ of an inch in diameter.

Organism G, Fig. 46, Pl. I, is similar in shape to the last, but larger, measuring $\frac{1}{140}$ of an inch in diameter. The neck is prolonged into a long, tapering, and slightly-curved filament. The body contains a number of egg-shaped bodies, transparent, and greenish in hue.

Organism H, Fig. 47, looks like an oat, well bearded upon one side, with delicate spines. It is colorless and transparent, and measures about $\frac{1}{450}$ of an inch in length.

Organism I, Fig. 48, is of the same greenish translucent appearance as F and G, and may be fancifully compared to a pair of breeches with a hat-brim for a waistband, and with legs that end in closed, tapering, and forked processes. Dark granules, apparently of clay, seem to have washed into these processes through the open waistband end.

Organism J is like a conical hat with a narrow brim. The latter is greenish and translucent, but the sides of the conical crown have radiating lines of *foramina*. It measures $\frac{1}{112}$ of an inch across the brim.

Annexed will be found the tabulated details of my observations, with the lists and plates of the microscopic organisms. A study of these will show a very general prevalence of fresh-water forms, even in strata obviously of marine formation. This was to be expected in deposits near the mouth of a great river, whose waters must be always sweeping the exuviæ of its own inhabitants out into the sea. Some of the strata, viz, Nos. 2, 7, 9, 10, and 11, seem to have been formed out of reach of salt water; but no marine stratum is free from influence of the fresh. In the sea-marsh stratum, No. 12, the proportion of marine forms is greater near the lake than farther back, probably because they were introduced by the tide. In the subjacent stratum, No. 8, the same phenomenon is noticeable, though in a less degree. Could it also have once been at the sea-level, and subjected to intermittent tidal influence? If so, has it sunk from the decay and disappearance of its vegetable matter? A process of this kind would have gone on unequally in different parts of the stratum, being affected by the porosity of the superincumbent layers, and would have left it at higher levels under the clays of Nos. 12 and 11 than under the sand-bed No. 9, as we see is the case.

But theorizing belongs rather to your department of our task. Trusting that the facts that I have accumulated may prove of service, I have the honor to subscribe myself,

Yours, very respectfully,

F. V. HOPKINS.

Prof. E. W. HILGARD.

APPENDIX III.

DETAILED RECORD OF EXAMINATION OF SPECIMENS OF BORINGS.

MICROSCOPIC CHARACTERS BY F. V. HOPKINS; LARGER ORGANISMS BY E. W. HILGARD.

BORING NO. 1.

	Depth of specimens.	No. of decantations used in washing.	Peculiarities of the grains of quartz.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
	Feet.						
Stratum No. 11.—A blu-ish, drab-colored clay; non-calcareous; fresh-water.	5 to 10	2	Clear, *round*, and sharp; not over .06mm in diameter.	Little; not over .05mm.	In crystals; rare; black.	Very little; rolled.	Fragillaria sp. undetermined, No. 1.
Stratum No. 8.—A blue clay, reddish where exposed; effervesces with acids; fresh-water.	10 to 20	3	Clear and red; rounded; not over .06mm in diameter.	Not over .16mm.	None.....	Much macerated.	Spongolithis mesogongyla, Ehr.
	20 to 30	3	Clear, red, and green; not over .1mm in diameter.	Brown and gray.	Black and crystallized.	Large pieces, macerated.	Spongolithis acicularis, Ehr. Lithostylidium denticulatum, Ehr.
	30 to 43	3	....do	....do	....do	....do	None.
	43 to 53	2	Clear .05mm down.	....do	....do	....do	Do.
	53 to 63	2	Clear, *rounded*, and sharp; .16mm in diameter and less.	....do	....do	....do	Lithostylidium sp. undetermined, No. 1. Synedra acuta, Ehr. Melosira sp. undetermined, No. 1. C and D, undetermined.
	63 to 73	3	Clear, rounded; not over .05mm in diameter.	....do	None.....	Very little...	Melosira sp. undetermined, No. 1.
Stratum No. 4.—Greenish-white sand; marine.	73 to 80	1	Clear, rounded; not over .25mm in diameter.	None.....	None.....	None	Shell fragments abundant. Echinoid spines, Mellita sp. Grammostomum sp. undetermined, No. 1. Lithostylidium denticulatum, Ehr. Melosira sp. undetermined, No. 1.
	80 to 90	1	....do	....do	....do	... do	Do.

Stratum No. 4, 90 to 95 feet. Strongly micaceous sand, with little clay. Shells mostly very young.

Larger organisms.—Stratum No. 4, 72 to 95 feet.—Crab carapace. Balanus eburneus. Serpula sp. Nassa acuta Say. Anachis avara. Oliva mutica. Natica pusilla. Turbonilla interrupta. T. speira. Scalaria angulata. Marginella limatula. Dentalium n. sp. (laeve). Utriculus biplicatus. Teredo n. sp. Pandora trilineata. Mactra lateralis. Tellina alternata. T. tenera. T. tenta. Macoma fusca. Tellidora lunulata. Donax variabilis. Dosinia discus. Lucina multilineata. L. costata. Arca transversa. Glottidia pyramidata. Mellita testudinata. Cellepora n. sp. (1).

Macerated stems of Scirpus lacustris.

BORING No. 1—Continued.

	Depth of specimens.	No. of decantations used in washing.	Peculiarities of the grains of quartz.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
Stratum No. 1.—A very firmly caked drab-colored clay; marine.	95 to 100	5	Clear; not over .1mm in diameter.	A little .1mm down.	None.....	None	Fragillaria sp. undetermined, No. 1.

Stratum No. 1, 95 to 100 feet.—Bluish-drab, rather dark clay; quite sandy. Shell fragments moderately abundant, large.

***Larger organisms.*—Nassa acuta. Utriculus biplicatus. Mactra lateralis. Mellita testudinata. Blackened vegetable fiber.**

BORING No. 2.

	Depth of specimens.	No. of decantations used in washing.	Character of the grains of quartz.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms
Stratum No. 11.—A bluish-drab clay, more sandy above than below; fresh-water; non-calcareous.	*Feet.* 5 to 10	2	Clear, rounded and sharp; not over .08mm in diameter.	A little....	An occasional black crystal.	None	None.
	10 to 17	2	Clear brown and yellow; size as above.	More than above.	Not noted.	A little, rounded, abundant.	Fragillaria sp. undetermined, No. 2.
	17 to 28	2	Very few, small, clear, & rounded; .0016mm in diameter and less.	A little; .005mm in diameter.	....do	Macerated & rounded.	Fragillaria sp. undetermined, No. 1. Spongolithis acicularis, Ehr. Spongolithis aspera, Ehr. Lithostylidium quadratum, Ehr. Xanthidium? sp. undetermined, No. 1.
	28 to 38	3	Few, clear, *rounded*, and sharp; not over .1mm in diameter; chalcedony in small proportion in smooth cubic grains.	Very little.	None.....	Very abundant in large pieces, macerated.	Spongolithis acicularis, Ehr. Spongolithis mesogongyla, Ehr. Eunotia sp. undetermined, No. 1. Synedra sp. undetermined, No. 1. Leptocystinema Kinahani, Archer.
Stratum No. 8.—A caking, bluish-drab clay; effervesces with acids; organisms a mixture of marine and fresh-water forms.	38 to 48	3	Clear, sharp; not over .1mm in diameter; green grains not infrequent.	Abundant, clear, gray, and red.	A little; black and crystallized.	A good deal, partly macerated and partly carbonized.	Lithostylidium denticulatum, Ehr.
	48 to 58	3	....do	....do	....do	....do.....	Do.
	58 to 68	3	Clear, with a little smoky quartz, and chalcedony; not over .1mm in diameter.	Moderate in am't.	Not noted.	Not noted....	Melosira sp. undetermined, No. 1. Grammostomum sp. undetermined, No. 1. Lithostylidium denticulatum, Ehr. Lithostylidium quadratum, Ehr. Cyclotella near punctata, S. Synedra acuta, Ehr.

Stratum 4, 68 to 82 feet. Greenish, strongly micaceous, sharp sand. Shells rather abundant, well preserved.

Larger organisms.—Crab carapace. Balanus eburneus. Nassa acuta. Anachis avara. Oliva mutica. Natica pusilla. Acus dislocatum. Dentalium n. sp. (laeve). D. n. sp. (sexangulare). Teredo n. sp. Pholas costata. Pandora trilineata. Corbula cuneata. Tellina alternata. T. tenera. Chione cancellata. Ch. cribraria. Dosinia discus. Lucina multilineata. L. costata. Cardium magnum? C. n. sp. (aequilaterale), C. n. sp. (inaequilaterale). Laevicardium Mortoni. Arca transversa. Pecten dislocatum? Mellita testudinata. Cellepora n. sp. (1).

BORING NO. 3.

	Depth of specimens.	No. of decantations used in washing.	Characteristics of the quartz grains.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
Stratum No. 11.—A bluish clay; non-calcareous; fresh-water.	*Feet.* 5 to 11	3	Clear; yellow and black; rounded and sharp; not over .1mm in diameter.	Very little.	None.....	Very little; fresh and macerated.	Fragillaria capucina.
	11 to 23	3	....do	A little....	Crystallized	A little.....	Rhizosolenia? sp. undetermined, No. 1. Two others undetermined.
	23 to 30	4	....do	....do	A few black crystals.	Abundant; macerated.	Fragillaria capucina. Navicula sp. undetermined, No. 1. Lithostylidium sp. undetermined, No. 1. Spongolithis acicularis, Ehr. Organism undeter., A.
Stratum No. 8.—A blue clay; calcareous; fresh-water.	30 to 38	3	Clear and rounded; size not above .08mm in diameter.	A little....	A few black crystals.	Moderately plenty, in flattened pieces.	Cocconema lanceolatum Ehr. Synedra sp. undetermined, No. 1. Undetermined A and B.
	38 to 49	4	....do	....do	....do	....do	Lithostylidium quadratum, Ehr. Melosira? sp. undetermined, No. 2. A and B.
	49 to 59	4	Clear, with some yellow grains; not over .05mm in diameter; rounded and sharp in equal proportions.	....do	A few clear crystals; also the black.	....do	Fragillaria capucina. Fragillaria sp. undetermined, No. 1. Spongolithis acicularis, Ehr. Lithostylidium denticulatum, Ehr. A, B, and D.
	59 to 69	3	....do	....do	Not noted.	Very little ..	A.
	72	3	Some grains reach .16mm in diameter.	....do	Dark crystals.	Very little; fresh and macerated.	Lithostylidium denticulatum, Ehr. Melosira sp. undetermined, No. 1. A and B.

BORING No. 3—Continued.

	Depth of specimens.	No. of decantations used in washing.	Characteristics of the quartz grains.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
Stratum No. 4.—Greenish sand; marine or fluvio-marine.	*Feet.* 72 to 82	1	Clear, rounded and sharp; not over .25mm in diameter.	Not noted.	A few black crystals.	None.....	Shell fragments abundant. Navicula sp. undetermined, No. 1. Eunotia? sp. undeterm'd, No. 1. Rotalia sp. undetermined, No. 1, A and B.
	82 to 92	1	Clear, rounded and sharp; not over .25mm in diameter, with some brown and greenish grains.	Abundant. not over .7mm in diameter.	None.....	....do	Shell fragments and echinoid spines abundant. Grammastomum sp. undetermined, No. 2. Fragillaria sp. undetermined, No. 2. B and C, undetermined. Spongolithis acicularis Ehr.
	96	1	Clear, size as above; grains rounded.	A little....	....do	....do	Shell fragments and Echinoid spines abundant.
	97	1	....do	....do	....do	....do	None noted.

Stratum No. 4, 72 to 97 feet. Greenish micaceous sand, coarse above, growing finer downward. Shell fragments rather abundant, but to a great extent very small and much worn, so as to be difficult to identify. Browned vegetable fragments especially in lower portion, and shell fragments larger.

Large organisms.—Squalidean tooth. Crab carapace. Balanus eburneus. Serpula, n. sp. Nassa acuta. Anachis avara. Oliva mutica. Natica pusilla. Marginella limatula. Scalaria angulata. Architectonica gemma. Cylichna, sp. Dentalium, n. sp. (læve). Dent., n. sp. (sexangulare). Dactylina oblonga. Pholas costata. Pandora trilineata. Corbula cuneata. Solen viridis. Mactra lateralis. Tellina alternata. T. tenera. Tellidora lunulata. Chione cribraria. Dosinia discus. Tapes pygmæa. Astarte lunulata. Lucina multilineata. L. costata. Cardium, n. sp. (æquilaterale). C., n. sp. (inæquilaterale). Lævicardium Mortoni. Arca transversa. Pecten dislocatum. Anomia ephippium. Glottidia pyramidata. Mellita testudinata. Cellepora, n. sp. (1).

BORING No. 3—Continued.

	Depth of specimens.	No. of decantations used in washing.	Peculiarities of quartz grains.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
Stratum No. 1.—A firmly caked drab-colored clay; marine.	*Feet.* 97 to 100	3	Clear, with some yellow, green, and black grs.; not over .1mm in diameter; *sharp*.	None.....	None.....	None.....	Orbulina universa, d'Orb. Globigerina bulloides, d'Orb. Rosilina beccarii, d'Orb.

Stratum No. 1, 97 to 100 feet. Dark gray, very heavy and plastic clay; disintegrates very slowly on boiling, but settles rapidly, showing much rather coarse sand. Shell fragments numerous, quite large, much worn. Much blackened vegetable bast and fiber.

Larger organisms.—Balanus eburneus. Oliva mutica. Natica pusilla. Pandora trilineata. Mactra lateralis. Tellina alternata. Chione cancellata. Ch. cribraria. Lucina multilineata. Cardium, n. sp. (æquilaterale). Lævicardium Mortoni. Arca transversa. Arca ponderosa. Leda acuta. Mellita testudinata. Cellepora, n. sp. (1).

BORING No. 4.

	Depth of specimens.	No. of decantations used in washing.	Characteristics of the grains of quartz.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
Stratum No. 11.—A bluish drab-colored clay; non-calcareous; fresh-water.	*Feet.* 5 to 10	3	Clear, rounded and sharp, some red; not over .05mm in diameter.	A little....	An occasional black crystal.	Moderate in amount; macerated.	Synedra acuta? Ehr.
	10 to 22	3	.....do.....	....do	....do	....do	Xanthidium? sp. undetermined, No. 1. Leptocystinema? sp. undetermined, No. 1.
Stratum No. 8.—A caking bluish-drab clay; effervesces with acide; fresh-water.	22 to 32	4	Clear, sharp and rounded; not over .16mm in diameter.	A little....	Not noted.	Macerated in pieces. 3in. in diameter.	Leptocystinema Kinahani, Archer. Synedra acuta? Ehr.
	32 to 42	2	.....do.....	....do	....do	Very little...	None.
	42 to 52	2	.....do.....	....do	....do	....do	None noted.
	56	2	.....do.....	....do	....do	....do	Do.
	56 to 64	2	.....do.....	Abundant.	....do	....do	Do.
Stratum No. 4.—A greenish micaceous sand; marine.	64 to 73	1	Clear, rounded; not over .25mm in diameter.	A little....	None.....	None.....	Shell fragments abundant.
	73 to 91	1	Clear, rounded; not over .25mm in diameter; some ferruginous conglomerate grains.	....do	....do	....do	Do.

Larger organisms.—Stratum 4, 64 to 91 feet.

Balanus eburneus. Mangelia filiformis? Natica pusilla. Turbonilla interrupta? Dentalium, n. sp. (sexangulare). Cylichna, sp. Pholas costata. Pandora trilineata. Tellina alternata. T. tenera. Chione cribraria. Dosinia discus. Lucina multilineata. Cardium, n. sp. (æquilaterale). Arca transversa. Mellita testudinata. Cellepora (1).

Stratum No. 1, 91 to 100 feet. Tough bluish-gray clay, leaving but little

sand on sieve, but quite sandy. Shell fragments tolerably abundant and large. Little mica, some browned vegetable fiber.

Corbula cuneata. Tellina alternata. Tellidora lunulata. Dosinia discus. Lucina multilineata. Levicardium Mortoni. Arca transversa. Pecten dentatus. Mellita testudinata.

BORING No. 5.

	Depth of specimens.	No. of decantations used in washing.	Characteristics of the grains of quartz.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
Stratum No. 11.—A bluish-drab colored clay; non-calcareous; fresh-water.	*Feet.* 5 to 10	4	Clear, rounded, and sharp; not over .16mm in diameter.	None.....	None.....	Abundant; macerated.	Spongolithis acicularis, Ehr. Fragillaria sp. undetermined, No. 1. Leptocystinema ? sp. undetermined, No. 1. Nitzschia ? sp. undetermined, No. 1. Fragillaria capucina. B.
	10 to 20	4	As above, but grains not over 1mm in diameter.	A little....	....do	In excess....	Fragillaria sp. undetermined, No. 1. Fragillaria capucina. A and B.
Stratum No. 10.—A blue clayey sand; calcareous; fresh-water.	20 to 30	3	Clear, with some black grains; not over .15mm in diameter.	None.....	A few black crystals.	In excess; carbonized.	A and B.
Stratum No. 9.—A bluish sand, slightly clayey; calcareous; fresh-water.	30 to 45	1	Clear and brownish-yellow; not above .1mm in diameter; sharp and rounded.	Abundant, clear, and yellow.	None.....	Abundant; carbonized and fresh.	A and B.
Stratum No. 8.—A bluish-drab clay; calcareous; fresh-water above, a few marine shells below.	45 to 53	3	Clear and rounded; not over .04mm in diameter.	Abundant.	None.....	Abundant; macerated.	Fragillaria sp. undetermined, No. 2. Navicula sp. undetermined, No. 3. A and B.
	53 to 57	3	Clear, with many black and yellow grains; not over .15mm in diameter.	....do	....do	Abundant; macerated and black.	A and B.

Larger organisms.—The specimen from 53 to 57 feet. A tough, bluish-gray clay. Boiled and washed through the sieve, leaves on the latter but a very little rounded quartz sand, some fragments of ferruginous conglomerate, a few mica scales, many blackened vegetable fragments, very few of shells. Among the latter, Tellina alternata, T. tenta, and fragments and spicules of Mellita testudinata were recognized.

BORING No. 5—Continued.

	Depth of specimens.	No. of decantations used in washing.	Peculiarities of the quartz grains.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
Stratum No. 4.—A greenish-white sand; marine or fluvio-marine.	*Feet.* 57 to 67	1	Clear, rounded, and sharp; not over .25mm in diameter.	Abundant.	A few black crystals.	A little; partly carbonized.	Shell fragments abundant. Echinoid spines 2 species undeterm'd. Truncatulina (lobulata? d'Orb.).
	67 to 72	1	....do	....do	... do	....do	Shell fragments abundant. Echinoid spines 2 species undeterm'd. Nonionina sp. undetermined. Spongolithis acicularis, Ehr. Fragillaria capucina. A and B.

Larger organisms.—In the yellowish-drab, highly micaceous sand of stratum No. 4, 57 to 72 feet, shell fragments are quite abundant but small; some blackened vegetable remains. Sand grains mostly so large as to remain on the sieve, and rather sharp.

Balanus eburneus. Serpula n. sp. Nassa acuta. Anachis avara. Oliva mutica. Pleurotoma cerinum? Mangelia filiformis? Turbonilla n. sp. (undecimsulcata). Obeliscus crenulatus. Utriculus biplicatus. Pholas costata. Pandora trilineata. Corbula cuneata. Mactra lateralis. Tellina alternata. T. tenera. T. tenta. Macoma fusca. Chione cancellata. Ch. cribraria. Dosinia discus. Lucina multilineata. L. costata. Cardium n. sp. (æquilaterale). C. n. sp. (inæquilaterale). Arca transversa. Pecten dislocatus. Mellita testudinata. Cellepora n. sp. (1).

BORING No. 5—Continued.

	Depth of specimens.	No. of decantations used in washing.	Peculiarities of the quartz grains.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
Stratum No. 3.—A smooth yellowish-drab clay; non-effervescent with acids; fluvio-marine.	*Feet.* 72 to 78	5	Clear, rounded, and sharp; not over .25mm in diameter.	Abundant.	A few black crystals.	None	Hyalonema? sp. undetermined. Nonionina (crassula?) d'Orb. Spongolithis acicularis, Ehr. Spongolithis aspera, Ehr. Spongolithis mesogongyla, Ehr. Fragillaria sps. undetermined, 1 and 2. Fragillaria capucina. Lithostylidium sp. undetermined, No. 1. A and B.

Stratum No. 3, 72 to 78 feet. A yellowish-white, very pure and tough clay, difficult to disintegrate by boiling. Washed on sieve, leaves little sand; white, very sharp sand goes through. The clay water does not settle for a long time, showing absence of lime-salts. Shells scarce.

Larger organisms.—Balanus eburneus. Mactra lateralis. Macoma fusca. Chione cribraria. Lævicardium Mortoni. Arca transversa. Mellita testudinata.

BORING No. 5—Continued.

	Depth of specimens.	No. of decantations used in washing.	Peculiarities of the quartz grains.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
Stratum No. 2.—A yellowish-drab sand; calcareous; fluvio-marine.	*Feet.* 78 to 90	1	Clear, with many yellow grains; not over .25mm in diameter.	Not noted.	A few black crystals.	Fresh and macerated; abundant.	Spongolithis appendiculata. Ehr. Spongolithis acicularis, Ehr. Frazillaria capucina. A and B.
	90 to 100	....	.....do	....do	....do	.....	Shell fragments.

Stratum No. 2, 78 to 100 feet. Yellowish-drab sand, usually coarse above, fine below; numerous grains of ferruginous conglomerate. Shells rare, in large fragments.

Larger organisms.—Nassa acuta. Oliva mutica. Corbula cuneata. Solen viridis. Mactra lateralis. Tellina alternata. Chione cribraria. Dosinia discus. Lucina mutilineata. Arca ponderosa. Anomia ephippium. Mellita testudinata.

BORING No. 6.

	Depth of specimens.	No. of decantations used in washing.	Characteristics of the grains of quartz.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
Stratum No. 11.—A bluish clay; non-calcareous; fresh-water.	*Feet.* 5 to 10	4	Clear; not over .16mm in diameter; rounded oftener than sharp.	None.....	None.....	Abundant, macerated and rounded.	Spongolithis acicularis. Fragillaria sp. undetermined, No. 1.
Stratum No. 10.—A blue, clayey sand; calcareous; fresh-water.	10 to 20	3	Clear, with a few black grains; not over .25mm in diameter; rounded and sharp.	Very little.	None.....	Abundant, but less so than above.	None noted.

BORING No. 6—Continued.

	Depth of specimens.	No. of decantations used in washing.	Characteristics of the grains of quartz.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
Stratum No. 9.—A drab-colored sand; calcareous; fresh-water.	20 to 30	1	Clear, yellow and brown; not over .16mm in diameter; sharp and rounded.	Moderate..	None.....	Moderate, macerated.	None noted.
	35 to 40	1	.....do.....	Abundant.	A little....	....do	Cocconema lanceolatum, Ehr.
Stratum No. 8.—A bluish clay, sandy above; calcareous; fluvio-marine.	40 to 50	3	Clear, rounded; not over .05mm in diameter; some green grains.	A little....	None.....	A little, with an odor of sulphur.	Spongolithis acicularis, Ehr. Melosira sp. undetermined, No. 1. Rosalina Beccarii, d'Orb.
	50 to 59	3	Clear, *sharp* oftener than rounded; not over .05mm in diameter; many green grains.	Moderate..	A few crystals, with one of actinolite & one of vivianite.	A little.....	Conferva-like green grains. Spongolithis sp. undetermined, No. 1. Navicula sp. undetermined, No. 4. B.

Stratum No. 4, 59 to 81 feet. Greenish sand with large mica scales, very little clay. Shell fragments small and difficult to determine. Splinters of white wood, seemingly cottonwood.

Larger organisms.—Crab claw. Balanus eburneus. Serpula n. sp. Urosalpinx cinereus. Nassa acuta. Anachis lunata. Oliva mutica. Mangelia linearis? Pleurotoma cerinum. Natica pusilla. Marginella limatula. Volva acicularis. Dentalium n. sp. (laeve). Cylichna sp. Pholas costata. Pandora trilineata. Corbula cuneata. Solen viridis. Mactra lateralis. Tellina alternata. T. tenera. Tellidora lunulata. Chione cribraria. Dosinia discus. Lucina multilineata. L. costata. Cardium n. sp. (aequilaterale). Laevicardium Mortoni. Arca transversa. A. pexata. Mellita testudinata. Cellepora n. sp. (1).

Stratum No. 3, 81 to 85 feet. Bluish gray, stiff clay, not easily disintegrated by boiling. No shells or sand left on the sieve, but much browned bark and wood fragments.

BORING NO. 7.

	Depth of specimens.	No. of decantations used in washing.	Characteristics of the grains of quartz.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
Stratum No. 11.—A bluish-drab colored clay; non-effervescent with acids; fresh-water.	*Feet.* 5 to 10	4	Clear, rounded; not over .1mm in diameter.	Moderate in am't.	In clear crystals.	A little macerated.	None.
	10 to 20	2	Clear, rounded; not over .25mm in diameter.	Abundant.	Green, striated crystals.	Rounded and macerated.	Do.
Stratum No. 8.—A bluish, sandy clay; calcareous; fresh-water.	20 to 29	2	Clear, rounded; not over .25mm in diameter; also a little chalcedony in smooth cubic grains.	None noted.	Both clear and green.	Moderately abundant; rounded & macerated.	Lithostylidium denticulatum, Ehr. Cyclops n. quadricornis.
	29 to 34	1	Variegated, clear, milky, black, red, and brown; not over .75mm in diameter.	Very little.	Not noted.	Pieces large, carbonized, and fresh.	None noted.
Stratum No. 7.—A coarse, gray sand; calcareous; fresh-water.	34 to 45	1	Clear, rounded; not over .25mm in diameter; black and green grains occasionally.	A little....	None.....	None	None.
	45 to 57	1	....do	....do	....do	....do	Do.
	57 to 67	1	....do	....do	....do	....do	Do.
	67 to 72	1	....do	....do	....do	....do	Do.

Stratum No. 4, 72 to 87 feet. Bluish grey, rather fine, clayey and micaceous sand; shell fragments, large, few.

Larger organisms.—Balanus eburneus. Nassa acuta. Dentalium ? n. sp. (læve). Tellina alternata. Pholas costata. Corbula cuneata. Mactra lateralis. Tellidora lunulata. Chione cancellata. Ch. cribraria. Lucina multilineata. L. costata. Cardium n. sp. (aequilaterale.) Lævicardium Mortoni. Mellita testudinata.

Stratum No. 3 (?), 87 to 88 feet. Dark colored clay, tough, evidently originally laminated, with layers variously colored and constituted; very difficult to disintegrate. Washed on sieve it leaves numerous and large blackened peaty fragments, mica scales, a few large rounded grains of pellucid quartz, fragments of ferruginous sandy conglomerate, and a few indistinct shell fragments, seemingly of Mactra lateralis and Tellina tenera.

Stratum No. 2, 88 to 100 feet. Fine bluish, rather clayey sand; quartz grains much rounded; some particles of ferruginous conglomerate.

Larger organisms.—Turbonilla acicula. Corbula cuneata. Tellina alternata. Chione cribraria. Dosinia discus. Lucina costata. Lævicardium Mortoni. Mellita testudinata.

BORING No. 8.

	Depth of specimens	No. of decantations used in washing.	Characteristics of the grains of quartz.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
Stratum No. 11.—A bluish, drab-colored clay; non-calcareous; fresh-water.	*Feet.* 5 to 16	2	Clear, rounded; not over .1mm in diameter; red-spotted grains and some carnelian.	Little.....	None.....	Very little, macerated.	None.
	17 to 22	2	Clear, with some red and red-spotted; not over .1mm in diameter.	....do.....	Green, in 9-sided crystals.	....do.....	One undetermined. C.
	22 to 32	2	Clear, rounded; not over .25mm in diameter.	....do.....	Not noted.	Moderate in amount.	None.
Stratum No. 8.—A blue clay; calcareous; fluvio-marine.	32 to 41	2	Clear, rounded, and sharp; not over .1mm in diameter.	Abundant; plates large.	Green striated.	Abundant; macerated.	Rosalina Beccarii.
	41 to 54	2	Clear, with some red and green grains; not above .1mm in diameter.	Abundant; plates large; .16mm in diameter.	....do.....	....do.....	Lithostylidium denticulatum, Ehr. Coscinodiscus radiatus, Ehr. Melosira sp. undetermined, No. 1.
	54 to 63	2	Clear, with a few red-spotted grs.; not over .25mm in diameter.	A little.....	.....	Very little; macerated and rolled.	Melosira sp. undetermined, No. 1.

Stratum No. 4, 63 to 77 feet. Greenish-drab sand, micaceous, much rounded, a little coarser below than above; very little clay; much browned vegetable remains.

Larger organisms.—Balanus eburneus. Anachis avara. Oliva mutica. Turbonilla interrupta. Cæcum pulchellum. Scalaria angulata. Dentalium n. sp. (læve). D., n. sp. (sexangulare). Pholas costata. Corbula cuneata. Corbula n. sp.?. Solen viridis. Mactra lateralis. Tellina alternata. Chione cribraria. Dosinia discus. Lucina multilineata. Cardium n. sp. (æquilaterale). C., n. sp. (inæquilaterale). Arca transversa. Lima sp. Anomia ephippium Mellita testudinata. Cellepora, n. sp. (1).

Stratum No. 3, 77 to 79 feet. Leaden-blue clay, rather sandy, micaceous, easily disintegrated, some fragments of bark.

Larger organisms.—Nassa acuta. Turbonilla interrupta. Scalaria lineata. Pholas costata. Corbula cuneata. Mactra lateralis. Chione cancellata. Ch. cribraria. Lucina multilineata. L. costata. Arca transversa. A. ponderosa. Anomia ephippium. Mellita testudinata.

BORING No. 9.

	Depth of specimens.	No. of decantations used in washing.	Characteristics of the grains of quartz.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
Stratum No. 12.—Dark brown clay, non-calcareous; a swamp mud, dark from excess of vegetable matter, with many fresh-water and a few marine organisms.	*Feet.* 5 to 10	2	Few and clear; not over .03mm in diameter.	None....	None....	Abundant, macerated.	Orbulina universa, d'Orb. Planulina n. elegans, Ehr. Rotalia n. pachyphysa, Ehr. Melosira sp. undetermined, No. 3. Pinnularia n. gigas, Ehr. Synedra acuta, Ehr. Synedra sp. undetermined, No. 1. Navicula sp. undetermined, No. 5. Spongolithis sp. undetermined, No. 1. Spongolithis acicularis, Ehr. Spongolithis aspera, Ehr. Spongolithis inflexa, Ehr. Fragillaria sp. undetermined, No. 1. Fragillaria capucina. B.
Stratum No. 11.—A bluish, drab-colored clay; non-calcareous; fresh-water.	11 to 15	2	Few, clear, and green; not over .1mm in diameter.	A little..	A few crystals.	Abundant, but less than above.	Synedra acuta?, Ehr. Spongolithis acicularis, Ehr.
Stratum No. 10.—A blue, clayey sand; calcareous; fresh-water.	15 to 24	1	Clear, with a few with red spots; rounded and sharp both; a little Chalcedony in smooth cubic grains; not over .25mm in diameter.	A little..	None....	A little, macerated.	Lithostylidium denticulatum, Ehr.
Stratum No. 9.—A drab-colored sand; calcareous; fresh-water.	24 to 35	1	Clear, with a few yellow and brown grains; not over .25mm in diameter.	A little..	None....	A little, macerated.	Lithostylidium denticulatum, Ehr.
Stratum No. 8.—A blue clay, sandy above; calcareous.	35 to 50	2	Clear and red, spotted, rounded, and sharp; not over .25mm in diameter; a little Chalcedony.	A little..	None....	A little, macerated.	Lithostylidium denticulatum, Ehr.
	50 to 59	3	Clear, with a few red and blue grains; not over .1mm in diameter.	...do	...do	None...	None.
	59 to 64	....	.....do	...do	...do	....do	Do.

Stratum No. 4, C, 64 to 73 feet. Greenish-buff sand, rather clayey above, less so below, very micaceous. Shell fragments abundant, small above, larger below. Much browned vegetable matter, mostly wood, in upper portion.

Larger organisms.—Crab carapace. Balanus eburneus. Serpula, n. sp. Nassa acuta. Anachis avara. Oliva mutica. Pleurotoma cerinum. Natica pusilla. Scalaria lineata. Dentalium, n. sp. (læve). Dent., n. sp. (sex angulare). Teredo sp. Pholas costata. Pandora trilineata. Corbula cuneata. Mactra lateralis. Tellina alternata. T. tenera. Dosinia discus. Astarte undulata. Lucina multilineata. L. costata. Cardium, n. sp. (æquilaterale). Lævicardium Mortoni. Arca transversa. Anomia ephippium. Mellita testudinata. Cellepora (2).

Stratum No. 4, B, 73 to 80 feet. Tenacious blue clay; when washed through the sieve leaves but little clear, well rounded quartz sand, little mica, and numerous rather coarse and angular shell fragments. Some blackened vegetable fiber.

Larger organisms.—Balanus eburneus Serpula sp. Nassa acuta. Oliva mutica. Marginella limatula. Corbula lineata. Mactra lateralis. Tellina alternata. Tellidora lunulata. Chione cribraria. Dosinia discus. Lucina multilineata. L. costata. Lævicardium Mortoni. Arca transversa. A. pexata. Anomia ephippium. Mellita testudinata. Cellepora, n. sp. (1).

BORING No. 9—Continued.

	Depth of specimens.	No. of decantations used in washing.	Characteristics of the grains of quartz.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
Stratum No. 4.—A greenish-white sand; calcareous; marine.	*Feet.* 80 to 91	1	Clear, rounded; not over .25mm in diameter.	.....	.....	.....	Shell fragments abundant. Echinoid spines. Mellita.

Stratum No. 4, A, 80 to 91 feet. Blue, somewhat clayey and coherent sand, with much blackened vegetable fiber and sea-weed. Shell fragments abundant, large, sharp.

Larger organisms.—Balanus eburneus. Nassa acuta. Oliva mutica. Marginella limatula. Utriculus biplicatus. Pholas costata. Pandora trilineata. Mactra lateralis. Tellina alternata. T. tenera. Chione cribraria. Dosinia discus. Astarte undulata. Mellita testudinata.

Stratum No. 1, 91 to 100 feet. Very dark, rather sandy clay, leaving but little sharp sand on the sieve. Shell fragments numerous, large. Some browned bark.

Larger organisms.—Balanus eburneus. Nassa acuta. Oliva mutica. Dactylina oblonga. Pandora trilineata. Mactra lateralis. Chione cribraria. Ch. cancellata. Lucina multilineata. L. costata.

BORING No. 10.

	Depth of specimens.	No. of decantations used in washing.	Characteristics of the grains of quartz.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
Stratum No. 12.—A blue clay, dark with vegetable matter; non-calcareous; many fresh-water organisms, with a few marine.	*Feet.* 5 to 10	4	Clear, rounded; not over .1mm in diameter.	Not noted	Not noted	Abundant, macerated.	Orbulina universa, d'Orb. Hyalodiscus cervinus, Brightwell. A, B, and E. Spongolithis sp. undetermined, No. 1. Spongolithis acicularis, Ehr. Lithostylidium denticulatum, Ehr. Lithostylidium n. quadratum. Closterium sp. undetermined, No. 1.
Stratum No. 8.—A blue clay; calcareous; more fresh-water organisms than marine in the upper part, more marine than fresh-water below.	10 to 25	4	Clear, with a few red and yellow grains; from .25mm in diameter down.	Not noted	Not noted	Abundant, macerated.	Melosira sp. undetermined, 1 and 4. Eunotia n. gibberula, Ehr. Spongolithis sp. undetermined, No. 2. Fragillaria capucina. Fragillaria sp. undetermined, No. 2. A and B.
	25 to 35	4	Clear, with some carnelian, sharp; not over .1mm in diameter.	...do	...do	....do	Orbulina universa, d'Orb. Triceratium favus, Ehr. Pleurosigma sp. undetermined, No. 1. Rotalia sp. undetermined, No. 1. Melosira sp. undetermined, No. 5. Melosira n. sulcata, Ehr. A.
	35 to 45	4	Clear, rounded, and sharp; not over 1mm in diameter.	...do	...do ...	Moderately plenty.	Hyalodiscus cervinus, Brightwell. Orbulina universa, d'Orb. Melosira n. sulcata, Ehr. Melosira sp. undetermined, 6 and 7. Gallionella distans, Ehr. Pleurosigma sp. undetermined, No. 2. Navicula n. Grundleri, Ad. Schmidt. Navicula sp. undetermined, No. 6. Cocconeis sp. undetermined, No. 1. Pinnularia macilenta, Ehr. Spongolithis sp. undetermined, No. 2. A and B. Closterium sp. undetermined, No. 2. Fragillaria capucina.
Stratum No. 6.—Fine, crumbling, grayish clay; calcareous; organisms few, fresh-water and marine.	45 to 55	3	Clear, rounded; not over .032mm in diameter.	None ...	None....	A little.....	Shell fragments few. Spongolithis sp. undetermined, No. 2. A and B.

Larger organisms.—Abundance of macerated and partly blackened vegetable remains, apparently chiefly of grasses and rushes. Numerous very young shells, irrecognizable. Balanus eburneus. Mactra lateralis. Arca transversa. Lucina multilineata.

BORING No. 10—Continued.

	Depth of specimens.	No. of decantations used in washing.	Characteristics of the grains of quartz.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
Stratum No. 4.—A greenish sand; marine and fresh-water organisms, both present, but the former much the more numerous.	*Feet.* 55 to 70	1	Clear, with few grains of carnelian, amethyst, and silicified wood; not over .1mm in diameter.	A little..	A few crystals.	None	Shell fragments abundant. Orbulina universa, d'Orb. Pleurosigma sp. undetermined, No. 3. Cocconeis scutellum, Ehr. Pinnularia n. macilenta, Ehr. Navicula sp. undetermined, No. 4. Gallionella (Melosira), distans, Ehr. Fragillaria capucina. Fragillaria sp. undetermined, Nos. 1 and 2.

Larger organisms.—Balanus eburneus. Oliva mutica. Busycon perversus. Utriculus biplicatus. Spirorbis sp. Dentalium, n. sp. (læve). Pandora trilineata. Corbula cuneata. Solen viridis. Mactra lateralis. Tellina polita? Strigilla flexuosa. Tellidora lunulata. Chione cribraria. Astarte lunulata. Lucina multilineata. L. costata. L. Kiawahensis. Cardium, n. sp. (æquilaterale). Lævicardium Mortoni. Arca transversa. Anomia ephippium. Mellita testudinata. Cellepora, n. sp. (1). Cellepora n. sp. (2).

BORING No. 11.

	Depth of specimens.	No. of decantations used in washing.	Characteristics of the grains of quartz.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms
Stratum No. 12.—A black swamp clay; non-effervescent with acids; vegetable matter in excess; organisms both fresh-water and marine.	*Feet.* 5 to 15	3	Clear, rounded; not over .1mm in diameter.	Very little	A few black crystals.	In excess, macerated.	Campylodiscus sp. undetermined, No. 1. Rotalia sp. undetermined, No. 2. Spongolithis acicularis, Ehr.
	20 to 25	3	....do	....do....	Not noted...	....do	Lithostylidium denticulatum. Spongolithis acicularis, Ehr. One undetermined, I.

BORING NO. 11—Continued.

	Depth of specimens.	No. of decantations used in washing.	Characteristics of the grains of quartz.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
	Feet.						
Stratum No. 8.—A sandy blue clay; effervesces with acids; organisms few; more marine than fresh-water.	30 to 35	2	Clear, rounded, and sharp; not over .1mm in diameter.	Abundant	None.....	None.....	Campylodiscus sp. undetermined, No. 1. Coscinodiscus radiatus. Melosira sp. undetermined, No. 1. Spongolithis acicularis, Ehr.
	48 to 52	2	....do	....do....	....do	....do	Do.

Stratum 4, 52 to 70 feet. Grayish, very micaceous, rather coarse-looking sand, with numerous entire shells and shell fragments, the most abundant in the set. Although styled "quicksand" by the borers, it contains many grains and pebbles of clay, so as to render it difficult to separate it all. Sand grains much rounded, often partly conglomerated by a ferruginous cement.

Larger organisms.—Balanus eburneus. Serpula sp. Urosalpinx cinereus. Nassa acuta. Anachis avara. Oliva mutica. Obeliscus crenulatus. Cæcum pulchellum. Architectonica gemma. Acus dislocatum. Modulus Floridanus. Cochliolepis parasitica. Crepidula fornicata. Dentalium, n. sp. (læve). Dent., n. sp. (sexangulare). Utriculus biplicatus. Pholas costata. Pandora trilineata. Corbula cuneata. Solen viridis. Mactra lateralis. Tellina alternata. T. polita. Strigilla flexuosa. Donax variabilis. Chione cancellata. Ch. cribraria. Astarte lunulata. Lucina multilineata. L. costata. L. Kiawahensis. Cardium, n. sp. (inæquilaterale). Arca transversa. A. ponderosa. Modiola sp. Anomia ephippium. Mellita testudinata. Cellepora, n. sp. (1). Cellepora, n. sp. (2).

BORING No. 12.

	Depth of specimens.	No. of decantations used in washing.	Characteristics of the grains of quartz.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
Stratum No. 12.—Swamp clay, black with vegetable matter; organisms, both marine and fresh-water, in excess.	*Feet.* 5 to 15	3	Clear, rounded, and sharp; not over .125mm in diameter.	Very little.	A few black crystals.	Very large amount; carbonized and fresh.	Campylodiscus sp. undetermined, No. 1. Rotalia sp. undetermined, No. 2. Melosira (Gallionella) distans, Ehr. Melosira sp. undetermined, No. 8. Pinnularia viridula, Ehr. Cocconema lanceolatum, Ehr. Lithostylidium denticulatum, Ehr. Synedra acuta, Ehr. Spongolithis acicularis, Ehr. Fragillaria sp. undetermined, No. 1. Closterium sp. undetermined, No. 3. Two others undetermined, E and F.
	15 to 26	3	....do	A little	....do	....do	Campylodiscus sp. undetermined, No. 2. Rotalia sp. undetermined, No. 2. Orbulina universa, d'Orb. Melosira sp. undetermined, No. 1. Pinnularia viridula, Ehr. Navicula fulva?, Ehr. Lithostylidium denticulatum, Ehr. Spongolithis acicularis, Ehr. A and B. Cypris? Two others undetermined, E and F.
Stratum No. 8.—A sandy blue clay; calcareous; organisms few and more marine than fresh-water.	26 to 40	3	Clear, with a few grains of silicified wood; not over .1mm in diameter.	Abundant.	A few black crystals.	A little, macerated.	Rotalia sp. undetermined, No. 1. One undetermined, n. Coscinodiscus. Spongolithis acicularis, Ehr. A.
	40 to 55	2	Clear, rounded, and sharp; not over .08mm in diameter.	....do	None.....	....do	Pleurosigma sp. undetermined, No. 4. Melosira sp. undetermined, No. 1.
Stratum No. 5.—A sandy leaden blue clay, easily disintegrated; calcareous; marine, with a very few fresh-water organisms.	55 to 71	3	Clear, rounded; not over .5mm in diameter.	Abundant.	A few black crystals with some actinolite.	A little, macerated.	Rosalina Beccarii, d'Orb. Truncatulina (lobulata?), d'Orb. Planulina n. elegans, Ehr. Globigerina n. depressa, Ehr. Orbulina n. universa, d'Orb. Grammostomum sp. undetermined, No. 1. Campylodiscus sp. undetermined, No. 1. Coscinodiscus radiatus, Ehr. Triceratium reticulatum, Ehr. Navicula n. Grundleri, Ad. Schmidt. Spongolithis acicularis, Ehr. Spongolithis n. anchora, Ehr. Spongolithis n. aspera, Ehr. Fragillaria sp. undetermined, No. 1. Shell fragments abundant. Echinoid spines.

Larger organisms.—Balanus eburneus. Nassa acuta. Oliva literata. Natica pusilla. Scalaria lineata. Pholas costata. Pandora trilineata. Corbula cuneata. Mactra lateralis. Tellina alternata. T. tenera. Strigilla flexuosa. Chione cribraria. Tapes pygmaea. Cardium n. sp. (æquilaterale). Lævicardium Mortoni. Lucina (Codakia?) n. sp. Arca transversa. Mellita testudinata.

BORING No. 13.

	Depth of specimens	No. of decantations used in washing	Characteristics of the grains of quartz.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
Stratum No. 12.—Swamp clay, black with vegetable matter; more muc fine than fresh-water organisms.	*F. t.* 5 to 15	3	Clear, rounded and sharp; not over 1/6 in diameter.	Very little.	A few black crystals.	In excess; macerated.	Campylodiscus sp. undetermined, No. 1. Melosira sp. undetermined, No. 1. Cyclotella n. punctata. Ad. Schmidt. Lithostylidium denticulatum, Ehr. E. undetermined. Navicula sp. undetermined, No. 7.
	15 to 25	3	...do.....	....do.....	.....do.....	.....do.....	Do.
Stratum No. 8.—A blue clay; calcareous; more marine than fresh-water organisms.	30 to 35	2	Clear, sharp; not over 1/8 in diameter.	Moderate in amount.	None.....	Abundant...	Lenticulum n. discus, Ehr. Grammostomum n. Americanum, Ehr. Melosira sp. undetermined. Nos. 1 and 9. Navicula sp. No. 7. Spongolithis acicularis.
	35 to 45	2	Clear, with some yellow and brown grains and silicified wood; not over 1/6 in diameter.	Moderate in am'nt; some plates studded with garnets.	A little green striated.	....do.....	None noted.
	45 to 56	2	Clear, sharp; not over 1/8 in diameter.	Moderate in am'nt.	None.....	....do.....	Cyclotella n. punctata, Ad. Schmidt. Melosira sp. undetermined, No. 1, abundant.

Stratum No. 4, 56 to 69 feet. Fine greenish quartzose sand, moderately micaceous, grains both sharp and rounded. Shell fragments abundant, but small and mostly irrecognizable. Much macerated wood and fragments of Scirpus.

Larger organisms.—Balanus eburneus. Nassa acuta. Anachis avara. Mangelia sp. Oliva mutica. Natica pusilla. Obeliscus crenulatus. Dentalium, n. sp. (læve). Dent., n. sp. (sexangulare). Teredo sp. Pandora trilineata. Corbula cuneata. Mactra lateralis. Tellina tenera. Chione cribraria. Dosinia discus. Venus mercenaria. Astarte undulata. Lucina multilineata. L. costata. L. crenulata. L. Kiawahensis. Cardium, n. sp. (æquilaterale). Mellita testudinata.

BORING No. 14.

	Depth of specimens.	No. of decantations used in washing.	Characteristics of the grains of quartz.	Mica.	Tourmaline.	Vegetable matter.	Microscopic organisms.
Stratum No. 12.—Swamp clay, black with vegetable matter; organisms very abundant, more marine than fresh-water.	*Feet.* 5 to 15	3	Clear, rounded, and sharp; not over .13 mm in diameter.	Very little.	A few black crystals.	In excess....	Campylodiscus sp. undetermined, No. 1. Melosira sp. undetermined, No. 1. Cyclotella sp. undetermined, No. 1. Globigerina sp. undetermined, No. 1. Nitzschia? sp. undetermined, 2, 3, and 4. Navicula sp. undetermined, No. 8. Rhizosolenia sp. No. 2. Synedra acuta, Ehr. Spongolithis acicularis, Ehr. Spongolithis aspera, Ehr. Lithostylidium denticulatum, Ehr. Lithostylidium crispum, Ehr. E, H, G, and I undetermined.
	20 to 25	3	....do	....do	....do	....do.....	Do.
Stratum No. 8.—A blue clay, sandy; calcareous; organisms few, but more marine than fresh-water.	25 to 35	3	Clear, rounded, and sharp; not over .1 mm in diameter.	Abundant.	A few black crystals.	A little macerated.	None noted.
	35 to 45	3	....do	... do	None.....	....do.....	Do.
	45 to 56	3	....do	....do	....do	....do.....	Campylodiscus sp. No. 1. Melosira sp. undetermined, No. 1. Spongolithis acicularis, Ehr. Lithostylidium denticulatum, Ehr. I and J undetermined.

Stratum No. 4, 56 to 70 feet. Greenish sand, same as in boring 13 at same depths.

Larger organisms.—Balanus eburneus. Nassa acuta. Oliva mutica. Marginella limatula. Cæcum pulchellum. Dentalium? n. sp. (læve). Dent. n. sp. (sexangulare). Pholas costata. Corbula cuneata. Mactra lateralis. Tellina alternata. Tellidora lunulata. Chione cribraria. Dosinia discus. Lucina multilineata. L. costata. Lævicardium Mortoni. Arca transversa. A. pexata. A. ponderosa. Pinna muricata. Mellita testudinata. Cellepora n. sp. (1).

APPENDIX IV.

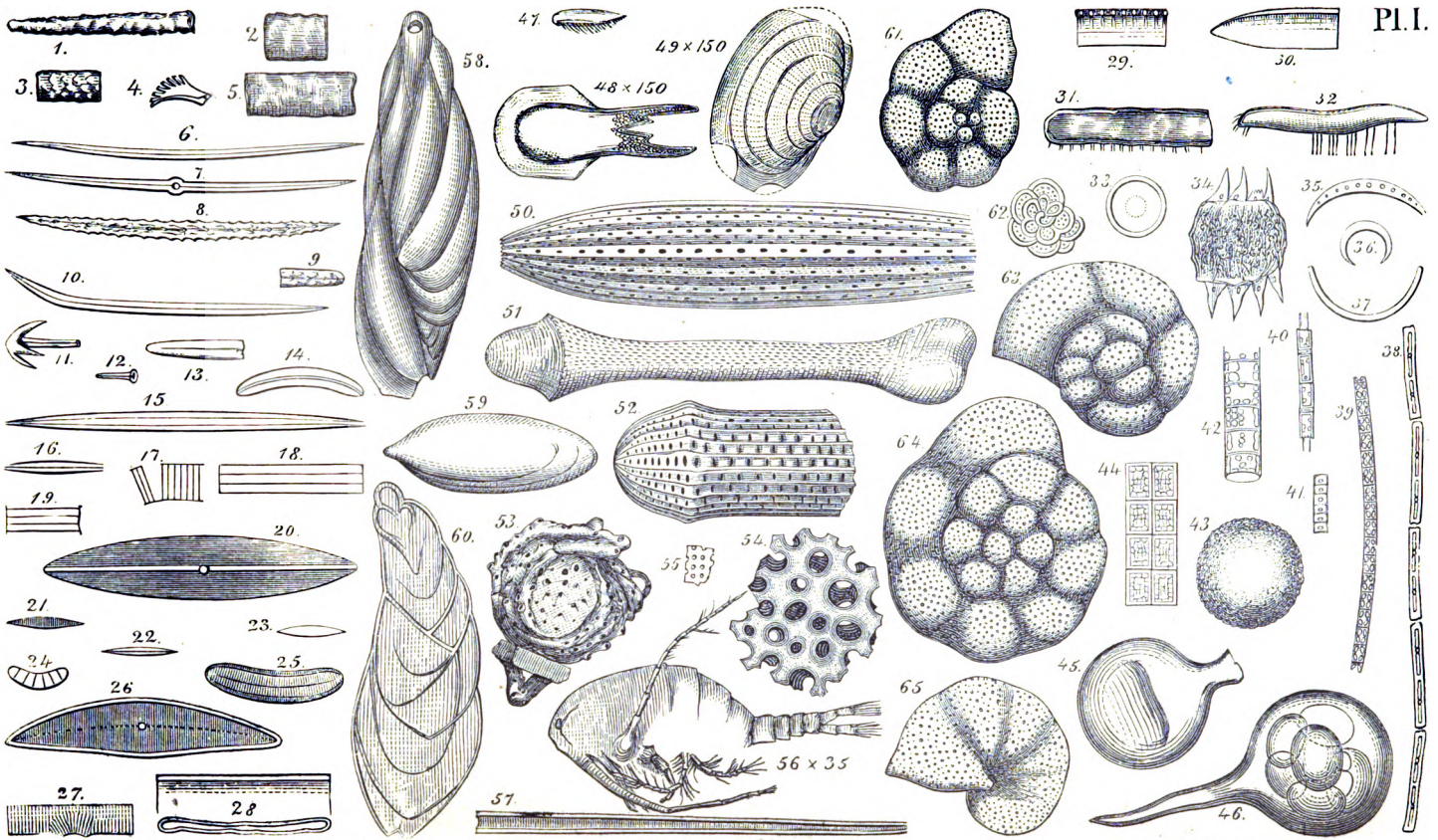
LIST OF MICROSCOPIC ORGANISMS FOUND IN BORINGS, WITH TWO PLATES. BY F. V. HOPKINS.

LIST OF FRESH-WATER ORGANISMS.

[To front Plate I.]

[The figures represent the objects magnified 300 diameters, unless otherwise marked on the plates.]

Fig. 1. Lithostylidium denticulatum, Ehr. Occurs in Borings 1, 2, 3, 7, 8, 9, 10, 11, 12, 13, and 14, and in Strata 4, 8, 9, 10, and 12.
Fig. 2. Lithostylidium quadratum, Ehr., in Borings 2 and 3. Strata 11 and 8.
Fig. 3. Lithostylidium n. quadratum, Ehr. Boring 10. Stratum 12.
Fig. 4. Lithostylidium crispum, Ehr. Boring 14. Stratum 12.
Fig. 5. Lithostylidium sp. undet., 1. Borings 1, 3, and 5. Strata 8, 11, and 3.
Fig. 6. Spongolithis acicularis, Ehr. Borings 1, 2, 3, 5, 6, 9, 10, 11, 12, 13, and 14. Strata 2, 3, 4, 5, 8, 11, and 12.
Fig. 7. Spongolithis mesogongyla, Ehr. Borings 1, 2, and 5. Strata 8, 11, and 13.
Fig. 8. Spongolithis aspera, Ehr. Borings 2, 5, 9, and 14. Strata 3, 11, and 12.
Fig. 9. Spongolithis n. aspera, Ehr. Boring 12. Stratum 5.
Fig. 10. Spongolithis inflexa, Ehr. Boring 9. Stratum 12.
Fig. 11. Spongolithis anchora, Ehr. Boring 12. Stratum 5.
Fig. 12. Spongolithis appendiculata, Ehr. Boring 5. Stratum 2.
Fig. 13. Spongolithis sp. undet., No. 1. Borings 6, 9, and 10. Strata 8 and 12.
Fig. 14. Spongolithis sp. undet., No. 2. Borings 10 and 2. Strata 8, 6, and 11.
Fig. 15. Synedra acuta? Ehr. Borings 1, 2, 4, 9, 12, and 14. Strata 8, 11, and 14.
Fig. 16. Synedra sp. undet., No. 1. Borings 2, 3, and 9. Strata 11, 8, and 12.
Fig. 17. Fragillaria capucina. Borings 3, 5, 9, and 10. Strata 2, 3, 4, 8, 11, and 12.
Fig. 18. Fragillaria sp. undet., No. 1. Borings 1, 2, 3, 5, 6, 9, 10, and 12. Strata 1, 3, 4, 5, 8, 11, and 12.
Fig. 19. Fragillaria sp. undet., No. 2. Borings 2, 3, 5, and 10. Strata 3, 4, 8, and 11.
Fig. 20. Navicula sp. undet., No. 1. Boring 3. Strata 11 and 4.
Fig. 21. Navicula sp. undet., No. 3. Boring 5. Stratum 8.
Fig. 22. Navicula sp. undet., No. 4. Borings 6 and 10. Strata 8 and 4.
Fig. 23. Navicula sp. undet., No. 5. Boring 9. Stratum 12.
Fig. 24. Eunotia n. gibberula, Ehr. Boring 10. Stratum 8.
Fig. 25. Eunotia sp. undet. Borings 2 and 3. Strata 11 and 4.
Fig. 26. Cocconema lanceolatum, Ehr. Borings 3, 6, and 12. Strata 8, 9, and 12.
Fig. 27. Nitzschia? sp. undet., No. 1. Boring 5. Stratum 11.
Fig. 28. Nitzschia? sp. undet., No. 2. Boring 14. Stratum 12.
Fig. 29. Nitzschia sp. undet., No. 3. Boring 14. Stratum 12.
Fig. 30. Nitzschia sp. undet., No. 4. Boring 14. Stratum 12.
Fig. 31. Rhizosolenia? sp. undet., No. 1. Boring 3. Stratum 11.
Fig. 32. Rhizosolenia? sp. undet., No. 2. Boring 14. Stratum 12.
Fig. 33. Gallionella (Melosira Ag.) distans, Ehr. Borings 10 and 12. Strata 8, 4, and 12.



DESMIDS.

Fig. 34. Xanthidium ? sp. undet., No. 1. Borings 2 and 4. Stratum 11.
Fig. 35. Closterium sp. undet., No. 1. Boring 10. Stratum 12.
Fig. 36. Closterium sp. undet., No. 2. Boring 10. Stratum 8.
Fig. 37. Closterium sp. undet., No. 3. Boring 12. Stratum 12.
Fig. 38. Leptocystinema Kinahani, Archer. Borings 2 and 4. Strata 8 and 11.
Fig. 39. Leptocystinema ? sp. undet. Borings 4 and 5. Stratum 11.

INCERTÆ SEDIS.

Fig. 40. A. Borings 3, 5, 10 and 12. Strata 2, 3, 4, 6, 8, 9, 10, 11, 12.
Fig. 41. B. Borings 3, 5, 6, 9, 10 and 12. Strata 2, 3, 4, 6, 8, 9, 10, 11, 12.
Fig. 42. C. Borings 1 and 8. Strata 8 and 11.
Fig. 43. D. Borings 1 and 3. Stratum 8.
Fig. 44. E. Borings 10, 12, 13 and 14. Stratum 12.
Fig. 45. F. Boring 12. Stratum 12.
Fig. 46. G. Boring 14. Stratum 12.
Fig. 47. H. Boring 14. Stratum 12.
Fig. 48. I. Boring 14. Stratum 8.
Fig. 49. J. Boring 14. Stratum 8. An infant *Codakia ?*

LIST OF SALT AND BRACKISH WATER ORGANISMS.

RADIATES.

Fig. 50. Echinoid spine sp. undet., No. 1. Boring 3. Stratum 4.
Fig. 51. Echinoid spine sp. undet., No. 2. Boring 5. Stratum 4.
Fig. 52. Echinoid spine sp. undet., No. 3. Borings 1, 5, 9, and 12. Strata 4 and 5.
Fig. 53. Coral sp. undet., K. Boring 3. Stratum 4.
Fig. 54. Coral sp. undet., L. Boring 5. Stratum 4.
Fig. 55. Coral sp. undet., M. Boring 10. Stratum 4.

ARTICULATE.

Fig. 56. Cyclops n. quadricornis. Boring 7. Stratum 8.

SPONGE.

Fig. 57. Hyalonema ? sp. undet. Boring 5. Stratum 3.

FORAMINIFERA.

Fig. 58. Grammostomum sp. undet., No. 1. Borings 1, 3, 12. Strata 4, 5, and 8.
Fig. 59. Grammostomum ? sp. undet., No. 2. Boring 3. Stratum 4.
Fig. 60. Grammostomum n. Americanum, Ehr. Boring 13. Stratum 8.
Fig. 61. Rotalia n. pachyphysa, Ehr. Boring 9. Stratum 12.
Fig. 62. Rotalia sp. undet., No. 1. Borings 3, 10 and 12. Strata 4 and 8.
Fig. 63. Rotalia sp. undet., No. 2. Borings 11 and 12. Stratum 12.
Fig. 64. Rosalina Beccarii, d'Orb. Borings 3, 6, 8, and 12. Strata 1, 8, and 5.
Fig. 65. Truncatulina (lobulata ? d'Orb.). Borings 5 and 12. Strata 4 and 5.

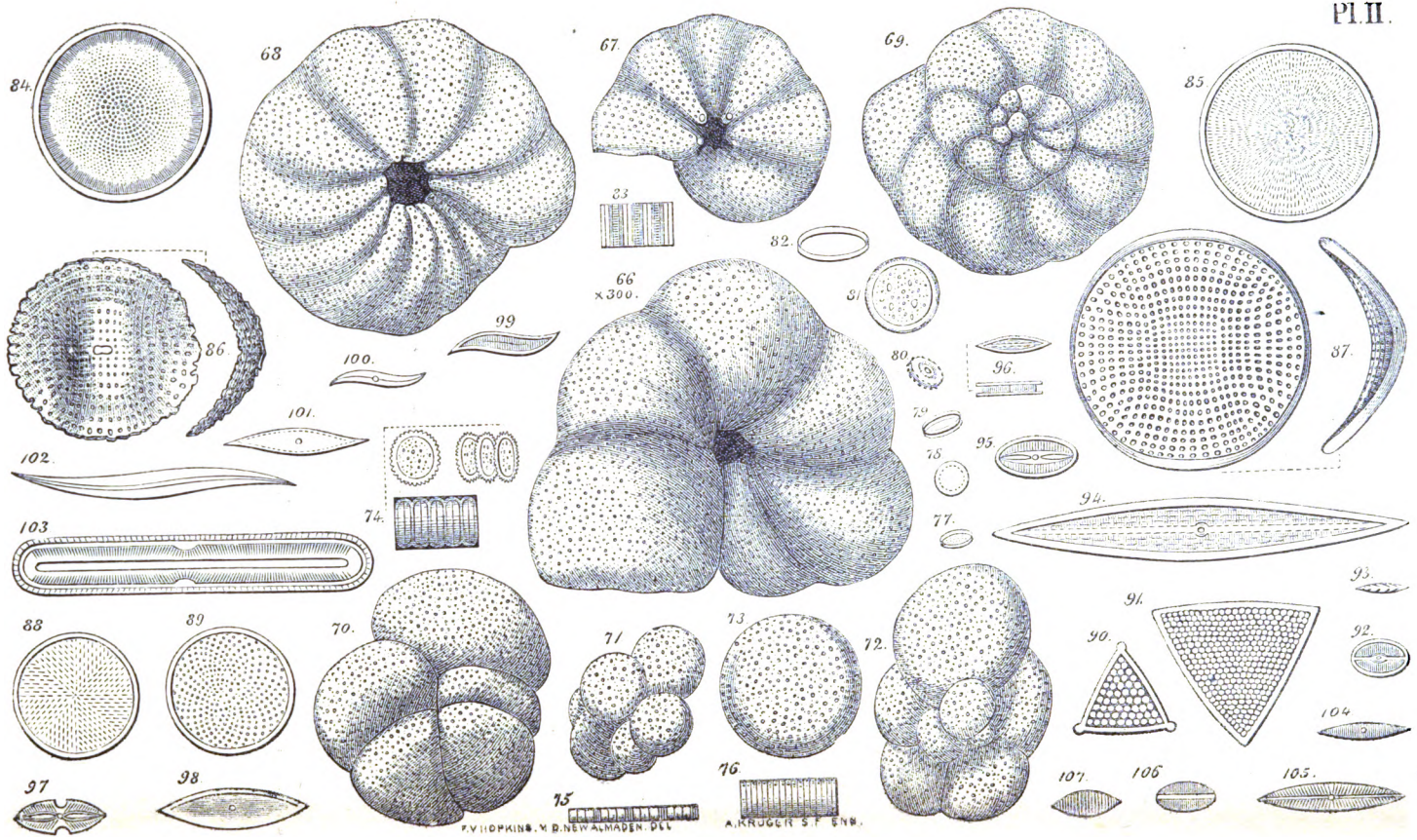
Salt and Brackish Water Organisms—Continued.

[To front Plate II.]

Fig. 66. Planulina n. elegans, Ehr. Borings 9 and 12. Strata 12 and 5.
Fig. 67. Nonionina (crassula ? d'Orb). Boring 5. Stratum 3.
Fig. 68. Nonionina sp. undet. Boring 5. Stratum 4.
Fig. 69. Lenticulum n. discus., Ehr. Boring 13. Stratum 8.
Fig. 70. Globigerina bulloides, d'Orb. Boring 3. Stratum 1.
Fig. 71. Globigerina n. depressa., Ehr. Boring 12. Stratum 5.
Fig. 72. Globigerina sp. undet. Boring 14. Stratum 12.
Fig. 73. Orbulina universa? d'Orb. Borings 3, 9, 10, and 12. Strata 1, 4, 5, 8, and 12.

DIATOMS.

Fig. 74. Melosira sp. undet., No. 1. Borings 1, 2, 3, 6, 8, 10, 11, 12, 13 14. Strata 4, 8, and 12.
Fig. 75. Melosira sp. undet., No. 2. Boring 3. Stratum 8.
Fig. 76. Melosira sp. undet., No. 3. Boring 9. Stratum 12.
Figs. 77, 78, 79, 80. Melosiræ sps. undet., Nos. 4, 5, 6, and 7. Boring 10. Stratum 8.
Fig. 81. Melosira sp. undet., No. 8. Boring 12. Stratum 12.
Fig. 82. Melosira sp. undet., No. 9. Boring 13. Stratum 8.
Fig. 83. Melosira sp. n. sulcata, Ehr. Boring 10. Stratum 8.
Fig. 84. Cyclotella n. punctata, Ad. Schmidt. Borings 2 and 13, Strata 12 and 8.
Fig. 85. Cyclotella sp. undet. Boring 14. Stratum 12.
Fig. 86. Campylodiscus sp. undet., No. 1. Borings 11, 12, 13, and 14, Strata 5, 8, 11, and 12.
Fig. 87. Campylodiscus sp. undet., No. 2. Boring 12. Stratum 12.
Fig. 88. Hyalodiscus cervinus? Brightwell. Boring 10. Strata 8 and 12.
Fig. 89. Coscinodiscus radiatus? Ehr. Borings 8, 11, and 12. Strata 8 and 5.
Fig. 90. Triceratium favus, Ehr. Boring 10. Stratum 8.
Fig. 91. Triceratium reticulatum, Ehr. Boring 12. Stratum 5.
Fig. 92. Navicula sp. undet., No. 2. Boring 3. Stratum 4.
Fig. 93. Navicula sp. undet., No. 6. Boring 10. Stratum 8.
Fig. 94. Navicula sp. undet., No. 7. Boring 9. Stratum 12.
Fig. 95. Navicula sp. undet., No. 8. Boring 14. Stratum 12.
Fig. 96. Navicula sp. undet., No. 9. Boring 13. Strata 8 and 12.
Fig. 97. Navicula sp. n. Grundleri, Ad. Schmidt. Boring 12. Stratum 5.
Fig. 98. Navicula (fulva? Ehr.). Boring 12. Stratum 12.
Figs. 99, 100. Pleurosigma sps. undet., Nos. 1 and 2. Boring 10. Stratum 8.
Fig. 101. Pleurosigma sp. undet., No. 3. Boring 10. Stratum 4.
Fig. 102. Pleurosigma sp. undet., No. 4. Boring 12. Stratum 8.
Fig. 103. Pinnularia n. gigas, Ehr. Boring 9. Stratum 12.
Fig. 104. Pinnularia macilenta, Ehr. Boring 10. Strata 8 and 4.
Fig. 105. Pinnularia viridula, Ehr. Boring 12. Stratum 12.
Fig. 106. Cocconeis sp. undet., No. 1. Boring 10. Stratum 8.
Fig. 107. Cocconeis (scutellum? Ehr.). Boring 10. Stratum 4.



APPENDIX V.

SYNOPTICAL TABLE OF THE "LARGER ORGAINISMS" FOUND IN THE BORINGS. NOTES ON FOSSILS. BY E. W. HILGARD.

Synoptical table of "larger organisms" occurring in the Lake Borgne survey borings.

	Boring.																											
	No. 1.		No. 2.	No. 3.		No. 4.		No. 5.			No. 6.		No. 7.			No. 8.		No. 9.				No. 10.		No. 11.	No. 12.	No. 13.	No. 14.	New Orleans well, 1856.
	Stratum 4, 73 to 95 feet.	Stratum 1, 95 to 100 feet.	Stratum 4, 68 to 82 feet.	Stratum 4, 72 to 97 feet.	Stratum 1, 97 to 100 feet.	Stratum 4, 64 to 91 feet.	Stratum 1, 91 to 100 feet.	Stratum 4, 57 to 72 feet.	Stratum 3, 72 to 78 feet.	Stratum 2, 78 to 100 feet.	Stratum 4, 59 to 81 feet.	Stratum 3, 81 to 85 feet.	Stratum 4, 72 to 87 feet.	Stratum 3, 87 to 88 feet.	Stratum 2, 88 to 100 feet.	Stratum 4, 63 to 77 feet.	Stratum 3, 77 to 80 feet.	Stratum 4'', 64 to 73 feet.	Stratum 4', 73 to 80 feet.	Stratum 4, 80 to 91 feet.	Stratum 1, 91 to 100 feet.	Stratum 6, 45 to 55 feet.	Stratum 4, 55 to 70 feet.	Stratum 4, 52 to 70 feet.	Stratum 5, 55 to 75 feet.	Stratum 4, 56 to 69 feet.	Stratum 4, 56 to 70 feet.	
Squalidean tooth	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Crab carapace, fragments	+	—	+	—	—	—	—	—	—	—	+	—	—	—	—	—	—	+	+	—	—	—	—	—	—	—	—	—
Cypris sp.?	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	—	—
Balanus eburneus (?)	+	—	+	+	+	+	—	+	+	—	+	+	+	—	—	+	—	—	+	+	+	+	+	—	+	+	+	+
Serpula n. sp.?	+	—	—	+	—	—	—	+	—	—	+	+	—	—	—	—	—	+	+	—	—	—	—	+	—	—	—	—
Ranella caudata, Say	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	—	—	—	—	—	—	—	+
Fasciolaria distans, Lam.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+
Sycotypus canaliculatus, Linn.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+
Sycotypus perversus	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	—	—	—
Urosalpinx cinereus, Say	—	—	—	—	—	—	—	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	—	—
Nassa acuta, Say	+	+	+	+	—	—	—	+	—	+	+	—	+	—	—	—	+	+	+	+	+	—	—	+	+	+	+	+
Anachis avara, Say	+	—	+	+	—	—	—	+	—	—	—	—	—	—	—	+	—	+	—	—	—	—	—	+	—	+	—	—
Anachis lunata, Say	—	—	—	—	—	—	—	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Oliva literata, Say	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	+
Oliva mutica, Say	+	—	+	+	+	—	—	+	—	+	+	—	—	—	—	+	—	+	+	+	+	—	+	+	—	+	+	+
Pleurotoma cerinum, K. and St.	—	—	—	—	—	—	—	+	—	—	—	—	—	—	—	—	—	+	—	—	—	—	—	—	—	—	—	+
Mangelia filiformis, Holm.	—	—	—	—	—	+	—	+	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Natica pusilla, Say	+	—	+	+	+	+	—	—	—	—	+	—	—	—	—	—	—	+	—	—	—	—	—	—	+	+	—	+
Natica Campeachensis	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+
Marginella limatula, Con.	+	—	—	+	—	—	—	—	—	—	+	—	—	—	—	—	—	—	+	+	—	—	—	—	—	—	+	+
Volva acicularis, H. and A.	—	—	—	—	—	—	—	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Turbonilla interrupta, H. and A.	+	—	—	—	—	—?	—	—	—	—	—	—	—	—	—	+	+?	—	—	—	—	—	—	—	—	—	—	—
Turbonilla speira, Rav.	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Turbonilla undecim-sulcata n. sp	—	—	—	—	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Turbonilla acicula, Holm.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—
Obeliscus crenulatus, Holm.	—	—	—	—	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	+	—	—
Caecum pulchellum, Stimp.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	—	—	—	—	—	+	—	—	+	—

Synoptical table of "larger organisms" occurring in the Lake Borgne survey borings.—Continued.

	Boring.																											
	No. 1.		No. 2.	No. 3.		No. 4.		No. 5.			No. 6.		No. 7.			No. 8.		No. 9.				No. 10.		No. 11.	No. 12.	No. 13.	No. 14.	New Orleans well, 1856.
	Stratum 4, 73 to 95 feet.	Stratum 1, 95 to 100 feet.	Stratum 4, 65 to 82 feet.	Stratum 4, 72 to 97 feet.	Stratum 1, 97 to 100 feet.	Stratum 4, 64 to 91 feet.	Stratum 1, 91 to 100 feet.	Stratum 4, 57 to 72 feet.	Stratum 3, 72 to 78 feet.	Stratum 2, 78 to 100 feet.	Stratum 4, 59 to 81 feet.	Stratum 3, 59 to 81 feet.	Stratum 4, 72 to 87 feet.	Stratum 3, 87 to 88 feet.	Stratum 2, 88 to 100 feet.	Stratum 4, 63 to 77 feet.	Stratum 3, 77 to 80 feet.	Stratum 4, 64 to 73 feet.	Stratum 4, 73 to 80 feet.	Stratum 4, 80 to 91 feet.	Stratum 1, 91 to 100 feet.	Stratum 6, 45 to 55 feet.	Stratum 4, 55 to 70 feet.	Stratum 4, 32 to 70 feet.	Stratum 5, 55 to 75 feet.	Stratum 4, 36 to 69 feet.	Stratum 4, 56 to 70 feet.	
Scalaria angulata, Say	+	—	—	+	—		—	—	—	—	—	—	—	—	—	+	—	—	—		—	—	—	—	—	—	—	—
Scalaria lineata, Say	—	—	—	—	—	—	—	—	—		—	—	—		—	—	+	+	—	—	—	—	—	—	+	—	—	—
Architectonica gemma, Holm.	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	—	—
Acus dislocatum, Say	—	—	+		—	—	—	—	—	—	—		—	—	—		—	—	—	—		—	—	+	—	—		+
Modulus Floridanus, Con.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	—	+	—	—	—	—
Crepidula fornicata, Linn.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	—	+
Dentalium ? n. sp. (laeve)	+	—	+	+	—	—	—	+	—	—	+	+	+	—	—	+	—	+	—	+	—	+	+	+	—	+	+	
Dentalium n. sp. (sexangulare)	—	—	+	+	—	+	—	+	—	—	—	—	—	—	—	+	—	+	—	—	—	—	—	+	—	+	+	—
Cylichna sp.	—	—	—	+	—	+	—	—	—	—	+	—	—		—	—	—	—	—	—	—	—	—	—	—	—	—	—
Utriculus (Tornatina) biplicatus, H. C. Lea	+	+	—	—		—	—	+	—	—	—	—	—	—	—	—	—	—	—	+	—	—	+	+	—	—	—	+
Teredo sp.	+		+	—	—		—	—	—	—		—	—	—	—	—	—	+	—	—	—	—	—	—	—	+	—	—
Dactylina oblongata, Say	—	—	—	+	—	—	—	—	—	—		—	—	—	—	—	—	—	—	—	+	—	—	—	—	—		—
Pholas costata, Linn.	—	—	+	+	—	+	—	+	—	—	+	+	+	—	—	+	+	+	—	+	—	—	—	+	+	—	+	+
Pandora trilineata, Say	+	—	+	+	+	+	—	+	—	—	+	+	—	—	—	—	—	+	—	+	+	—	+	+	+	+	—	+
Corbula cuneata, Say	—	—	+	+	—	—	+	+	—	+	+	—	+	—	+	+	+	+	+	—	—	—	+	+	+	+	+	—
Corbula acuta ?	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—		—	—	—	—		—	—	—	—
Solen viridis, Say	—	—	—	+	—	—	—	—	—	+	+	+	—	—	—	+	—	—	—	—	—	—	+	+	—	—		—
Gnathodon cuneatus, Say	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	—	—	—	—	—	—	+
Mactra lateralis, Say	+	+	—	+	+	—	—	+	+	+	+	—	+	+	—	+	+	+	+	+	+	+	+	+	+	+	+	+
Mactra Sayi, Con.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	—	—	—	—	—	—	—	—	+
Tellina alternata, Say	+	—	+	+	+	+	+	+	—	+	+	+	+	—	+	+	—	+	+	+	—	—	—	+	+		+	+
Tellina polita, Say	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	+	—	—	—	+
Tellina tenera, Say	+	—	+	+	—	+	—	+	—	—	+	+	—	+!	—	—	—	+	—	+	—	—	—	—	+	+	—	+
Tellina tenta, Say	+	—	—	—		—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+
Strigilla flexuosa, Say	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	+	+	—	—	+
Macoma fusca, Say	+	—	—	—	—	—	—	+?	+?	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Tellidora lunulata, Adams	+	—	—	+	—	—	+	—	—	—	+	+	+	—	—	—	—	—	+	—	—	—	+			—	+	+
Donax variabilis, Say	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	—	+
Abra n. sp., Con.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+
Semele n. sp., Con.	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	—	—	—	—	—	+?	—	—	—	—	+
Chione cancellata, Linn.	—	—	+	—	+	—	—	+	—	—	—	—	+	—	—	—	+	—	—	—	+	—	—	+	—	—	—	+
Chione cribraria, Con.	—	—	+	+	+	+	—	+	+	+	+	—	+	—	+	+	+	—	—	+	+	—	+	+	+	+	+	+

Chione latilirata, Con. (C. paphia, Lam.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+
Dosinia concentrica, Con. (D. discus, Rve.)	+	—	+	+	—	+	+	+	—	+	+	—	—	—	+	+	—	+	+	+	—	—	—	—	—	+	+	+
Tapes pygmaea	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	+
Mercenaria violacea, Adams	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	+
Astarte lunulata, Con.	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	+	—	—	—	+
Astarte undulata, Say	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	+	—	—	—	—	—	+	—	—
Lucina multilineata, Con.	+	—	+	+	+	+	+	+	—	+	+	—	+	—	—	+	+	+	+	—	+	+	+	+	—	+	+	+
L. costata, T. and H.	+	—	+	+	—	—	—	+	—	—	+	—	+	—	+	—	+	+	+	—	+	—	+	+	—	+	+	+
Lucina Kiawahensis, T. and H.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	+	—	+	—	—
Lucina crenulata, Con.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—
Cardium magnum, Born	—	—	+?	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+
Cardium n. sp.? (aequilaterale)	—	—	+	+	+	+	—	+	—	—	+	—	+	—	—	+	—	+	—	—	—	—	+	—	+	+	—	—
Cardium n. sp., Con. (inaequilaterale)	—	—	+	+	—	—	—	+	—	—	—	—	—	—	—	+	—	—	—	—	—	—	—	+	—	—	—	+
Laevicardium Mortoni, Con.	—	—	+	+	+	—	+	—	+	—	+	—	+	—	+	—	—	+	+	—	—	—	+	—	+	—	+	+
Arca transversa, Say	+	—	+	+	+	+	+	+	+	—	+	+	—	—	—	+	+	+	+	—	+	+	+	+	+	—	+	+
Arca pexata, Say	—	—	—	—	—	—	—	—	—	—	+	—	—	—	—	—	—	—	+	—	—	—	—	—	—	—	+	+
Arca ponderosa, Say	—	—	—	—	+	—	—	—	—	+	—	—	—	—	—	—	+	—	—	—	—	—	—	+	—	—	+	+
Arca Americana, Gray	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+
Leda acuta, Con.	—	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Modiola ?	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	—	—
Pinna muricata, Linn.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—
Lima sp.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+?	—	—	—	—	—	—	—	—	—	—	—	—
Pecten dislocatus, Say	—	—	+?	+?	—	—	—	+?	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+
Pecten dentatus ?	—	—	—	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+
Anomia ephippium, Linn.	—	—	—	+	—	—	—	—	—	+	—	—	—	—	—	+	+	+	+	—	—	—	+	+	—	—	—	+
Ostrea, 2 sp., undet.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+
Glottidia pyramidata, Stimp	+	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mellita testudinata, Klein? or M. Caroliniana, Rav.	+	+	+	+	+	+	+	+	+	+	+	+	+	—	+	+	+	+	+	+	—	—	+	+	+	+	+	—
Cellepora sp. (1)	+?	—	+	+?	+	+	—	+	—	—	+	—	—	—	—	+	+	+	+	—	—	—	+	+	—	+	+	+
Cellepora sp. (2)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	—	—	+	+	—	—	—	+

NOTES ON THE LARGER FOSSILS FOUND IN THE BORINGS FOR THE LAKE BORGNE OUTLET.

Balanus eburneus.—The specimens of this somewhat tender species, occurring in nearly all the marine strata examined, are all so broken and worn as to render an absolute specific identification difficult. Its general shape could in no case be verified; but the structural characters, as far as observable, agree with those of *B. eburneus.*

Serpula "fenestrata," n. sp.?—Of very general occurrence in the marine sands; minute; fragments rarely above 0.3^{mm} in length; sometimes two or three tubes longitudinally coherent. Canal orbicular, about 0.3^{mm} in diameter, smooth. Walls of about the same average thickness as the diameter of the canal exterior of four to five rough, irregular lamellar costæ, each forming a ridge between two rows of transverse rectangular cells, which, when worn, impart to the surface a fenestrated appearance. On the longitudinal section these cells appear subquadrate and twice the diameter of the solid portion of the tube-wall. Pl. III, Fig. 11*a*; *b*, worn fragment; *c* and *d*, horizontal and longitudal sections.

Turbonilla undecim-sulcata, n. sp.—In form of spire, etc., resembles T. 5-*striata* Holmes. It differs in having eight revolving lines, one of which is double, and two broad furrows. One of the latter is at base, close to the shoulder, then four fine lines, of which the lowest is the double one; then (a little above the middle of the volution), the second broad furrow, then four more lines. Fig. 10, basal whorl, with magnified view of lines.

Utriculus (*Tornatina*) *biplicatus.*—This is the species named *Bullina canaliculata* in my report on the fossils of the New Orleans artesian well (Rep. U. S. Eng. Dept. for 1870). Upon examination of more numerous and perfect specimens in the present series, I identify the New Orleans specimens likewise with *U. biplicatus.*

Cylichna sp.—From the broken and much worn specimens found, I am unable to identify this shell positively with any of the described species. It comes nearest C. oryza Stimp. Pl. III, Fig. 14.

Architectonica gemma.—Although differing slightly in sculpture from Holmes' description, this can hardly be claimed as a new species. Pl. III, fig. 9, basal and dorsal view. In the latter the prominence of the apical volution is not sufficiently shown.

Natica Campeachenis. Pl. III, fig. 8.—Young shell, natural size. A careful comparison of this shell with a full suite of specimens from the West Indies, establishes its identity. From the New Orleans artesian well of 1856.

Dentalium (*Antalis*)? "*laeve,*" n. sp.?—Minute, almost straight, young shells, semi-transparent, very fragile, very abundant in some sediments; older ones opaque, porcelain-like; surface perfectly smooth and shining, with no trace of longitudinal striæ, but faintly perceptible growth-lines. Apex rounded, imperforate, as observed in immature specimens of 2 to 3^{mm} length. Greatest length of fragment observed 6.75^{mm}, indicating about 10^{mm} as the length of the mature shell. The imperforate apex, if maintained in maturity, seems to separate this shell from *Antalis* and *Dentalium.* Pl. III, fig. 6.

Dentalium "sexangulare," n. sp.?—Larger than the preceding, but no perfect specimen seen. Shell rather thick, not shining, six-sided, with an elevated line midway on the faces; curved especially toward the apex. Resembles strongly *D. alternatum* of the Mississippi eocene. Pl. III, fig. 7; A, apex; C, basal cross-section.

Pl. III.

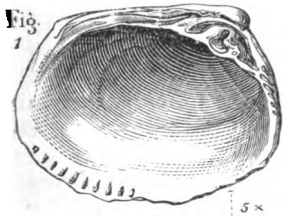
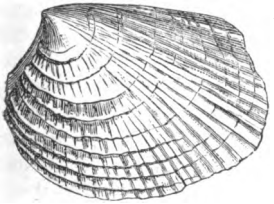


Fig. 1



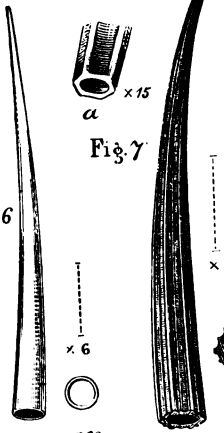


Fig. 6

a

Fig. 7


b

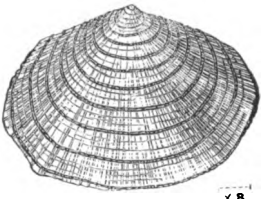


Fig. 2

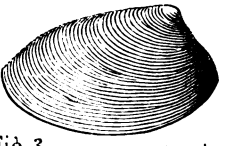


Fig. 3


Fig. 8

Fig. 10


Fig. 9

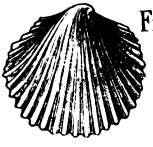
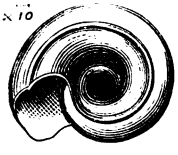
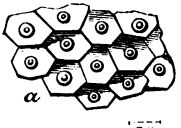


Fig. 4




a

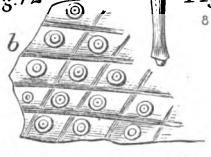

c


d


Fig. 5

Fig. 12

Fig. 12


b

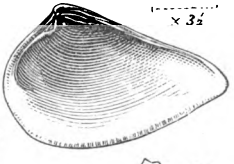


Fig. 13 a № 2. b

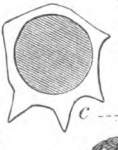
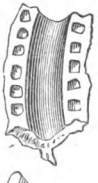

c

Fig. 11.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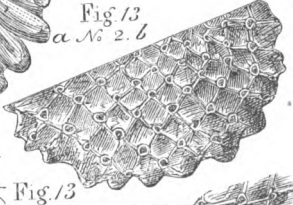


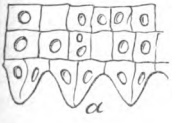
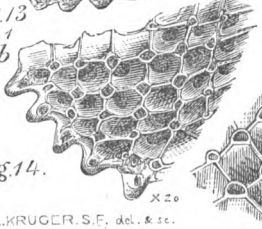
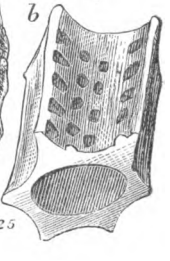

a

Fig. 13 № 1


a


b


b

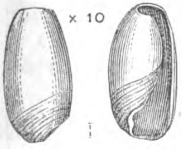
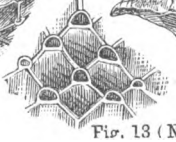


Fig. 14.



A. KRUGER. S.F. del. & sc.

Fig. 13 (No. 2

Corbula cuneata.—"Rather more deeply and regularly ribbed than Say's figure, but clearly referrible to this very variable species." (R. E. C. Stearns.) Very abundantly and generally present in the strata examined, and somewhat unaccountably absent from the fossils of the New Orleans artesian well of 1856.

Astarte undulata Say. (?)—Not over 3.5^{mm} in diameter; agrees most nearly with this exceedingly variable species of Say.

Cardium "æquilaterale," n. sp.?—Shell orbicular, perfectly equilateral; maximum length, 2.2^{mm}; profoundly radiately ribbed; ribs about 28 in number, obtuse on edge, nearly triangular in cross-section, smooth, except the last 5 or 6 posterior ones, which have distant, smooth, mamillary warts, very uniform in size, so as to appear to be an adult shell. Very abundant in some of the Lake Borgne specimens, but not observed in the New Orleans well series. In both suites, however, there occurs sparingly another minute species.

Cardium "inæquilaterale," n. sp., perfect specimens of which from New Orleans were forwarded by me to Mr. Conrad, and recognized as new, but not as yet described in consequence of having been mislaid. In general form it resembles *C. magnum*, but is distinguished by its minuteness and surface sculpture from all described species. No perfect specimen was found in the Lake Borgne suite; characteristic fragments are not uncommon, but none sufficient for figuring.

Strigilla (Tellina) flexuosa, Say.—One of the most abundant shells of the New Orleans series, is quite rare in the Lake Borgne suite.

Abra n. sp. (fide Conrad, 1870).—A pretty species, abundant at some levels in the New Orleans artesian well, and to which some fragments found in the Lake Borgne borings may be referrible. Pl. III, fig. 3.

Venus cuneimeris (Circomphalus?), Pl. III, fig. 5.—Agrees with specimens from Florida collected by Mr. R. E. C. Stearns. Probably from the New Orleans artesian well of 1856, at 41 feet.

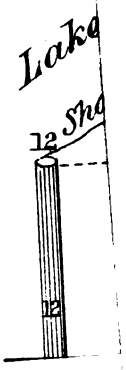
Tapes pygmæa.—Believed to be a new species by Mr. Conrad, to whom I transmitted specimens in 1870, but not described by him. The shell figured agrees altogether with Floridian specimens in the possession of Mr. Stearns. Pl. III, fig. 1.

Lucina (Codakia) n. sp.?—Only one valve found, somewhat imperfect. Hinge showing two subtriangular pits separated by a thin, straight, vertical lamellar tooth. Shell much compressed, undulate, thick. Pl. III, fig. 2.

Mellita testudinata Klein?—None of the fragments found were large enough to ascertain distinctly its general outline or the existence of perforations. Professor Carpenter, in a note on specimens sent him by Mr. Forshey, determines the specimens to be *M. pentafora* (doubtless *M. quinquefora* Lamk). But the form of the spines and spicules of my specimens, as well as the sculpture of the pits, does not agree with M. quinfora, but very closely with *M. testudinata*. On the other hand, in the regularity of the arrangement of the pits on the surface, it differs materially from the photograph given in the Cambr. Mus. Cat. (No. 7, Pl. XII^c), of *M. testudinata*. Pl. III, fig. 12, fragments showing surface sculpture, spines, and spicule.

Cellepora sp., (1). Pl. III, No. 1; A, lower, B, upper surface; fragments only found.

Cellepora sp., (2). Pl. III, No. 2; A, complete specimen, lower surface; B, upper surface; C, same magnified.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