

### THE CALOOSAHATCHIE.

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The region about the Caloosahatchie, and more particularly the interior tract which harbors the headwaters of that stream, are so little known that we found it almost impossible to obtain any information that could prove of advantage to us in our intended exploration of the southern wilderness. The most that could be ascertained was that at certain intervals along the river we would come across settled hamlets or plantations, but the approximate distances at which these furthest outliers of civilization were to be met with were so vaguely stated, and differed so materially among themselves, that it was impossible to place any implicit reliance upon them. No scientific observations, other than those pertaining to pure topography and hydrography, had ever been made in this section of the State before, which fact, coupled with the hope that along this stream we might expect to find a more reliable clue to the true physical history of the State than along any other, provided a geological profile was offered, made us anxious to enter the *terra incognita*. The results obtained amply warranted our determination.

The ascent of the river to Fort Thompson, where a rapid separates the headwaters from the waters of the lower stream, consumed somewhat more than four days, during which time, owing to contrary winds, and the remarkably tortuous channel, frequent recourse had to be had to the pole. The actual distance from the sea-border to the site of this old fort is not more than fifty miles, but measured along the sinuosities of the channel, which are especially well-marked in the upper course, and more particularly in the reach of the last few miles below the rapids, the distance is very nearly twice as great. We found a considerable depth of water, ranging in a general way from about five to fifteen feet, almost along the entire course of the stream, except in the immediate embouchure, or in the stretch of the first few miles above Punta Rassa, where innumerable shoals so completely bar the channel as to render its passage difficult and hazardous to all but the lightest craft. Although drawing but two feet of water, our schooner barely succeeded in effecting an entrance, and on the return journey we were shoaled several times. There seems to be no reason why, with a moderate outlay, this channel could not be so deepened as to permit of a safe and ready entry even for vessels of a moderately high draught, although, manifestly, by reason of the very

gradual shelving of the sea-bottom, no really great depth of water could ever be secured. But even with this deepening the tortuousness of the channel would still very materially interfere with the possible conversion of the stream into a highway of travel, and not until connecting canals are cut to shorten distances is it likely that much use will be made of the stream as a water-way either to or from the far interior. The deepest sounding obtained by Engineer Meigs during his official survey of the river was sixteen feet, but at least in one instance, not very far from the site of Fort Denaud, our lead dropped 28 feet, and I am informed by our captain that on a former occasion he had marked off 32 feet. Numerous snags, principally trunks of live-oak and palmetto, around which sand-bars have formed, and are forming, obstruct the channel of the river for a very considerable part of its course, and render navigation in some parts a matter of considerable caution. These could be very readily removed, however, as only in very few places do they appear to be actually jammed.

The width of the stream varies considerably, naturally narrowing very rapidly in its upper course. Here, the numerous projecting or overhanging trees, in their tendency to catch on to the rigging, necessitate a careful rounding of the bights, into which a vessel is apt to be forced by the current of the water. On more than one occasion a pennant, derived from the overhanging vegetation, was added to our topmast, and once we barely escaped serious accident through this novel method of aerial anchorage. Along the lower reaches of the river the mangrove constitutes the predominating element in the vegetation, its dense line of aerial roots forming an impenetrable palisade for miles of the river-front. We found that the plants here had suffered much less from the cold than elsewhere, and they accordingly presented a much more vernal aspect than in the bays and inlets to the north. The foliage was brilliant green, and showed but little of that purple tint which elsewhere recalled our autumnal season. At Fort Myers the orange trees were in both fruit and flower, and here for the first time could we obtain quantities of that most luscious fruit without being compelled to select from a mass of frost-bitten specimens. The general southern limit of the cold wave, which at Tampa is reported to have depressed the thermometer to 18° F., might be said to have been the Caloosahatchie. Still, even along this river many of the more tropical plants appear to have suffered. Thus, while at Fort Myers the cocoanut and date-palm were bearing fruit—noble specimens of their kind—the banana presented a most wilted appearance, the few straggling leaves or stems that were not frost-bitten little recalling those graceful outlines which the delineations of travelers impress upon their sketches of tropical scenery. The pineapple appears to have suffered equally with the banana, both here and further along the river in the interior.

A few miles above Fort Myers the mangrove gradually thins out, and is followed by straggling lines or groups of palmettos, which here attain a height of some thirty to forty feet. Before reaching Telegraph Station, and at intervals beyond, the forest unfolds itself in its full magnificence, the dense tangle of endless creepers and climbers, the rigid but delicate leaves of the palm, whose noble shaft is reared pre-eminent over the forest, and the brilliant greens with which the eye never satiates, forming a picture of scenic loveliness which no pen can adequately describe. The growth along the immediate water margin is very dense, so that in many places no landing can be effected. The almost complete absence of flowering plants was here again very apparent, but I observed at least one species of *Ipomæa* and a *Lobelia* in bloom.

One of the largest of the lower clearings is seen at Thorpe's, on the right bank of the river, where, in addition to the cultivation of a number of semi-tropical products, such as the pineapple and banana, there is a considerable industry derived from the growth of the cane, which yields sugar of a fine quality. The soil is reported to be very favorable to the proper development of this vegetable product, which is also cultivated with profit in other sections of the country where but little else is produced. A series of clearings, alternating with larger patches of more or less heavily timbered woodland, ending in a pine tract, extend from Thorpe's to within about twelve or fourteen miles of Ft. Thompson, when an apparently interminable forest of palms clothes the river on both banks. This is probably one of the most extensive tracts of primeval palm growth in the State. The palm trunks range to 40 or 50 feet, or more, in height, and almost by themselves constitute the forest, there being but little intermixture of deciduous trees. There is also little, or no undergrowth, and the eye, accustomed to the impenetrable mazes of the lower river, follows with rapturous delight the beautiful vistas that reach far into the forbidding recesses of the deep interior. Nowhere else did I observe such a wealth of arboreal vegetation; the profusion of plants clustering around the individual palms, forming there aerial gardens of the most fairy-like description, was simply amazing, and, indeed it seemed as though the usual undergrowth of our northern forests had been bodily transported into an upper realm.

The larger game, such as the deer, wolf and American panther, or Florida lion, are said to be fairly abundant in these wilds, especially in the more open country of pines, but we had little opportunity of testing the truth of the currently received notions respecting the distribution of these animals. On the return journey our captain, whom we were compelled to send on a foraging expedition, reported the finding of several deer, but this is the only instance during our entire journey when a mammal, exceeding the raccoon in size, was actually seen, although on one

occasion, on the borders of Lake Okeechobee, we heard the cry of a large cat, probably the panther. The birds of the forest were not very numerous either, and they appeared to be restricted to a comparatively small number of distinct types—red-headed woodpecker, cardinal grosbeak, scarlet tanager, a number of warblers, etc. We heard the cackle of the wild turkey on one or two occasions, and once a specimen of this not very rare bird helped to grace our larder. In the open meadow or "prairie" country immediately above Fort Thompson we observed three flocks, of six or eight individuals each, of sand-hill cranes (*Grus pratensis*), whose graceful outlines presented very pleasing objects in relief to the sombre green background. Their utter disregard for our presence and apparent ignorance of any possible injury, even during the firing of a gun, permitted of an easy approach to within short range, but we failed to secure specimens. The only response to our discharge was an aerial saltation of about three feet, followed by a peaceful return to a disturbed, and apparently interminable, meal. From this point inland, the marsh lands, with their scattered "hammaks" of hard-wood, and everglades literally teem with wild-fowl of all descriptions.

We paid but little attention to fishing on the Caloosahatchie, and are therefore not prepared to say much concerning the ichthyic fauna of that river. It is true that we observed, all in all, but a very insignificant number of fishes, but there is reason to believe that the river is fairly well stocked with these animals. The bass and cat-fish are reported to be fished quite extensively, and we caught several specimens of a bream and sun-fish.—The alligator is still fairly abundant in some parts of the stream, especially towards its upper course, but its early destruction is threatened through the endless pursuit of the hide-hunters, whose compensation is about 50 cents for the hide of an animal exceeding five feet in length. The expense of skinning and salting is included in this sum, which, therefore, allows but little margin for profit, and necessitates an appalling destruction of the animal in order to secure the hunter against loss. None of the animals that we saw in the river were of large size, and the greater number probably did not exceed six feet in length.

Owing to the great number of snags in the channel, and the fear of losing our dredge, we were unable to make any systematic observations respecting the invertebrate fauna of the stream; the dark color of the water, moreover, resulting from an infusion of palmetto roots and stocks, limited the range of vision to a very moderate depth, so that we were doubly handicapped. Still, as far as could be ascertained, there appears to be a decided deficiency in this lower fauna. Indeed, almost the only molluscan form that we obtained were a species of *Unio*, a *Neritina* (*N. reactivata*), a *Planorbis* (*P. trivolvis*), and an *Ampullaria* (*A. depressa*). Other species, doubtless, exist, and possibly even in considerable quantity,

concealed along the deeper and inaccessible parts of the stream. In the everglade tract above Fort Thompson two species of Planorbis (*P. trivolvis* and *P. [Physa] scalaris*), besides the large Ampullaria, were very plentiful, and still nearer the interior lakes the dredge brought up quantities of one or more species of Vivipara (*V. lineata*, *V. Georgiana?*).

GEOLOGICAL FEATURES OF THE CALOOSAHATCHIE.—The banks of the river for its entire course are very low, at no place probably rising much above twelve feet. They are highest in the middle and upper course of the stream, where their faces are cut down almost vertically to the water's level, below which they descend at a very steep angle. In the lower reaches of the river they barely attain one-half this height, and, indeed, for a very considerable distance above Fort Myers, the average elevation probably does not exceed three or four feet, and beyond the immediate border the land-surface, showing unmistakable signs of periodic overflows, sinks still lower.\* Compact rock crops out here and there, or may be seen lying in the channel, but for by far the greater distance the banks consist of a partially indurated marl, in which, at places, fossils are exceedingly abundant. In my experience I have never met with an exposure in which fossils were nearly as plentiful as in the vertical cut which extends almost uninterruptedly for ten or more miles below the Thompson rapids. Fossils could here be counted by the million, and were as densely packed, but without crushing, as it was possible for them to have been placed together. Their state of preservation was also wonderful.

Owing to the innumerable turns in the river, and the fact that the beds exposed maintain a well-defined horizontality for most of their extent, I was unable to satisfy myself as to the direction of true dip†, so that it may yet be an open question how much of the more westerly exposed rocks, or those cropping out at, and immediately above, Fort Myers, correspond to the rocks exposed along the upper stream. The fact, however, that there is such a slight difference in level between the inner and outer points, and the circumstance that for such a long distance the practical horizontality of the beds can be connectedly followed, lead me to suppose that the entire system is in reality one, despite a certain amount of variation both in the lithological and faunal features of the deposits.

\* Tide-water, or perhaps more properly back-water, is said to extend to Fort Thompson. We, however, found a strong river-current for a considerable distance below this point, both during our ascent and descent of the river. The difference between mean high water and mean low water at Fort Myers has been determined by Meigs to be 2.2 feet.

† At one point, not very far above Daniels', the strata show a decided declination to the east, or towards the interior of the State, but I feel confident that this marked deviation from the horizontal is a local circumstance, and has but little bearing on the question of true dip.

A tough sand-rock, of undoubtedly recent formation, crops out at Fort Myers, just above the landing; as far as I could determine, it was destitute of organic remains, or when present these were in such a fragmentary condition as to be unrecognizable. I was also shown along the river's bank a number of large nodules or boulders of a fossiliferous limestone, which were reported to have been obtained from a neighboring well-digging. In these the recent *Venus cancellata* was clearly determinable; from the very great abundance of this shell, its excellent state of preservation, and the general appearance of the imbedding matrix, I feel satisfied that the rock is of Post-Pliocene age—certainly not older than late Pliocene. A somewhat similar rock, densely charged with the same species of mollusk, and with various other bivalves, besides a host of gasteropods (*Fulgur*, *Turbinella*, etc.) crops out in a field on the left bank of the river, about 20 miles by water above Fort Myers (six or seven miles in a direct line?), not very much beyond Telegraph Creek crossing. The species of mollusk recognized here were: *Venus cancellata*, *Venus mercenaria* (*permagna?*), *Cardita Floridana*, *Arca transversa*, *Fulgur* sp.?, etc., all of them apparently still living in our waters, from which it is to be inferred that the deposit is of Post-Pliocene age. The rock is overlaid by a sandstone, in appearance identical with that which crops out at Fort Myers, of which it is the probable equivalent. Immediately below the fossiliferous stratum first described a tough rock, largely charged with shell-fragments, and containing numerous impressions of bivalves, mainly of small size, makes its appearance at water-level, below which it extends for probably several feet. The very unsatisfactory condition of the embedded remains, rendering a positive determination of species impossible, precluded also an absolute determination of the horizon. The sharp line of demarkation separating this deposit from that immediately overlying it, coupled with the knowledge that extensive Pliocene deposits are developed in the further course of the stream, leads me to suspect that this basal rock is also Pliocene, or, at any rate, that it represents a geological period distinct from that which is indicated by the *Venus cancellata* bed.

Just below Thorpe's, and in both banks, a white shell marl rises out of the water to a height of about two and a half or three feet. It contains great quantities of a ponderous flat oyster (*Ostrea meridionalis*), distinct from any of the related forms now living, and of two large scallops—*Pecten comparilis*, and a form, *P. solaroides*, resembling it in general outline, but differing in its much greater size, and in several other peculiarities of structure. Both the oyster and the scallops could be detected in the marl-rock some distance beneath the surface of the water, whence several specimens were obtained by means of the mattock. The *Ostrea Virginica* is also very abundant in the sand rock. On top of this fossil-

iferous white marl, for which I assume a Pliocene age,\* there rests a stratum containing innumerable valves of the *Venus cancellata* (Post-Pliocene).

Mr. Thorpe conducted me to an outcrop of compact sand-rock in a palm "hammak," just back of his sugar-mill, which had much the appearance of the rock exposed at our last section on the river. Its absolute stratigraphical relations with the beds exposed immediately on the river front could not be established, but it is certainly very nearly the newest of the series.

The banks increase in height almost immediately after leaving Thorpe's, but for a considerable distance there is a decided dearth of fossil remains. Stray specimens of the oyster or *Pecten* appear here and there in the beds, but for miles we found practically nothing. Before reaching Daniels' a compact and highly fossiliferous rock forms the upper moiety of the (right) bank, appearing at an elevation of from four to eight feet above the water. Among the large number of molluscan casts occurring here I recognized those of *Venus cancellata* and of species of *Fulgur* (*F. perversum?*), *Turritella*, *Cardium*, *Arca*, etc., most of them undeterminable specifically. There can be no question, however, that they represent the forms (Pliocene) which occur in such a beautiful state of preservation a short distance further up the stream, and which, by their vast numbers and large size, constitute probably one of the most remarkable exposures of fossils to be seen anywhere. In the lower part of the bank above described we found the large oyster associated with many fragments of the scallops already referred to. We also obtained numerous *Rangias* from the bed immediately underlying the top-sands.

A fine exposure of yellow and buff limestone, averaging about ten feet in height, is presented above Daniels', the different strata of which it is composed apparently dipping to the east; the bottom bed is a compact shell-rock, containing innumerable shell remains, largely fragmentary. I feel confident that the dip observed here is purely local, a possible result of sagging, and that it does not interfere with the general scheme of horizontality that is presented both above and below this point.

A short distance above this locality begin the highly fossiliferous deposits to which reference has already been made, and which extend practically without intermission to Fort Thompson, a distance along the river of some ten to twelve miles. This is without question the most remarkable fossiliferous deposit that has as yet been discovered in the State, and from a purely paleontological standpoint, perhaps the most significant in the entire United States east of the Mississippi River. The fossils, which are about equally distributed between both banks, crop out

\* The same oyster and scallops are contained in the unequivocal Pliocene deposits occurring further up the river, occupying approximately the same relative positions.

in almost countless numbers, and attract attention, apart from their prodigious development, by their great variety, large size, and beautiful state of preservation. The whole bank much resembles a fossil shell-beach, and recalled to my mind the wall of shells extending from Little Sarasota Inlet to Casey's Pass. But that this was not its true character is proved by the perfection in which individual shells had retained their outlines—even the most delicate, such as *Pyrula* (*Ficula*), showing little or no surf action—and by the great number of forms (*Panopæas*, *Arcas*) which still remained in their normal positions, both valves firmly attached—the same as they originally occupied when living.

The number of recent forms occurring here is very great, so that at first glance I scarcely doubted that the formation was of Post-Pliocene age, a conclusion to which I was further led by the absolute freshness of many of the specimens. Closer inspection, however, revealed a host of forms which had no analogues in the recent fauna, and others, again, which, while closely approximating living species—so much so, indeed, as to leave no doubt as to their inter-relationship—yet differed sufficiently to indicate a long period of time during which the modifications, resulting in the distinctive characters of the recent species, were brought about. This relationship between the old and the new fauna is very remarkable, and perhaps nowhere else does the doctrine of transformism or evolution receive stronger support from invertebrate paleontology than here. The lines of derivation through which some of the modern forms have passed are perhaps best seen in the case of one or two species of *Arca*, which stand in unmistakable proximity to the recent *A. incongrua* and *A. Floridana*, in a large volute as ancestral type of the comparatively rare *Voluta Junonia*, and in a ponderous stromb, which strongly foreshadows the recent *Strombus accipitrinus*. Other cases of relationship and obvious derivation might here be cited, but these will be specially noticed in the descriptions of species.

It is a singular fact that scarcely any of the distinctively Miocene fossils of the Atlantic coast are found here; such of the Miocene species as do occur are with few exceptions forms that still live along the coast. *Per contra*, the new species are as a rule strikingly distinct, even in their broadest characters, from the members of our hitherto ascribed Tertiary faunas, or from the equivalent faunas of the West Indian Islands. It is difficult to conceive of the radical difference existing between this fauna and that which ought to be most nearly related to it, whether the special comparison be made with the faunas occurring on this side of the Atlantic or the other.

The following enumeration of species exhibits the relation existing between the forms now described for the first time and those that had been previously described, fossil and recent:



- \*Murex imperialis,  
 \* " brevifrons,  
   Fusus *Caloosaensis*,  
   Fasciolaria *scalarina*,  
 \* " gigantea,  
 \* " tulipa,  
   Melongena *subcoronata*,  
   Fulgur *rapum*,  
 \* " contrarius,  
   " excavatus,  
 \* " pyrum,  
 \* " pyriformis,  
 \*Nassa vibex,  
   Turbinella *regina*,  
   Vasum *horridum*,  
   Mazzalina *bulbosa*,  
   Voluta *Floridana*,  
   Mitra *lineolata*,  
   Marginella *limatula*,  
 \*Oliva *literata*,  
 \* " *reticularis*,  
   Columbella *rusticoides*,  
 \*Cancellaria *reticulata*,  
   Pleurotoma *limatula*?  
   Conus *Tryoni*,  
   " *mercati*?  
   " *catenatus*?  
   Strombus *Leidyi*,  
 \* " *pugilis*,  
   Cypræa (*Siphocypræa*) *problematica*,  
 \*Pyrula *reticulata*,  
 \*Natica *canrena*,  
 \* " *duplicata*,  
 \*Crucibulum *verrucosum*,  
   Crepidula *cymbæformis*,  
 \* " *fornicata*,  
   Turritella *perattenuata*,  
   " *apicalis*,  
   " *cingulata*,  
   " *mediosulcata*,  
   " *subannulata*,  
 \*Cerithium *atratum*?
- Cerithium *ornatissimum*,  
 \*Bulla *striata*,  
 \*Siliqua *bidentata*,  
   Panopæa *Menardi*,  
   " *Floridana*,  
   " *navicula*,  
   Semele *perlamellosa*,  
 \* " *variegatum*,  
 \*Rangia *cyrenoides*,  
   Venus *rugatina*,  
 \* " *cancellata*,  
   " *Rileyi*,  
 \* " *Mortoni*,  
 \*Artemis *discus*,  
 \* " *elegans*,  
 \*Dione (*Calliste*) *gigantea*,  
 \* " *maculata*,  
   Cardium *Floridanum*,  
 \* " *magnum*,  
 \* " *isocardia*,  
   Hemicardium *columba*,  
 \*Chama *arcinella*,  
   " *crassa*,  
   Lucina *disciformis*,  
 \* " *edentula*,  
 \* " *Pennsylvanica*,  
 \* " *Floridana*,  
 \* " *tigerina*,  
   Carditamera *arata*,  
   Arca *scalarina*,  
   " *crassicosta*,  
 \* " *lienosa*,  
   " *aquila*,  
   " *plicatura*,  
   " (*Arcoptera*) *aviculæformis*,  
 \*Pectunculus *lineatus*,  
   " *aratus*,  
   Spondylus *rotundatus*,  
 \*Plicatula *ramosa*,  
   Pecten *solarioides*,  
   " *comparilis*,  
   " *Mortoni*,  
 \* " *nodosus*,

\**Pecten nucleus*,  
*Anomia Ruffini*,

*Ostrea meridionalis*,  
 \* " *Virginica*.

Recent species are preceded by an asterisk ; the new species are italicized.

It will thus be seen that the relation of recent to extinct species is as 48 to 41, giving a very much higher percentage for living forms than obtains in any of the divisions of our recognized Miocene deposits, even the "Carolinian," which holds a position nearly equivalent to the so-called Mio-Pliocene of Europe. It becomes manifest that this most extensive Floridian exposure represents the Pliocene age—a circumstance interesting, apart from the general bearing which its presence has upon the geology of the State in particular, from the fact that it gives us the first unequivocal indication of the existence of marine Pliocene deposits in the United States east of the Pacific slope.

I made a careful examination of the banks to ascertain if any dividing lines or horizons, characterized by distinct assemblages of organic remains, existed, but failed to discover any such ; the fossils appeared to be packed almost indiscriminately, and in several instances when I thought that a certain localization in some species could be detected, the same forms would appear in other parts of the bank, and completely vitiate all my surmises. Only along the top line was there a true differentiation, the uppermost (marine) bed being densely charged with the valves of *Venus cancellata*, largely to the exclusion of the numerous other forms that so eminently serve to define the bank in general. Nor did I succeed in obtaining any extinct species from this topmost stratum, although no true junction line between it and the stratum immediately underlying could be determined. There is no question in my mind that this upper Venus bed, the same as we found it at other points of the river, is of Post-Pliocene age, continuous sedimentation, however, uniting it with the older Pliocene deposits beneath, and obscuring all well-defined faunal lines of separation.

From the observations that have thus far been made respecting the geology of the State, it will be seen that the Tertiary formations follow one another through the peninsula in regular succession from north to south, beginning with the Oligocene (or late Eocene) and ending with the Pliocene. The Post-Pliocene, doubtless, follows as a continuation of the Pliocene south of the Caloosahatchie, probably for a very considerable distance into the everglade region, and possibly nearly to its end. Our observations failed to bring forward a single fact confirmatory of a coral-reef theory of the formation of the peninsula such as had been advocated by Louis Agassiz and Prof. Le Conte ; on the contrary, the existence of the heavy fossiliferous deposits about Tampa, on the Manatee, along the

tributaries of Big and Little Sarasota Bays, and more particularly those exposed on the Caloosahatchie, conclusively proves that a coral extension to the southern United States, such as had been theoretically set forth, does not exist in fact. To be sure, remains of coral structures, possibly representing even true reefs, were found at various points, as for example at Ballast Point, Hillsboro Bay, and on White Beach, Little Sarasota Bay, but these limited structures are evidently only of local formation, and indicate a period when a fringe of coral developed where, through unfavorable circumstances, probably induced through a lowering of the temperature, structures of a similar kind are no longer represented. In other words, they indicate nothing more or less than is indicated by remains of a like character found in our more northern Miocene deposits—the masses of *Astræa*, etc., of North Carolina, the James River, and other localities. Along the Caloosahatchie we found only scattered clumps of coral (*Astræa*, *Colpophyllia*, *Dichocœnia* ?), measuring possibly eight or ten inches in greatest extent, and nothing that could be taken to indicate an associated reef.

In conformity with the system of nomenclature which I have elsewhere adopted in the classification of the American Tertiary deposits, I would propose to designate the Pliocene series of the Caloosahatchie as the "Floridian," by this name indicating the region where the formation has its furthest, and, as far as we know, only, development. What its precise equivalent among the trans-Atlantic formations, if any such exist, may be, still remains to be determined. Thus far I have been unable to discover any whose fauna can be strictly, or even approximately, correlated with the present one. Besides shells and corals, and a few hypothetical remains which are perhaps to be referred to the class of annelids, the only other invertebrates found in the banks were several more or less perfect specimens of the large urchin, *Echinanthus rosaceus*. Two of the more remarkable of the molluscan forms occurring here are an ark, differing from all known types of the family, whether recent or fossil, in a peculiar anteriorly projecting spout or rostrum, and a cowry, with a singular channeled apex.

For some distance below the Fort Thompson rapids the topmost of the marine deposits exposed on the river—the Post-Pliocene *Venus cancellata* bed already referred to—is seen to be overlaid by a heavy stratum of limestone, in which the remains of fresh-water organisms, *Planorbis*, *Limnea*, etc., are very numerous imbedded. This fresh-water limestone, in many places an absolute shell-rock, compact but largely water-worn, can be traced with few breaks to the rapids (and beyond), where it acquires its maximum development, with a thickness of two or two and a-half feet. It here rises from two to four feet above the surface of the water, everywhere overlying the *Venus cancellata* bed, which in turn here

and there exposes the older fossiliferous deposits beneath; these, however, are practically all concealed beneath the water's level.

The fresh-water limestone forms the bed-rock of the beautiful "prairie" or meadow land which opens out immediately above Fort Thompson, and which soon passes off into the region of endless swamps and everglades that continue to the Okeechobee wilderness. There can be little question, it appears to me, that this vast area of scattered ponds and swamps marks the site of an ancient continuous, or nearly continuous, body of fresh water, which covered the region in the form of a vast shallow lake, and whose origin is probably to be traced back to the period when the land gradually emerged from the sea. The general configurations of the country, and the broad extent over which the limestone (or its remains) is spread, leave little doubt in my mind as to a former union of the present scattered waters, whose isolation may have been brought about principally as the result of vegetable growths, or of this in combination with actual desiccation.

The limestone has been traced eastward, as reported by Captain Menge, the officer in charge of the dredging operations connected with the Okeechobee Canal, for a considerable number of miles, disappearing\* at a depth of five feet two inches beneath the canal surface, about three miles west of Lake Hikpochee. We, ourselves, traced the extension of the limestone for nearly this distance by means of the scattered shell remains (fossils), which at intervals were dredged up from the bottom of the canal. All the molluscan forms occurring in the limestone are identical with species now living in the river, and consist mainly of *Planorbis (Physa) scalaris*, innumerable shells of which, evidently distributed at a period of recent high-water, are scattered over the open tracts, and in crevices on the trunks of trees. I obtained specimens from tree-trunks at an elevation certainly not less than 10 or 12 feet above water-level, but the high-waterline marked on the palmetto trunks—the traces of a recent overflow—was still much above this, probably fully six or eight feet.

\* That is to say, had not been traced further, but there can be no question as to its extension beyond this point.