ON THE OCCURRENCE OF NUMMULITIC DEPOSITS IN FLORIDA, AND THE ASSOCIATION OF NUMMULITES WITH A FRESH-WATER FAUNA.

BY ANGELO HEILPRIN.

[*From Proceedings of the Academy of Natural Sciences of Philadelphia, July, 1882.*]

ON THE OCCURRENCE OF NUMMULITIC DEPOSITS IN FLORIDA, AND THE ASSOCIATION OF NUMMULITES WITH A FRESH-WATER FAUNA.

BY ANGELO HEILPRIN.

Beside the so-called *Nummulites Mantelli* of Morton ("Synopsis Org. Rem. Cretac. Group," p. 45, 1834), a species now known to belong to the genus *Orbitoides*, only one other form of supposed Nummulite has been recorded as occurring fossil in any North American formation. This is the *Nummulites Floridanus* from the "upper Eocene limestone" of Tampa Bay, Florida, described by Conrad in Vol. II (new series) of the American Journal of Science and Arts" (1846). The species is there said to be abundant, and is referred to the subgenus *Assilina*[1] of D'Orbigny. The description given is brief, but at the same time very broad, and no reference of any kind is made to the internal chambers or the partitions of the test; nor does the figure appended to the description, which resembles a nummulite only in the circumferential outline, give the faintest indication of these characters. In fact, if Conrad's figure is at all carefully drawn, it would much more nearly indicate a species of the genus *Orbiculina* than of *Nummulites*. In the "Catalogue of the Eocene Annulata, Foraminifera, Echinodermata, and Cirrepedia of the United States," prepared by the same author (Proc. Acad. Nat. Sciences of Phila., vol. 17, p. 74, 1865) the form in question (*Cristellaria? Floridana* of D'Orbigny, *Prodrome de Paléontologie*, vol. II, p. 406) is referred to the new genus *Nemophora* of Conrad, the characters of which are not stated, and whose relations to *Nummulites*, if any such exist, are left to the imagination of the reader to determine.[2] In numerous specimens of rock fragments that have been kindly furnished from different parts of the State of Florida by Dr. Eugene A. Smith, State Geologist of

[1] By some authors the members of this group are considered to have distinctive characters sufficient to separate them as a genus apart from *Nummulites* (La Harpe, *Etude sur les Nummulites du Comté de Nice*, Bulletin de la Soc. Vaud. des Sc. Nat., vol. XVI, p. 211. 1879).

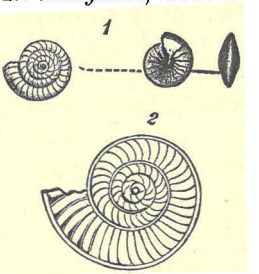
[2] As is the case with a very large proportion of Conrad's genera, no diagnosis of the "genus" *Nemophora* appears ever to have been furnished; at least, it has not been the good fortune of the writer to discover any such.

Alabama, and Mr. Joseph Willcox, of this city, the writer has carefully searched for foraminiferal remains that might with any amount of positiveness be identified with the form above referred to, but without success. While the *Operculina* (*Cristellaria !*) *rotella*, stated by Conrad (*loc. cit.*) to occur with the so-called Nummulite, was found in sufficiently great abundance in some of the rock fragments—in fact, largely entering into the composition of their incoherent masses—no trace of anything answerable to the latter could be detected, unless certain associated disciform bodies, measuring a quarter of an inch or more in diameter, and ornamented on the external surface with regular concentric lines of prominent granules, were actually the objects sought after.[1] But in these the spiral volutions represented by Conrad could not be detected, nor does that author make reference in his species to any external ornamentation consisting of granules. On the whole, we believe, it may be safely affirmed that the *Nemophora* had nothing in common with the genus *Nummulites* beyond a resemblance in outline, and the general community of character that would place all similar organisms in the one class of the foraminifera. The existence, therefore, of any fossil North American Nummulites may be considered to have been thus far at best but very doubtful.

But whatever doubt may have hitherto existed as to the occurrence of North American Nummulites, none such can any longer remain. From an examination of rock specimens that were recently obtained by Mr. Willcox from the western shore of the peninsula of Florida, the writer has been enabled to determine positively not only the existence there of these organisms, but their occurrence (locally) in such quantities as to constitute by their masses a true nummulitic rock. The rock in question is a white or yellowish-white friable limestone, found in the immediate neighborhood of the Cheeshowiska River, Hernando County, a few miles (4) from the coast line. The rock whence the fragments were obtained occupies a level not more than two feet above tide-water of the Gulf. All the specimens of Nummulites appear to belong to a single species, and to the sub-genus *Nummulina*, in which, as distinguished from *Assilina*, the individual whorls

[1] These bodies appear to represent a new form of foraminiferal test, but their imperfect preservation precludes the possibility of a satisfactory diagnosis.

completely envelop each other, and to which the most characteristic foreign representatives of the genus—*N. lævigatus*, *N. complanatus*, *N. planulatus*, *N. intermedius*, etc., belong. The tests, varying in size up to about $\frac{1}{3}$ inch in diameter, are in an excellent state of preservation, and may be readily sliced open so as to show the internal structure. A central initial chamber is distinctly visible. To this species, belonging to the group of the *plicatæ* of D'Archiac, I would propose, from the name of its discoverer, the specific designation of *N. Willcoxi*.[1]



As to the age of the formation represented by these nummulitic deposits, there might appear to be at first sight no question of doubt. The presence alone of Nummulites in any formation is almost positive indication as to the eocene or oligocene age of that formation, and the more especially when the remains of these organisms occur in any abundance.[2] Admitting the supposition of this age, we should naturally look to the associated fossils for further confirmatory evidence bearing on this point. Singularly enough in the case of the Florida nummulitic rocks—at least in

[1] *Nummulites Willcoxi:* Test regularly rounded, tumid (more especially in the earlier stage), and measuring in the largest specimen about $\frac{1}{3}$ inch in diameter; external surface distinctly marked by the arcuate, and somewhat wavy outlines of the septal prolongations; volutions about 5, completely enveloping; septa close set, about 35-45 in the last whorl, and well flexed; central initial chamber distinctly visible.

While on further investigation this species may be found to be identical with one of the numerous forms described from the nummulitic deposits of Eur-Asia, from several of which it scarcely appears to differ, yet in the absence of actual specimens with which to institute direct comparisons, and the difficulty that attaches to the specific determination of this class of organisms, I have preferred to follow the safer course, and to describe it as distinct. According to Carpenter, Kitchen Parker and Rupert Jones, all the various "specifically distinct" forms described as belonging to the subgenus (or genus), *Nummulina*, of which, up to 1853, 55 were recognized by D'Archiac and Haime, are referable to a single species, which is consequently co extensive with the genus (Carpenter, "Introduction to the study of the Foraminifera," Roy Soc. Rep., 1862, pp. 273-4).

[2] Nummulites are excessively rare in deposits newer (miocene or pliocene) than the oligocene.

the fragments that have been placed at my disposal—with very few exceptions all the molluscan remains belong to a period much more recent than the eocene, and to species that are still living at the present day. And what may appear still more singular, they are referable in principal part to land and fresh-water genera—*Glandina*, *Paludina*, *Ampullaria*.[1] From this association, and the circumstance that Nummulites are still met with in existing seas,[2] it might readily be inferred that there has been here a co-mingling of contemporaneous marine and fresh-water organisms, and that the deposits in question were laid down under such conditions—proximity to the mouth of a river—where a co-mingling of this kind could take place. Indeed, it would be difficult from paleontological evidence alone to disprove such an assumption, were it not that almost incontrovertible proof to the contrary in addition to that furnished by the *abundance* of Nummulites, is afforded in the presence of the remains of *Orbitoides*,[3] a genus which attained its greatest development in the upper eocene ("Nummulitic") and oligocene periods, and which does not appear to have survived the miocene. There can, therefore, be little or no doubt that the rock fragments marked by this admixture of an older and newer (post-pliocene or recent) fauna, and comprising both marine and fresh-water types of organisms, have derived their faunal characters in great part from the deposits of a more ancient formation, which formation represents, and is the equivalent of a portion of the European "Nummulitic" (whether eocene or oligocene). The exact locality or localities which these Florida nummulitic deposits occupy *in situ* has not yet been ascertained, but it is fair to assume that the beds lie along the Gulf border (possibly in great part submerged), where, through the disintegrating action of the oceanic surf, their fragments have at a comparatively recent period been washed together with the material that at the same time was being carried out by the fresh-water streams. The

[1] The recent species *Glandina parallela*, *Paludina* (*Vivipara*) *Waltonii* (Tryon), and *Ampullaria depressa* have been identified by Mr. Tryon.

[2] Very rare; all the forms are referable to the type *N. planulatus* (Carpenter, *op. cit.*, p. 275; Zittel, *Handbuch der Paläontologie*, vol. 1, part 1, p. 100, 1876), of the same group (*plicatæ*; *radiatæ* of Carpenter) to which *N. Willcoxi* belongs.

[3] Resembling in outline the European *O. ephippium*.

precise position which the formation holds in the nummulitic scale as fixed by Hantken or La Harpe (*Étude sur les Nummulites du Comté de Nice*, Bull. de la Soc. Vaud. des Sc. Nat., vol. XVI., pp. 223–4, 1879), cannot be positively determined from our present data, since exceptionally the group of the *Nummulites plicatæ* is represented as well in the oldest as in the newest of the tertiary deposits marked by the members of this class of organisms.

FIGURES. *Nummulites Willcoxi.*

1, Natural size; 2, Same, enlarged.