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RUDIST ASSEMBLAGES IN CUBA

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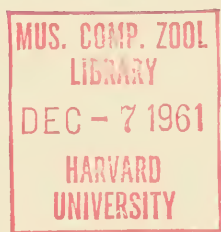
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RUDIST ASSEMBLAGES IN CUBA

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ABSTRACT

The existence of separate *Barrettia* and *Titanosarcolites* assemblages in Cuba having been questioned, this paper explains how these faunas may be distinguished, and the localities where they may be found; makes a necessary correction; gives a more definite age (Campanian) than was previously possible for the *Barrettia* fauna; and recapitulates the corrected faunal lists, including the larger Foraminifera found with *Barrettia* and *Titanosarcolites*.

INTRODUCTION

In 1905 the writer read a paper before the First Caribbean Geological Conference, in Antigua, entitled *Rudist Assemblages of the Antillean Upper Cretaceous*, which was subsequently published (Chubb, 1956). The principal purpose of this paper was to prove that the oft repeated statement that *Barrettia* and *Titanosarcolites* occur together in the Caribbean area is erroneous, and an attempt was made to show that in Jamaica, Cuba, and the other Antillean islands, there are two distinct rudist faunas, with hardly a species in common—an older associated with *Barrettia* and a newer associated with *Titanosarcolites*. Another still older rudist fauna, characterized by *Tepeyacia*, was recognised in Cuba.

In a separate section of the paper the age of the different rudist faunas was briefly discussed. This problem was treated on a regional basis, in the light of evidence from different parts of the Antillean and Central American area.

Recently Torre (1960, pp. 53-64) criticized the opinions expressed in this paper, in so far as they concern Cuba. With regard to the *Tepeyacia* fauna we are in agreement both as to its existence and its age, which we believe to be Cenomanian-Turonian. Our differences are mainly concerned with two questions: (a) the existence within the Habana formation of a *Barrettia* fauna, distinct and separate from the *Titanosarcolites* fauna, and (b) the age of the *Barrettia* fauna.

These two problems were considered separately in the original publication (Chubb, 1956), but throughout his paper Torre confused them, never discussed the first problem apart from the second, and attributed to the writer views that he does not hold. In this paper, for the sake of clarity, the two problems will be discussed independently.

BARRETTIA AND TITANOSARCOLITES FAUNAS IN CUBA

Torre made no attempt to examine the foundations of the writer's belief that two distinct faunas exist in the Habana formation. He seemed to treat it as merely a personal opinion, based perhaps on guesswork. Actually the separation of the two faunas was achieved by a meticulous and detailed analysis of all published fossil lists available to the writer, especially those of the Utrecht geologists who investigated considerable areas of Cuba in the years 1933 and 1938-9. The work of these geologists is of exceptional value because they were diligent collectors, and they recorded the exact site of every find, gave it a distinguishing letter and number, and pinpointed it on their maps. Thus it became possible to ascertain which rudist species were associated together in Cuba.

The lists referred to will be found in the publications of Rutten (1936, p. 37), MacGillavry (1937, p. 24), Thiadens (1937, pp. 43-4), Vermunt (1937a, pp. 36-7), Van Wessen (1943 pp. 57-8) and Hermes (1945, pp. 20-1). Much information may be extracted from these lists.

A study of Vermunt's list will show that at locality H870, in Piñar del Río, the following rudists were collected: *Barrettia monilifera*, *B. multilirata*, *Torreites sanchezi*, *Biradiolites* cf. *aquitanicus*, *B. tschoppi*, *Tampsia rutteni*, *Chiapasella cubensis*, and *Plagioptychus* sp. Obviously, as all these species were found together they must be regarded as members of one fauna. Rutten's list shows that at locality H550, in northern Santa Clara (Las Villas), the following species were found: *Barrettia monilifera*, *Torreites sanchezi*, *Parastroma* sp., *Biradiolites cubensis*, *Parabournonia bispida*, and *Chiapasella cubensis*. It will be noted that three species are common to both lists. All the species at both these localities are associates of *Barrettia* and must be regarded as members of the *Barrettia* fauna.

Locality H698 in MacGillavry's list of Camaguey rudists may be considered next. Here were found *Titanosarcolites giganteus*, *Bournonia thiadensi*, *B.* cf. *bournoni*, *Biradiolites lumbricoides* and *Parastroma guitarti*. Vermunt's list shows that locality H774, in Piñar del Río, yielded *Titanosarcolites giganteus*, *Orbignya* sp. (determined as *O. mullerriedi* by MacGillavry, 1937, p. 111), *Praebarrettia sparcilirata*, *Bournonia thiadensi*, *Chiapasella pauciplicata*, and *Caprinula* cf. *annulata*. Two species are common to the lists. Being associated with *Titanosarcolites* the fossils from both these localities belong to the *Titanosarcolites* fauna.

It will be noticed that not one of the species found at the *Barrettia* localities, H550 and H870, was found at the *Titanosarcollites* localities, H698 and H774. If Thiaden's list of rudists in southern Santa Clara (Las Villas) be compared with Rutten's list of those in northern Santa Clara, it will be found that there is not one species common to the two. The former list includes *Titanosarcollites* in several localities, the latter includes *Barrettia*.

If all the abovementioned fossil lists of the Utrecht geologists be analysed and compared, it will be found that none of them recorded *Barrettia* from the same locality as *Titanosarcollites*, and the rudist species associated with the former genus were always different from those associated with the latter, with one possible exception, *Biradiolites aquitanicus*. If they are plotted on a map it will be found that the *Barrettia* localities are always many kilometers away from the *Titanosarcollites* localities.

These statements are not guesses, they are not opinions, they are not theories, they are facts.

The main purpose of Torre's article seems to be to demonstrate that there is only one rudist assemblage in the Habana formation, including both *Barrettia* and *Titanosarcollites*. If this is true it should be easy to prove, for it is only necessary to cite a few localities where the two genera may be found together, but there is no mention of even one such locality throughout his article.

Torre laid great stress on, and repeatedly referred to, a brief mention in the writer's paper (Chubb, 1956, p. 11, lines 8-13) of the limestones of Loma Yucatan. The fauna of these limestones was referred to only incidentally, not as a representative, but as a doubtful example of the *Barrettia* fauna; it was expressly stated that *Barrettia* had not been found there. These limestones were provisionally included in the *Barrettia* beds mainly because *Vaccinites* occurs in them, and elsewhere in the Antillean area this genus is generally associated with *Barrettia*, for example at 3 km. W. S. W. of San Diego de Los Baños, Pinñar del Rio. *Vaccinites* is also found with *Barrettia* in Puerto Rico, and the same genus has recently been found in Jamaica, 5 km. southeast of Lucea, Hanover, where it again occurs with *Barrettia*. It was, therefore, thought that a further search of the Loma Yucatan limestones would probably reveal the presence of *Barrettia*. But if Dr. Mario Sanchez Roig denies the existence of this genus in these limestones (Torre, 1960, p. 57) his word must be accepted. Evidently the Loma Yucatan limestones contain an intermediate rudist fauna, newer than

that of *Tepeyacina* and older than that of *Barrettia*. It is preferable to call this the *Durania* fauna, rather than to use Torre's term, *Durania* and *Vaccinites* fauna, as the latter genus occurs in other horizons.

Torre observed that the only way to clarify the problem of the existence of distinct *Barrettia* and *Titanosarcollites* faunas in Cuba would be by an exhaustive investigation, including field-work, collection, and stratigraphic study. To assist in this programme some localities will be suggested where the investigation might be carried out profitably:

(a) The *Barrettia* fauna (without *Titanosarcollites*) may be found in Piñar del Río west of Verracos and southwest of San Diego de los Baños; in Las Villas about six to seven km. east and southeast of Esperanza, one km. west of Bernia, and three km. northwest of Pastora; in Camaguey at about 17 km. and 27 km. west of Camaguey city on the La Florida road, at Arroyo Hondo, and at 8 km. west and 14 km. east of Sibanicu. It is possible, but not certain, that *Barrettia* might also be found in Las Villas at seven to eight km. east of Fomento, at five to six km. northwest of Cabajuan, and at four km. south of Camajuani.

(b) The *Titanosarcollites* fauna (without *Barrettia*) may be found in Piñar del Río west of San Juan y Martinez and thence in a northeasterly direction to the neighbourhood of Guayabo; in Las Villas, west of Jutia and immediately north and east of Fomento; in Camaguey, east of Ciego de Avila, west and north of Piedrecitas, around Ingenio Grande and in an area five km. southeast thereof, at five km. and 17 km. north-north-east of San Francisco on the road to Veinte y Uno, and at four to six km. south of Berrocal.

Special attention should be paid to an exposure about 1½ km. southwest of San Diego, Piñar del Río (H802). Although in his stratigraphic paper Vermunt (1937a, pp. 36-37) recorded only *Barrettia* and species belonging to the *Barrettia* fauna at this locality, in another paper (1937b, p. 263) *Titanosarcollites giganteus* was added to the list. This record is thought to be erroneous, perhaps a slip of the pen, perhaps a printer's error. However that may be, this is the only definite locality known to the writer where it has been claimed, by any geologist who has worked in Cuba, that *Barrettia* and *Titanosarcollites* occur together.

It is also suggested that the Loma Yucatan fauna should be sought, not only in the hill of that name north of Camaguey, but also in northern Piñar del Río, around and between the harbours of Bahia Honda and Cabañas.

When this work has been accomplished and the existence of the two faunas in the Habana formation recognised, it may be possible to find the solution of other problems, such as why, in Piñar del Río, Las Villas, and Camaguey, the outcrops of *Barrettia* limestone always lie some 10 to 30 km. north of those of *Titanosarcolites* limestone.

AGE OF THE BARRETTIA FAUNA

There is no need to discuss here the age of the *Titanosarcolites* fauna as there is general agreement that it is Maestrichtian. The question of the age of the *Barrettia* fauna was dealt with only briefly in the earlier paper (Chubb, 1956, pp. 16-17). It was considered on a regional basis in the light of evidence drawn from Jamaica, Cuba, and south Mexico.

The following facts were mentioned: (a) that in the St. Ann's Great River section, Jamaica, the shales below a *Barrettia* limestone yield Turonian-Coniacian fossils; (b) that in northern Las Villas, Cuba, Rutten (1936, pp. 7, 36) found Turonian-Coniacian ammonites apparently below a *Barrettia* limestone; (c) that in Chiapas, south Mexico, Mullerried (1936, p. 160) reported Turonian-Coniacian ammonites, not below, but above *Barrettia*; (d) that the apparent inconsistency would be resolved if it were assumed that *Barrettia* ranged from Upper Turonian to Lower Senonian; (e) that recent evidence suggested that *Barrettia* ranged into the Campanian in Puerto Rico and Cuba; and finally (f) that Campanian Foraminifera had been found in the shales below *Barrettia* in St. James, Jamaica. No attempt was made to draw any final conclusion from these varied pieces of evidence.

Torre, however, persists in treating the mention of the Turonian-Lower Senonian as the writer's considered opinion of the range of *Barrettia*, and devotes much space to attempts to discredit it. He is tilting at windmills. He is evidently unaware that in the last few years a considerable amount of research on the problems of the Caribbean Cretaceous has been carried out (Chubb, 1958a; 1958b; 1959; 1960a; 1960b) and that new evidence has led to the possibility of a more exact evaluation of the age of the *Barrettia* beds.

As Mullerried's reported discovery of Turonian-Coniacian ammonites above *Barrettia* in south Mexico conflicted with evidence from other areas, it was decided to visit Chiapas, in order to study the Cretaceous sequence

personally. Accordingly, after the Twentieth Session of the International Geological Congress in Mexico City (September 4-11, 1956) the writer spent a full month in the state (Chubb, 1959). Most of Mullerried's faunal horizons were discovered, but unfortunately not the *Barrettia* and ammonite zones. It was found, however, that Campanian rocks rested directly upon Turonian, both Coniacian and Santonian were absent, and the opinion was formed that the Chiapas *Barrettia* horizon was probably Campanian.

The *Barrettia* bed in St. Ann's Great River, Jamaica, which is underlain by beds with a Turonian-Coniacian fauna, is now known to be overlain by beds with a Campanian one. The possibility, therefore, arises that this *Barrettia* bed might be Santonian, as was suggested in a paper read to the Mexico Congress in 1956 (in press), but it is now regarded as more probably basal Campanian (Chubb, 1960a, p. 91), the Santonian being absent. As previously mentioned the St. James *Barrettia* bed is underlain by a thick shale formation yielding Upper Campanian Foraminifera and is succeeded by 800 meters of beds without diagnostic fossils, above which lies the basal bed of the Maestrichtian with the first *Titanosarcolites*. This *Barrettia* bed is, therefore, believed to be Upper Campanian (Chubb, 1960a, p. 88).

In another recent publication (Chubb, 1960b, p. 17) it was stated that "the genus *Barrettia* could perhaps be regarded as an index fossil of the Campanian in Jamaica as well as in the other Greater Antilles," and it might be added, in south Mexico.

Torre (1960, p. 57) quoted the occurrence of orbitoidal Foraminifera, such as *Pseudorbitoides*, with *Barrettia*, as evidence of a Maestrichtian age. Evidently he does not know of the work of Bronnimann (1957, p. 591) who, after an exhaustive study of *Pseudorbitoides israelskyi* Vaughan and Cole, including topotype material from Louisiana, and specimens from Mississippi, Texas, Chiapas, Cuba, Haiti, and Puerto Rico, concluded that this species is restricted to the Campanian.

The Utrecht geologists included the larger Foraminifera in their fossil locality lists. By an analysis of these lists it is possible to ascertain which Foraminifera were associated with *Barrettia* and which with *Titanosarcolites*; the former may be regarded as Campanian, the latter as Maestrichtian. *Pseudorbitoides israelskyi* and *P. trechmanni* were found with *Barrettia* but not with *Titanosarcolites*.

Three species were reported to be common to both groups, *Vaughanina cubensis*, *Orbitoides browni*, and *Lepidorbitoides minima*. According to Bronnimann (1957, p. 591) *V. cubensis*, *Orbitoides palmeri*, and *Sulcoperculina dickersoni* form an assemblage which is diagnostic of late Maestrichtian beds, and as would be expected, all three were found in the *Titanosarcolites* limestones of Cuba.

Vaughanina cubensis, however, would not be expected in the *Barrettia* beds, and Rutten alone, among the Utrecht geologists, reported it there, not in his palaeontological paper (1935, p. 528) but only in his stratigraphical paper (1936, p. 36). Possibly the report may have been due to a mistaken identification, as there has been considerable confusion between this species and *Pseudorbitoides israelskyi* (Bronnimann, 1954, pp. 91-93).

CONCLUSION

In the Upper Cretaceous rocks of Cuba four successive rudist faunas may be recognised. The fossil lists previously published (Chubb, 1956, pp. 10-13) require revision owing to the separation of the Loma Yucatan fauna from the *Barrettia* fauna. The larger Foraminifera of the Campanian and Maestrichtian are included in the lists.

(a) *Tepeyacia* fauna of the Provincial limestones; the age is probably Cenomanian-Turonian.

Caprinuloidea perfecta Palmer

Coalcomana ramosa (Boehm)

Sabinia sp.

Ichthyosarcolites sp.

Tepeyacia corrugata Palmer

(b) *Durania* fauna of the Loma Yucatan limestones. The age is believed by Torre, following Albear and MacGillavry, to be Upper Campanian; but in view of the absence of orbitoidal Foraminifera a somewhat earlier age, perhaps Santonian or Coniacian, may be suggested.

Durania curasavica (Martin)

D. lopeztrigoi (Palmer)

Vaccinites macgillavryi Palmer

Torreites tschoppi MacGillavry

Præbarrettia coralli (Palmer)

(c) *Barrettia* fauna of the lower Habana formation. The age is Campanian.

RUDISTS

- Plagioptychus antillarum* (Douvillé)
Antillocaprina crassitella MacGillavry
Biradiolites cubensis Douvillé
B. macgillavryi Vermunt
B. tschoppi Vermunt
B. cf. acuticostatus d'Orbigny
B. cf. lameracensis Toucas
B. cf. aquitanicus Toucas
Parabournonia hispida Douvillé
Radiolites macroplicatus Thiadens *non* Whitfield
Chiapasella cubensis Rutten
Tamopsis rutteni Vermunt
Vaccinites vermunti MacGillavry
Torreites sanchezi Douvillé
Parastronia sanchezi Douvillé
Barrettia monilifera Woodward
B. multilirata Whitfield

FORAMINIFERA

- Vaughanina cubensis* Palmer (according to Rutten)
Orbitoides browni (Ellis)
Torreina torrei Palmer
Lepidorbitoides minima Douvillé
L. planasi Rutten
L. cubensis (Palmer)
L. rooki Vaughan & Cole
L. agnayo Palmer
Pseudorbitoides trechmanni Douvillé
P. israelskyi Vaughan & Cole

(d) *Titanosarcolites* fauna of the upper Habana formation. The age is Maestrichtian.

RUDISTS

- Mitrocaprina tschoppi* (Palmer)
Antillocaprina annulata (Palmer)
A. pugniformis (Palmer)

Titanosarcolithes gigantus (Whitfield)
Biradiolites galofrei (Palmer)
B. aquitanicus Toucas
B. lumbricoides Douvillé
Bournonia planasi Thiadens
B. thiadensi Vermunt
B. cancellata (Whitfield)
B. cf. bournoni Des Moulins
Thyrastylon adhaerens (Whitfield)
Chiapasella bermudezi Palmer
C. pauciplicata Mullerried
Orbignya mullerriedi Vermunt
Parastroma guitarti (Palmer)
Praebarrettia cf. peruviana (Gerth)
P. sparsilirata (Whitfield)
P. porosa Palmer

FORAMINIFERA

Sulcoperculina dickersoni (Palmer)
Vaughanina cubensis Palmer
Orbitoides apiculata Schlumberger
O. browni (Ellis)
O. palmeri Gravell
Lepidorbitoides estrellae van Wessem
L. macgillavryi Thiadens
L. minima Douvillé
L. minor (Schlumberger)
L. nortoni (Vaughan)
L. palmeri Thiadens
L. ruttnei Thiadens
L. ruttnei var. *armata* Thiadens
L. tschoppi van Wessem

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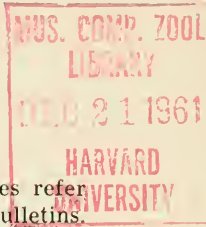
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