

MINISTERIO DA AGRICULTURA, INDUSTRIA E COMMERCIO

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SERVIÇO GEOLOGICO E MINERALOGICO DO BRASIL

EUZEBIO PAULO DE OLIVEIRA, Director interino

MONOGRAPHIA N. IV

FOSSEIS TERCIARIOS DO BRASIL

COM

DESCRIPÇÃO DE NOVAS FORMAS CRETACEAS

PELA

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IMPRESA NACIONAL

1924

INTRODUCTION

THE main object of this monograph is to present all the paleontological facts so far known regarding the Tertiary formations of Brazil.

In addition to this a number of new Cretaceous faunas are described from the States of Rio Grande do Norte and Bahia. These Mesozoic collections were recently made at the request of the director, Dr. Gonzaga de Campos, by various members of the Geological Survey. The fossils are of great interest as they demonstrate the presence of Cretaceous formations in those States, since the marine Cretaceous forms hitherto described were practically all from the State of Sergipe. The new Cretaceous horizons are tentatively referred to the probable stage of the Cretaceous period in which they were formed, and, as far as the facts permit, their correlation is suggested.

For the sake of clearness, Part I of the monograph is devoted to the Tertiary and Part II to the Cretaceous fossils.

A large portion of Part I consists of a detailed comparative study of the Tertiary faunas of the State of Pará with a view of determining their affinities and their geological age. This has resulted in establishing a new geological horizon, and in demonstrating the presence of Lower Miocene formations, hitherto unknown, in Brazil. The rich faunas also afforded a large number of new and interesting species.

New Tertiary faunas, probably of Pliocene age, are also described from the State of Maranhão.

Since the discussions of the Tertiary faunas of Brazil already known are scattered and often inaccessible, a brief review of the history of these formations and summaries of the articles in which they are described seemed of value.

Comparisons are suggested of the Brazilian Tertiary formations with those found elsewhere in South and Central America and in the Antilles. As far as possible, these are correlated with the North American and European stages. The stratigraphic position of certain of the Brazilian Tertiary formations appears definitely proven by their faunas or floras. Others have not furnished sufficient paleontological evidence to permit their assignment to precise horizons, as for example the Amazonian beds. In that case the term Neogene is used, indicating

that they show relationships with the younger Tertiary, but might be as old as the Miocene. In these indefinite cases correlation is necessarily very tentative.

The majority of the Tertiary fossils described in this report are those recently obtained Dr. Gonzaga de Campos and several members of the Survey at his request. The rest have been for many years in the Museum of the Geological Survey at Rio de Janeiro.

The exquisite drawings illustrating this report were made by Mr. G. S. Barkentin. To his unrivalled skill the beauty of the plates stands withess.

Sincerest thanks are offered to Dr. Gonzaga de Campos, Director of the Geological Survey of Brazil, for his sympathetic interest in this work and for his active support and most efficient aid in its furtherance. Appreciation is also expressed of the kindness of Dr. Horace E. Williams of the Geological Survey.

For most valuable suggestions as to the biological and stratigraphic relationships of certain of the faunas I beg to offer my warmest thanks to Professor G. D. Harris, Dr. T. W. Stanton Dr. W. H. Dall, Dr. T. W. Vaughan, Dr. R. S. Bassler, Professor R. S. Lull and, for lithological analyses, to Professor A. C. Gill.

This monograph was begun at the request of Dr. Orville A. Derby who took the keenest interest in its inception. That his earnest wish for its completion is now fulfilled is due to Dr. Gonzaga de Campos.

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June, 1921.

***Drillia crandalli*, sp. nov.**

PLATE XII, FIGURE 3

Shell fusiform, slender, with about eight whorls. Posterior sinus narrow, bordered by a rounded ridge adjacent to the suture. Entire surface of the shell ornamented with closely-set spiral threads.

The whorls of the spire are sculptured with strong, rounded, longitudinal riblets, numbering about eight to a volution, and extending from beneath the sinus to the following suture. On the last whorl the ribs number about ten, but are very weak developed only immediately beneath the sinus. The canal is long, giving the shell the form of a *Surcula* but the sinus is that of *Drillia*. Length of shell 30 mm., greatest width 10 mm.

This species is named in honor of Dr. Roderico Crandall, formerly member of the Geological Survey of Brazil.

Locality — Rio Pirabas.

Genus **CONUS** LINNAEUS

In North America this genus was comparatively scarce during Eocene time and did not become really abundant until Oligocene and especially Miocene faunas developed. Correspondingly, no *Conus* have been found as yet in the Lower Eocene beds of Pernambuco while they are quite common on the Lower Miocene of Pará.

The genus is now at its maximum and includes some three hundred and fifty species. Eleven are in the Antillean waters, but of these only one, *Conus verrucosus* Hwass, is said to inhabit also the Brazilian beaches. The great majority of the modern *Conus* live in the equatorial regions of the Indian and Pacific Oceans. They are dwellers in shallow water, in the fissures of rocks and the labyrinths of coral reefs. They are often brilliant in coloring and the identification of living species is based largely on the color patterns of their shells. Doubtless the *Conus* that lived during the deposition of the Pirabas limestone had similar habits of life to the recent members of this handsome genus.

Conus conditorius WHITE

PLATE XI, FIGURE 1

Conus conditorius White, Arch. do Museu Nac., v. 7, p. 118, pl. 10, figs. 1, 2, 1887.

Conus conditorius Katzer, Grund. der Geol., p. 136, pl. 3, fig. 18 (After White), 1903.

This species is recognized by its rather small size, broad and perfect conic form, and very low spire. The type measured 32 mm. in length and 19 mm. in greatest width. In the present collection are several molds of this species and also an external imprint, probably of the same shell, which suggests that the spire and the basal part were spirally striated.

Conus conditorius in general form resembles *Conus planiceps* Heilprin from the Chipolan stage of the Lower Miocene in Florida. It is the Brazilian analogue of the Floridian shell.

Locality — Rio Pirabas.

Conus whitei, *sp. nov.*

PLATE XI, FIGURES 2, 3

Conus. . . . ? White, Arch. do Museu Nac., v. 7, p. 119, pl. 10, fig. 3, 1887.

Dr. White described and figured but did not name the internal mold of a species of *Conus* that differed from *Conus conditorius* in its broader form and higher spire. Specimens in the present collection correspond to the unnamed shell and it seems to be a recognizable form. The whorls are about eighth, increasing regularly in size. Approximate length 28 mm., greatest diameter 19 mm.

This is a small species about the size of *Conus conditorius* White, but shorter, broader and higher-spined. It is dedicated to the memory of Dr. White as a slight tribute to his splendid monograph on Brazilian fossils.

Locality — Rio Pirabas.

Shell long, rather slender, with a high spire, equalling one fourth of the total length of the shell. Volutions ten, the last subangulated at the shoulder. Surface of the last volution ornamented by numerous, shallow, spiral grooves each with a median, spiral thread. Interspaces between the grooves flat. Outer lip notched posteriorly. Estimated length of shell 40 mm., greatest width 13 mm.

This species is recognized by its high, nearly cylindrical form, high spire and grooved surface. The shell was referred by Dr. White to *Conorbis* Swainson. An examination of a specimen of *Conorbis dormitor* Solander from the Barton beds, England shows, however, that true *Conorbis* has a biconic form, the greatest diameter being nearly central, and its aspect is unlike that of the Pirabas fossil. *Conorbis* is chiefly Eocene and became extinct in Oligocene time. It forms the connecting link between *Conus* and *Pleurotoma*. *Conus restitutus* is, I think, a true Cone with somewhat the form of *Conus parisiensis* Deshayes, but sulcated.

Locality — Rio Pirabas.

***Conus lisboae*, sp. nov.**

PLATE XI, FIGURE 18

Shell small, conic, with a low spire marked on each of its volutions with three incised, spiral lines. These spirals on the spire are so fine that they are visible only with a lens. The last volution is ornamented with regular, equidistant, narrow, spiral grooves which extend from the base almost to the shoulder of the shell. They then terminate abruptly as though the last groove had been omitted. There are about four grooves to a distance of five millimeters. They do not bear a spiral thread as in the preceding species. Approximate height of shell 20 mm., greatest width 10 mm.

The low spire and shorter, broader form differentiate this shell from *Conus restitutus* White. It recalls certain of the small, sulcated *Conus* from the Dominican Miocene.

This pretty and well characterized shell is named in honor of Dr. Miguel Arrojado Lisbôa, in appreciation of his valuable work on the Permian of northern Brazil.

Locality — Rio Pirabas.

Conus longesperatus, sp. nov.

PLATE XI, FIGURE 4

This species is described and also illustrated under the discussion of the fauna of the Estação Agronomica, State of Pará, from which the best specimen was obtained.

A spire of this species found as an external mold in the Rio Pirabas limestone is figured.

Locality — Rio Pirabas.

Conus, sp. indet.

PLATE XI, FIGURE 8

Partly embedded in the limestone is the internal mold of a *Conus*, which is probably a small species, distinct from those described. As shown by the figure, the spire is rather high, consisting of seven volutions, the last whorl measuring 10 mm., in diameter.

Locality — Rio Pirabas.

Conus, sp. indet.

There are two external molds of the spire of a large *Conus* about the size of *Conus pachecoi*, but differing in its nearly flat and conspicuously striated spire. The spire comprises nine or ten volutions which are slightly channelled on their upper surfaces and marked with fine spiral threads, about eighth to a whorl. Diameter 33 mm.

The material is too imperfect for further description. Attention is merely called to the presence of the shell.

Locality — Rio Pirabas.

PLATE XI

Fig. 1 — *Conus conditorius* White; natural size. After White. Lower Miocene, Rio Pirabas.

Fig. 2 — *Conus whitei*, new species; natural size. (*Conus sp. indet.* White.) After White. Lower Miocene, Rio Pirabas.

Fig. 3 — *Conus whitei*, new species; natural size. Lower Miocene, Rio Pirabas.

Fig. 4 — *Conus longesperatus*, new species; $\times 3$. Mold showing the sculpture of the last whorl. Lower Miocene, Estação Agronomica, State of Pará.

Fig. 5 — *Conus longesperatus*, new species; $\times 3$. From a cast of an external mold of the spire. Lower Miocene, Rio Pirabas.

Fig. 6 — *Conus tortuosostriatus* Toula; $\times 2$. For comparison with the Pará species, Figures 4 and 5. Lower Miocene, Santo Domingo.

Fig. 7 — *Conus restitutus* White; natural size. After White. Lower Miocene, Rio Pirabas.

Fig. 8 — *Conus*, sp. indet.; $\times 2$. Internal mold in the limestone. Lower Miocene, Rio Pirabas.

Fig. 9 — *Turris albida paraensis*, new variety; natural size. Compare with Figure 15. Drawn from a fragmentary external mold. Lower Miocene, Rio Pirabas.

Fig. 10 — *Conus pachecoi*, new species; natural size. From an artificial cast of an external mold. Lower Miocene, Rio Pirabas.

Fig. 11 — *Conus planiceps* Heilprin. For comparison with the Pirabas species, Figure 1. Lower Miocene, Florida.

Fig. 12 — *Drillia henekeni* Sowerby. For comparison with the Pirabas species, Figure 13. Lower Miocene, Santo Domingo.

Fig. 13 — *Drillia pirabica*, new species; $\times 2$. From a cast of an external mold, Lower Miocene, Rio Pirabas.

Fig. 14 — *Surcula camposi*, new species; $\times 1\frac{1}{2}$. Drawn from an artificial cast of the external mold. Lower Miocene, Rio Pirabas.

Fig. 15 — *Turris albida* Perry; $\times 1\frac{1}{2}$. For comparison with the Pirabas fragment, Figure 9. Lower Miocene, Santo Domingo.

Fig. 16 — *Conus pachecoi*; natural size. Internal mold. Lower Miocene, Rio Pirabas.

Fig. 17 — *Conus* cf., *bonaczyi*, Gabb. For general comparison with the Pirabas sulcated species, Figure 18. Lower Miocene, Santo Domingo.

Fig. 18 — *Conus lisboae*, new species; $\times 2$. From a cast of the external mold. Lower Miocene, Rio Pirabas.

Fig. 19 — *Conus pirabensis*, new species; slightly enlarged. Internal mold. Lower Miocene, Rio Pirabas.

Fig. 20 — *Conus recognitus* Guppy. For comparison with Figure 19. Lower Miocene, Santo Domingo.



