

PLEISTOCENE GASTROPODS FROM TOCA DA ESPERANÇA, MUNICIPALITY OF CENTRAL, STATE OF BAHIA, BRAZIL

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Fossil shells collected during excavations in Toca da Esperança, BA, were identified on morphological grounds as: Artemon intermedius intermedius (Albers, 1857); Gastrocopta (Privatula) corticaria (Say); Bulimulus (Rhinus) heterotrichus (Moricand, 1836) and Polygyratia polygyrata polygyrata (Born, 1780). Bone samples found associated with these shells were dated by the Uranium – Thorium method as being between 204,000 and 295,000 years old (Middle – Upper Pleistocene). Species of the mastofauna also found associated, on the other hand, were identified as being of the Upper Pleistocene or even of the beginning of the Holocene. The material studied here was not dated.

Key words: Gastropoda – Stylommatophora – Pleistocene

The purpose of the present work was to identify and record the finding of a number of species of Pleistocene land gastropods in Toca da Esperança, municipality of Central, in the State of Bahia, Brazil. The shells of these molluscs were collected during excavations carried out by French missions in caves of the region, under the supervision of Professor Maria da Conceição de Moraes Coutinho Beltrão, in 1986 and 1987.

The evidence collected by the above mentioned missions would indicate that Toca da Esperança is the most ancient human site known in the American continent (Lumley et al., 1987, 1988; Beltrão et al., 1988). However, this opinion is questionable.

THE REGION

The substratum of the region is formed by pre-Cambrian black calcareous of the "Una group". It is covered by a reddish residual clay, derived from the calcareous decarbonation, with some rocky outcrops (Lumley et al., 1987).

The Serra da Pedra Calcária or Serra Preta

or Serra Brava is a highly karstified massif of the Upper Proterozoic period, its highest point being 672 m above sea level (Lumley et al., 1987, 1988). It is located on the right bank of the São Francisco River, 11 km north of the municipality of Central, 11° 8' 8" S and 42° 6' 46" W (Beltrão et al., 1990).

The typical vegetation is caatinga, composed of xerophilous shrubs (thorny, caducous and other plants adapted to dry conditions) with a few zones of anthropic activity (Ab' Saber, 1977a; Lumley et al., 1987, 1988; Beltrão & Locks, 1990).

According to Köppen classification, the climate is Bsh type (Encyclopaedia Britannica, 1975), hot semiarid, characterized by high temperatures and torrential rains, with a dry period from April to October and a rainy period from November to March (Ab' Saber, 1977b; Beltrão et al., 1990).

THE CAVE

The Toca da Esperança (Cave of Hope), located in the Serra da Pedra Calcária, lies 110 km east of the São Francisco River, 25 km east of the Verde River and 75 km west of the Jacaré River (or Vereda de Romão do Gramacho River), on the property of the Pé do Morro Farm (Lumley et al., 1987).

Two caves, the Toca dos Buzios and the Toca da Esperança, are located in the eastern part of the northern slope of the mountain range, at a height of 610 m. The latter is the larger, opening to the northwest. The main chamber is 18 m wide, 18 m long, with a height varying from 1.80 to 4.25 m. Several galleries and low cavities originated from this chamber (Lumley et al., 1987, 1988; Beltrão et al., 1990).

STRATIGRAPHY

The excavations were made over a 12 m² area under to a depth of a 100 to 150 cm, allowing four distinct layers to be distinguished (Lumley et al., 1987, 1988; Beltrão et al., 1990).

LAYER I: consists of very hard stalagmitic soil, about 50 cm thick, containing small freshwater gastropods. This structure is indicative that, during the period of deposition, the climate was more humid than at present (Lumley et al., 1987, 1988; Beltrão & Danon, 1987; Beltrão et al., 1988).

LAYER II: consists of angular broken stones in a very solid sandy-clayey matrix. It is 20 to 35 cm thick and contains fossilized bones. The materials encountered here indicate a humid climate (Beltrão & Danon, 1987; Lumley et al., 1987, 1988; Beltrão et al., 1988).

LAYER III: lacks stones, is sandy and has a thickness of 5 to 50 cm. A few fossilized bones (Lumley et al., 1987, 1988) and land gastropods were found. This layer suggests a dry climate during the period of deposition (Beltrão & Danon, 1987; Beltrão et al., 1988).

LAYER IV: consists of laterite soil, indicating a humid climate. It measures 5 to 60 cm in thickness, is devoid of stones but is rich in bones of large mammals and carved bone and stone artifacts (Lumley et al., 1987, 1988; Beltrão & Danon, 1987; Beltrão et al., 1988, 1990). Shells of land gastropods were also found in this layer.

DESCRIPTION OF MATERIAL

The material used in this study comprises four samples of shells from stratigraphic layers III (one sample) and IV (three samples), totalling 109 shells and 8 whorl fragments.

Owing to the process of fossilization, they do not possess the periostracum, have earth

incrustations, are rather fragile and of a whitish colour. In the majority, the peristome is damaged or even absent.

The material is deposited in the malacological collection of the Malacological Laboratory of the Centro de Pesquisas "René Rachou" (FIOCRUZ), Belo Horizonte, State of Minas Gerais, Brazil.

TAXONOMY

Among the shells found, all of the Order Stylommatophora, it was possible to identify four species.

To describe them we have chosen the best preserved specimens.

Superfamily Streptaxacea
Family Streptaxidae
Genus *Artemon* Beck, 1837

Artemon intermedius intermedius (Albers, 1857)

(in Thiele, 1931, p. 729 and Morretes, 1949, p. 166).

Eight shells of this species were found in the sample A-611 from layer III.

Shell description: colour white, diameter 6.6 mm, height 3.4 mm. Protoconch with two whorls, glabrous and translucent. Aperture 2.7 x 2.6 mm, rounded and slightly ovate. Peristome semisharp. Umbilicus deep, with a clear rounded contour. Suture visible, continuous, clearly delineating each of the whorls. Shape planorboid, with 4 1/2 whorls. Surface, encrusted with earth, with fine lines emanating from the midpoint of the body whorl to the protoconch. Three sections, appearing to be segments, were observed, which were more visible on the left hand side (Fig. 1).

Superfamily Vertiginacea
Family Vertiginidae
Subfamily Condriinae
Genus *Gastrocopta* Wollaston, 1878

Gastrocopta (Privatula) corticaria (Say)
(in Thiele, 1931, p. 512, and Wenz & Zilch, 1959-1960, p. 160, Fig. 597).

One shell of this species was found within the sample A-607-A from layer IV.

Shell description: colour white, diameter 2.1 mm, height 4.6 mm. Protoconch with in-

vaginated apex and a slight elevation at the end of the third whorl. Aperture 1.5 x 1.4 mm, slightly ovate with the columellar lip expanded. Umbilicus tiny, well delineated, filled with earth. Suture neat, continuous and deep, giving the impression that each whorl is overlapped by the preceding one. Shape tubular pupiform. Four slightly convex whorls. The earthen incrustations obscure the view of the surface (Fig. 2).

Superfamily Bulimulacea
 Family Bulimulidae
 Subfamily Bulimulinae
 Genus *Bulimulus* Leach, 1815

Bulimulus (Rhinus) heterotrichus (Moricand, 1836).

(in Thiele, 1931, p. 655; Morretes, 1949, p. 147, and Wenz & Zilch, 1959-1960, p. 485, Fig. 1707).

Nine shells of this species were found in three samples as shown in Table I.

TABLE I

Distribution and localization of *Bulimulus (Rhinus) heterotrichus* shells, per sample, in Toca da Esperança, BA

Sample	Layer	Number of shells
A-611	III	3
A-607-A	IV	4
A-607-C	IV	2

Shell description: colour white, diameter 7.1 mm, height 9.6 mm. Protoconch with microgranulations and abruptly invaginated apex in the direction of the columella. Aperture broken into several parts and filled with sediment. Umbilicus well delineated and fusiform. Suture distinct, continuous, with slightly crenulate ridges. Shape buliniform tending to conoidal, with 7 1/4 whorls. On the surface, the incrustations hinder observation of the mesostoch (Fig. 3).

Superfamily Helicacea
 Family Pleurodontidae
 Genus *Polygyratia* (Gray, 1847)

Polygyratia polygyrata polygyrata (Born, 1780)

(in Thiele, 1931, p. 679; Morretes, 1949, p. 163; Wenz & Zilch, 1959-1960, p. 579).

Shells of this species were found in four samples as shown in Table II.

TABLE II

Distribution and localization of *Polygyratia polygyrata polygyrata* shells, per sample, in Toca da Esperança, BA

Sample	Layer	Number of shells
A-611 A	III	69
A-607-A	IV	4
A-607-C	IV	8
A-613	IV	5

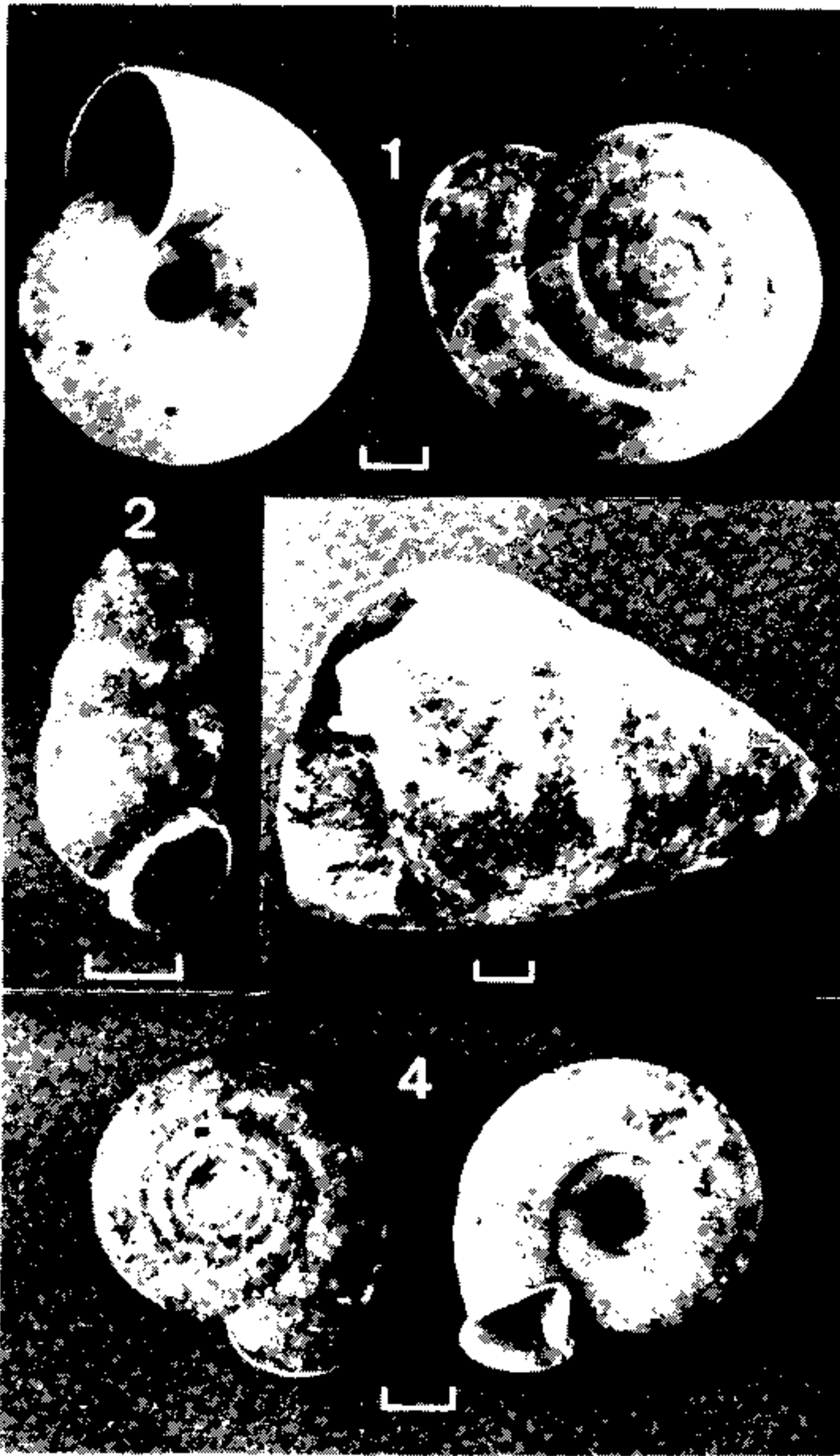
Shell description: colour white, diameter 5.3 mm, height 1.9 mm. Indistinct protoconch, with glabrous structure. Protoconch ends at the same level as the other whorls. Aperture 1.8 x 1.6 mm, subtriangular, with a tooth-shaped projection on the upper part pointing towards the interior. Peristome well marked and expanded. Umbilicus delimited, deep, reaching the fifth whorl, slightly fusiform. Suture distinct and continuous following the whorl convexity, its neatness hidden by the incrustations. Shape planorboid, with a slight flattening near the apperture, and 6 1/4 whorls. On the surface, some fine lines are observed, giving the whorls a pleated aspect (Fig. 4).

REMARKS

Three bones from layer IV and one from layer II were dated by the Uranium-Thorium method, using alpha and gamma spectrometry. The ages are about 300,000 B. P., with a minimum of between 204,000 and 295,000 (Lumley et al., 1987, 1988).

The bones found in layers II, III and IV are highly mineralized and fragmented, and according to Lumley et al. (1987, 1988) belong to the following species: *Eremotherium laurillardii* (Lund); *Propaopus sulcatus* Lund; *Pampatherium humboldti* (Lund); *Hippidion* sp.; *Tayassu albirostris* Illiger, 1811; *Scelidothierium* sp.; *Mazana* sp.; *Palaeolama* sp.; *Agouti paca* Linnaeus, 1758.

Species of this mastofauna have been identified as being of the Upper Pleistocene or



Fossil shells from Toca da Esperança, Bahia, Brazil. Fig. 1: *Artemon intermedius intermedius*. Fig. 2: *Gastropoda (Privatula) corticaria*. Fig. 3: *Bulimulus (Rhinus) heterotrichus*. Fig. 4: *Polygyratia polygyrata polygyrata*. Bar = 1 mm.

even the beginning of the Holocene (Cartelle & Bohorquez, 1982; Cartelle, 1991a, b).

The shells studied here are from layers III and IV, thus being associated with the collected mastofauna. They were not themselves dated however.

Thus the absolute datings cited would indicate that the malacofaunule referred to should be considered as being of the Middle-Upper Pleistocene transition, although the associated mastofauna suggests that it is from the Upper (Final) Pleistocene.

The malacofaunule studied here, from the geochronologic point of view, does not provide data concerning the contested differences between Lumley et al. (1987, 1988) and Cartelle (1991a).

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