

# THREE NEW SPECIES OF *KORA* (PULMONATA, ORTHALICIDAE) FROM BAHIA AND MINAS GERAIS, BRAZIL

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*Abstract* Three new species of the recently described genus *Kora* are described, based on dry material collected in cavernicolous and adjacent environments. *Kora terrea*, from Presidente Olegário, MG, is characterized by spotted pigmentation; projected, wide outer lip, and pointed spire. *Kora nigra*, from Carinhanha, BA, is characterized by dark-brown color, elliptical outline, and rounded, narrow aperture. *Kora iracema*, from São Desidério, BA, is characterized by very ample, projected outer lip, wide spire and white coloration. A new occurrence of the type species, *Kora corallina*, is reported, from Carinhanha, BA, expanding its geographic distribution ~200km towards southwest. Species of the genus *Kora* have been shown to be restricted to semi-dry, caatinga environment, restricted to south region of Northeast Brazilian region, and north of Southeast region.

## INTRODUCTION

The genus *Kora* Simone, 2012 was recently described for a single species, *Kora corallina* Simone, 2012, from Santa Maria da Vitória, Bahia state, Brazil (Simone, 2012a: 432–433). The genus is mainly characterized by the fusiform shape of the shell; by the narrow, but opened umbilicus; by the strongly deflected peristome located somewhat away from the longitudinal axis, weakly displaced if a normal growth was performed; and by a thickness in middle level of the inner lip, at the transition to the parietal wall, almost forming a labral, middle tooth.

Samples belonging to the genus *Kora* have been brought to attention by the team of Maria Elina Bichuette, who is searching the invertebrate fauna of caverns and similar environments. The analysis of that material revealed four species, one of them is *K. corallina*, but the others are new to science. They are additional species to a so far monospecific genus, and serve to expand the definition of the genus with some other details. This paper is part of a project revising the cavernicolous fauna collected by Bichuette's team (e.g., Simone, 2012b, 2013).

Recent descriptions of new supra-specific taxa, as well as several species, have been a routine in South America (e.g., Breure, 2009; Breure & Avila, 2010; Simone, 2010), showing how weak is the knowledge of the region's malacofauna. This aspect gains importance in the face of ongoing rapid environmental degradation, caused by the economic development of the region (Pendzich, 2010).

## SYSTEMATICS

### *Kora terrea* sp. nov. (Figs 1–5)

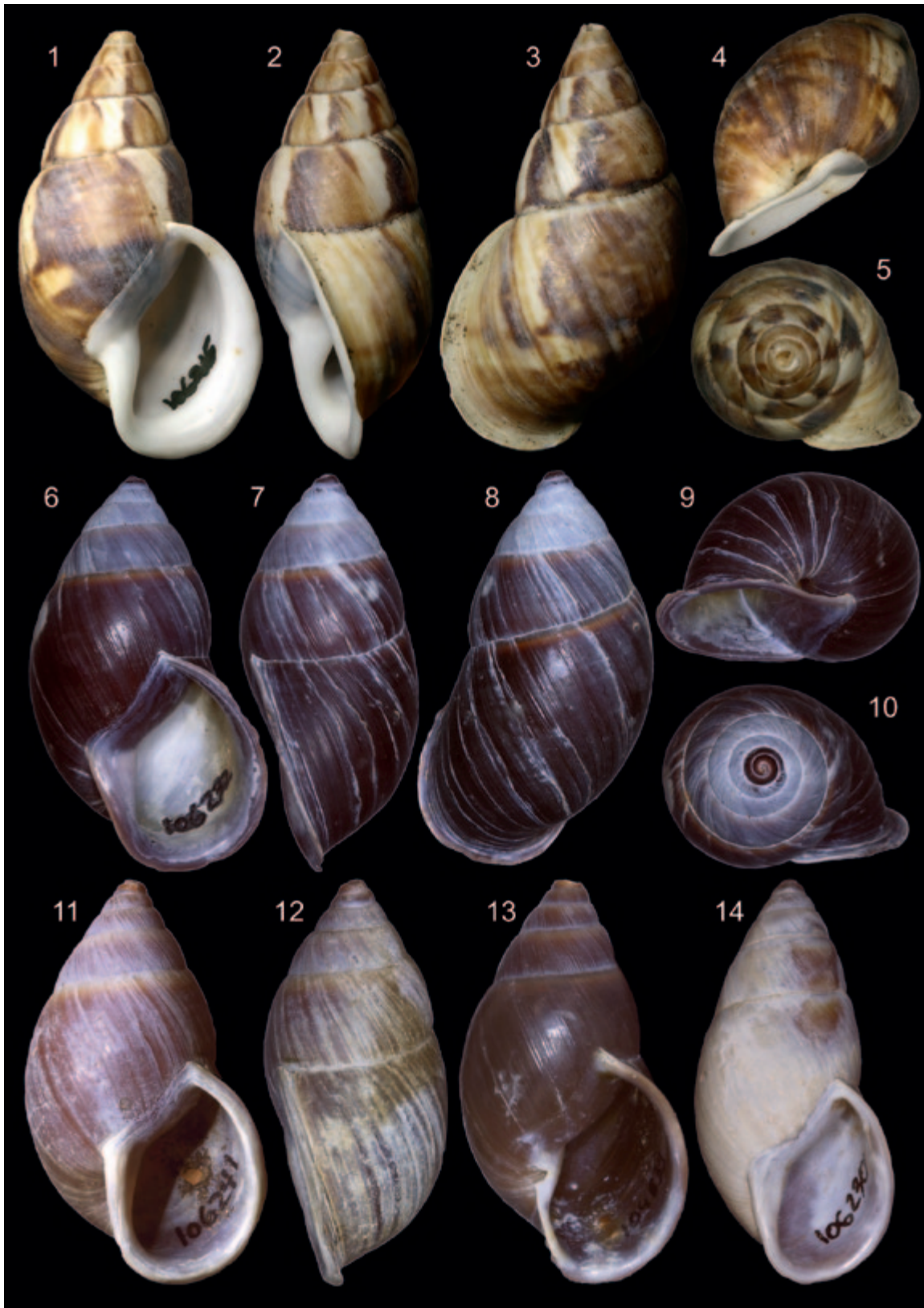
*Types* Holotype MZSP 106215. Known only from the holotype.

*Measurements* Holotype: 40.8mm (height) by 26.5mm (width).

*Type locality* BRAZIL. **Minas Gerais**; Presidente Olegário, Povoado de Galena, 18°25'S 46°25'W (Bichuette col., 02.v.2008. sta. LES2292) (Fig. 20, locality 1).

*Diagnosis* Shell with spotted pigmentation of dark and pale brown axial bands. Outer lip projected, wide, as long and as wide as spire. Spire pointed, with straight profile. Spire angle ~45°.

*Description* Shell 40.8mm, outline fusiform, biconic, width ~64% of length. Color pale beige, with strong pale and dark brown spots, somewhat randomly distributed, sometimes forming gradient mosaic (Figs 1–3). Protoconch broken (not seen). Teleoconch of ~5 whorls (Fig. 5) successively and uniformly increasing; profile almost straight, weakly concave; suture feebly deep. Sculpture absent, except for growth lines and delicate axial, uniform undulations, ~55in penultimate whorl. Spire angle ~45°. Peristome strongly deflected, except for region of callus. Callus straight, thin (Fig. 1). Peristome slightly prosocline at ~25° in relation to longitudinal axis (Fig. 2). Aperture wide, somewhat dislocated from spire longitudinal axis; length ~50% of shell



**Figures 1–14** shells of *Kora* specimens: 1–5, *Kora terrea*, n sp, Holotype MZSP 106215 (L 40.8mm); 1, apertural view; 2, left view; 3, dorsal view, 4, anterior-slightly left view; 5, apical view. 6–13, *Kora nigra*, n. sp.; 6, holotype MZSP 106232 (L 30.1mm), apertural view; 7, same, left view; 8, same, dorsal view; 9, same, anterior view; 10, same, apical view; 11, paratype MZSP 106241 (L 31.6mm), apertural view; 12, same, left view; 13, MZSP 104839 (L 43.8mm), apertural view. 14, *Kora corallina*, MZSP 106230 (L 32.8mm), apertural view.

length, ~70% of shell width. Outer lip inserted distantly from adjacent suture, simple, strongly arched; expansion of outer lip extending shell width ~15%. Inner lip strongly concave, superior half weakly convex; inferior half slightly convex; edge almost as wide as outer lip and as continuation from it; bearing oblique thickness, as wide fold, restricted to superior half (Figs 1, 2). Umbilicus present, narrow, partially covered by inferior half of inner lip (Fig. 4).

*Distribution* Known only from the type locality.

*Habitat* Caatinga environment, a dry scrubland of thorny trees, cacti and arid resistant groundcover.

*Etymology* The specific epithet refers to the spotted aspect of the shell, with a color resembling earth, derived from the Latin *terra*, meaning earth, ground, soil.

*Kora nigra* sp. nov.  
(Figs 6–13, 21)

*Types* Holotype MZSP 106232. Paratypes: MZSP 106241, 1 shell (sta. LES2214), MZSP 106250, 2 shells (sta. LES2216) from type locality; 104831, 5 shells from uncertain locality (possible same as type locality, sta; LES2077). Known only from the type series.

*Measurements* (height and width in mm). Holotype: 30.1 by 18.3; paratypes MZSP 106241: 31.6 by 19.5; MZSP 104839, 43.8 by 23.6.

*Type locality* BRAZIL. **Bahia**; Carinhanha, Serra do Ramalho, Grana do Casário, 14°19'S 43°47'W (Bichuette col., 12.ix.2008; sta. LES2213) (Fig. 20, locality 2).

*Diagnosis* Shell with dark-brown uniform color, except for beige subsutural band. Outer lip rounded, narrow, peristome thick; narrowly projected. Spire slightly dome-shaped. Spire angle ~65°.

*Description* Shell up to 44mm, outline fusiform, elliptical, width ~60–62% of length. Color uniform dark brown, with narrow beige subsutural band of unclear border, occupying ~1/8 of penultimate whorl (Figs 6, 8, 11). Protoconch of ~2 whorls, ~3mm; first whorl smooth, weakly glossy; second whorl gradually axial ribs

appearing, from suture to suture, relatively uniform, interspaces similar to ribs width (Figs 10, 21); border with teleoconch clear, weakly prosoclyne. Teleoconch of ~4 whorls (Figs 7, 10, 12) successively and uniformly increasing; profile slightly dome-shaped, whorls weakly concave; suture almost plane. Sculpture absent, except for growth lines and delicate axial, uniform undulations, ~75 in penultimate whorl; most specimens with sparse, stronger axial undulations. Spire angle ~65°. Peristome thick, narrowly deflected. Callus straight, relatively thick (Figs 6, 11). Peristome slightly prosocline at ~12° in relation to longitudinal axis (Figs 7, 12). Aperture wide, somewhat dislocated from spire longitudinal axis; length ~48% of shell length, ~60% of shell width. Outer lip inserted distantly from adjacent suture, simple, arched; expansion of outer lip extending shell width ~5%. Inner lip strongly concave, superior half weakly convex; inferior half almost straight (Fig. 6) to weakly concave (Figs 11, 13); edge almost as wide as outer lip and as continuation from it; bearing oblique thickness, as wide fold, restricted to superior half (Fig. 13). Umbilicus present, relatively wide, partially covered by inferior half of inner lip (Fig. 9).

*Distribution* Known only from type locality.

*Habitat* Caatinga environment.

*Etymology* The specific epithet refers to the dark coloration of the shell, dark brown, almost black, from the Latin *niger*, *nigra*, meaning black, dark.

*Kora corallina* Simone, 2012a  
(Figs 14, 22)

*Kora corallina* Simone, 2012a: 432–433 (figs. 1–8).

*Material examined* BRAZIL. **Bahia**; Carinhanha, Serra do Ramalho, 14°19'S 43°47'W, Grana das Três Cobras 440m elevation, MZSP 106230, 1 shell (ME Bichuette *et al.* col., 10.ix.2008).

*Remarks* Simone (2012a) stated the occurrence of this species as Santa Maria da Vitória, Bahia (Fig. 20, locality 3). The newly examined specimen was collected in Carinhanha, same state (Fig. 20, locality 2), about 200km southeast from the type locality. This new record expands the known distribution of the species.





**Figures 15–22** shell features of *Kora* specimens: 15–20, *Kora iracema*, n. sp., Holotype MZSP 104964 (L 39.3mm); 15, frontal view; 16, left view; 17, dorsal view; 18, anterior view; 19, apical view; 20, detail of protoconch in profile. 21, protoconch of *Kora nigra* paratype MZSP 106232 in profile. 22, protoconch of *Kora corallina* MZSP 104964 in profile. Scales=2mm.

The general shape of the additional discovered specimen (Fig. 14) fits well in the description. The single main difference is the whole profile of the spire, which is somewhat inflated, while the more common shape is slightly more acuminate (Simone, 2012a, figs 1–8). The remaining shell features, including the form of the aperture, are remarkably similar. The protoconch of the new specimen (Fig. 22) is rather smooth if compared with the typical protoconch (Simone, 2012a, fig. 5), but this variation can be attributed to shell erosion, as the presently examined specimen looks as if it has been dead for a long time.

*Kora iracema* sp. nov  
(Figs 15–20)

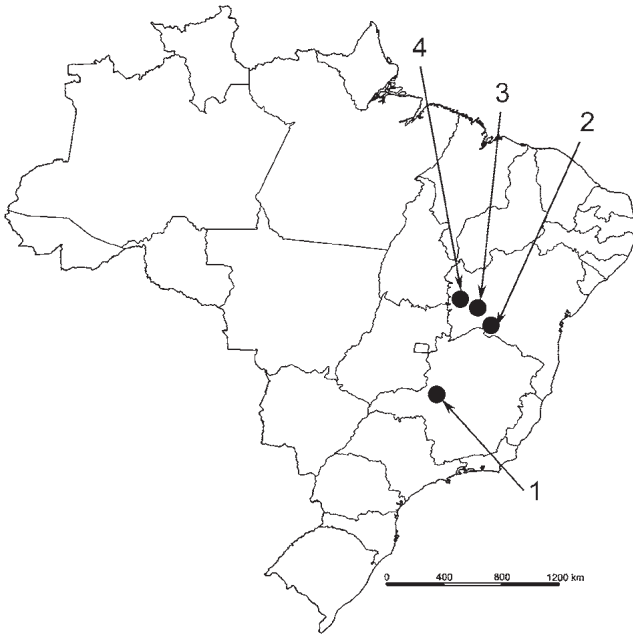
*Types* Holotype MZSP 104964. Known only from the holotype.

*Measurements* Holotype: 39.3mm (height) by 22.4mm (width).

*Type locality* BRAZIL. Bahia; São Desidério, Gruta do Morro dos Tapuias, 12°30'S 45°03'W (Bichuette col., 31.vii.2008; sta. LES2000) (Fig. 20, locality 2).

*Diagnosis* Shell with pure white uniform color. Outer lip greatly projected outside. Spire slightly dome-shaped. Spire somewhat dome-shaped, spire angle ~55°.

*Description* Shell up to 40mm, outline fusiform, biconical, width ~57% of length. Color uniform pure white (Figs 15–17). Protoconch of ~2 whorls, ~2–5mm; first whorl smooth, weakly glossy; second whorl gradually reticulate appearing, from suture to suture, relatively uniform, interspaces similar to ribs width (Figs 19,



**Figure 23** Map of Brazil with states delineated, showing known distribution of *Kora* species. Locality 1: Presidente Olegário, Minas Gerais (18°25'S 46°25'W); locality 2: Carinhanha, Bahia (14°19'S 43°47'W); locality 3: Santa Maria da Vitória, Bahia (13°24'S 44°12'W); locality 4: São Desidério, Bahia (12°56'S 45°29'W).

20); border with teleoconch clear, weakly prosocline (Fig. 20). Teleoconch of ~5 whorls (Figs 17, 19); profile slightly dome-shaped, wider in first whorls than last whorls; whorls weakly concave; suture almost plane. Sculpture absent, except for growth lines and delicate axial, uniform undulations, ~55 in penultimate whorl. Spire angle ~55°. Peristome very thick, strongly deflected to right, anterior and to left. Callus straight, relatively thick (Figs 15, 18). Peristome slightly prosocline at ~10° in relation to longitudinal axis (Figs 16). Aperture wide, somewhat dislocated from spire longitudinal axis; length ~41% of shell length, ~14% of shell width. Outer lip inserted distantly from adjacent suture, simple, arched; expansion of outer lip extending shell width ~15%. Inner lip strongly concave, superior half weakly convex; inferior half almost straight (Fig. 15); edge almost as wide as outer lip and as continuation from it; bearing low thickness, as wide fold, restricted to superior half (Fig. 15). Umbilicus present, narrow, mostly covered by inferior half of inner lip (Fig. 18).

*Distribution* Known only from type locality.

*Habitat* Caatinga environment.

*Etymology* The specific epithet is derived from the Tupu native language, from *iracema*, meaning honey lips, an allusion to the well-developed peristome.

## DISCUSSION

The four species of *Kora* here described can be easily distinguished from each other. The spotted color is only found in *K. terrea* (Figs 1–5), while the other species have a uniform coloration; however, *K. nigra* (Figs 6–13) and *K. corallina* (Fig. 14) possess a paler subsutural band. The color of *K. terrea* is pale and dark brown, that of *K. nigra* is dark brown, of *K. corallina* is reddish brown, and that of *K. iracema* is pure white (Figs 15–19). *K. terrea* and *K. iracema* share a well-developed, expanded outer lip, while the lip of *K. nigra* and *K. corallina* has a thinner degree of deflection. The spire is acuminate in *K. terrea* and in *K. corallina*, while the spire is slightly dome-shaped in *K. nigra* and *K. iracema*. The protoconch of all species has been uniformly rounded, with two whorls; their sculpture is initially a delicate reticulate (Fig. 20), however, this delicate sculpture can be easily eroded, producing a smooth protoconch (Fig. 22); *Kora nigra* is the only species that has stronger axial sculpture in the second protoconch whorl (Fig. 21). The sculpture is with somewhat uniform undulations in all species, but *K. nigra* appears to have some sparse, stronger, well-marked axial undulations (Figs 7–8, 11–12). The proportion of width to length of the species are: *K. terrea*: 64%, *K. nigra*: 61%, *K. corallina*: 36%, and *K. iracema*: 57%. The approximate spire angles are: *K. terrea*: 45°, *K. nigra*: 65°, *K. corallina*: 45°, and *K. iracema*: 55°.

*Kora* has been shown to occur in a semi-dry environment, like Caatinga and the dry regions of the Atlantic rainforest, being restricted to the northern part of Minas Gerais and south eastern part of Bahia states, between the Northeast and Southeast Brazilian regions. These regions have been degraded for centuries, but they now face the pressure of regional economic development, mainly in the form of mining for limestone. The description of the species is of importance, not only academically, but also as type localities have additional environmental protection under Brazilian laws.

## ACKNOWLEDGMENTS

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