

## ***Liguus blainianus*, an Endangered Lineage of *Liguus* from the Rosario Range in Western Cuba**

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**ABSTRACT** The *Liguus blainianus* lineage from western Cuba is presented, with a discussion of its placement as a subspecies of *Liguus fasciatus*, current and historical range, distribution maps, comments about past and recent field work and its hybridization with *L. f. archeri*. Color images of live animals and their habitat are included. An argument is made for creating a protected area to avoid the extinction of this beautiful and important race of tree snails.

**KEY WORDS** *Liguus*, *Liguus blainianus*, tree snails, Cuba

### **TAXONOMIC HISTORY:**

In May of 1853, the Cuban Naturalist Felipe Poey y Aloy (1799-1891) described *Achatina blainiana* in the first volume of his “*Memorias sobre la Historia Natural de la Isla de Cuba*” (1851–1853) [*Memorias No. XV. Especies nuevas de Heliceas. Moluscos terrestres inoperculados*, p. 206-207, Pl. 12, figs. 4-6]. The illustration of the holotype displayed was dated October 1852 in the same volume.

Poey originally collected this beautiful tree snail in the company of the naturalist José León Isidoro Francisco de la Trinidad Blaín y Cervantes (1808-?), owner of the “*El Retiro*” farm in Sierra del Rosario in Santa Cruz de los Pinos. Blaín’s brother in law, Francisco Adolfo Sauvalle y Chanceaulme (1807-1879), also owned neighboring farms named “*Finca Balestena*” and “*Finca Rangel*”. These farms were the first recorded localities for *L. blainianus* in the 19<sup>th</sup> century and became mandatory “camping grounds” for naturalists who visited Western Cuba at that time and even years later (ex. Pierre Marie Arthur de Morelet (1809-1892), Charles Wright (1811-1885),

Johann Christoph Gundlach (1810-1896) [González-Guillén, 2019]. Poey collected a “*great quantity*” of specimens noticing the “few or almost no variation among them” (see Poey’s *Memorias*, 1853, at pp. 207 and 361). This prompted him to describe *L. blainianus* as a new species.

Ludwig Pfeiffer (1804-1877), accepted *L. blainianus* as a valid species in several of his publications from 1853 to 1865. Rafael Arango y Molina (1836-1893) did not accept Poey’s species, and in his Cuban Landsnail Catalog of 1865 adamantly declared that *A. blainiana* was a synonym for *A. fasciata* (Müller, 1774). Oddly Poey accepted this assessment without any reluctance (González-Guillén; Krull & Lajonchere, 2018).

In 1899, Pilsbry addressed the genus *Liguus*, recognizing four species including *Liguus blainianus* (Poey, 1853) however, in his discussions he feared giving it full specific rank because: “*there are certain forms of L. fasciatus which approach L. blainianus, and when full series from the region adjacent to its locality are collected, I do not have much doubt that L.*

*blainianus* will be given subspecific rather than specific rank” (González-Guillén; Krull & Lajonchere, 2018).

When describing *L. blainianus* Poey used only shell characters and no anatomical features to declare it a species. To date, no DNA or other biological studies have been done to prove that *L. blainianus* is not a subspecies of *L. fasciatus*. Further it has been shown that *L. blainianus* hybridizes with *L. f. archeri* where their ranges overlap. Applying traditional definitions of species/subspecies we feel confident to assert herein that *L. blainianus* is a subspecies of *L. fasciatus*.

Even though Poey noted the uniformity of color in most *L. blainianus* shells, some other color forms do exist. In 1935, William Clench described the subspecies *L. blainianus pilsbryi* based on narrower axial flaming and a wider peripheral band [see Pl. n2, figs. 12-20]. We consider this to be a color form. In Pilsbry’s 1899 monograph, another color form is shown with a central creamy band (Pl. 55, fig. 53) which was given the manuscript name *Liguus blainianus mesai* by M.L. Jaime [see Pl. 1, figs. 1-4]. We believe that the last time specimens of this form were collected was in 1981 by Ramón Calzadilla Núñez, but we do not have an exact locality. Jaime also coined the name *L. bl. rangelinus* which remains a manuscript name [see Plate 1, Figure 5].

In the past, other Cuban *Liguus* were included within the *L. blainianus* species including *L. b. guanensis*, *L. b. fairchildi*, *L. b. jaumei*, *L. b. giganteus*, *L. b. minutus*, *L. b. picturatus* and *L. b. guillermi*. Those were shown by A. González-Guillén, F. Krull & L. A. Lajonchere in 2018 to belong to different *Liguus* subspecies [see Plate 3, Figures 1-13]. None of these color forms occur within the *L. blainianus* range.

## HISTORICAL AND CURRENT RANGE:

The original range of *Liguus blainianus* covered an area of approximately 40 square miles (100 km<sup>2</sup>), roughly 5 by 8 miles (see Figure 1 & 2). We have no records of how much of this territory actually supported *Liguus*. Most of this area was probably covered in hardwood forests but by the mid-18<sup>th</sup> century (or earlier) forest clearing for farming and forest fragmentation had begun, and deforestation continues to this day. Most of the range displayed on the map is no longer covered by primary hardwood forests. In 1960, all the properties that were once the farms of the Blain and Sauvalle families were subdivided “into several farms for crops or cattle raising and all its botanical values were destroyed” (González-García, 2017).

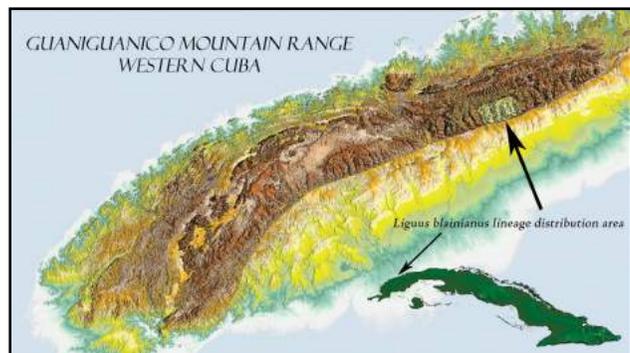


Figure 1. Location of the *Liguus blainianus* distribution area.

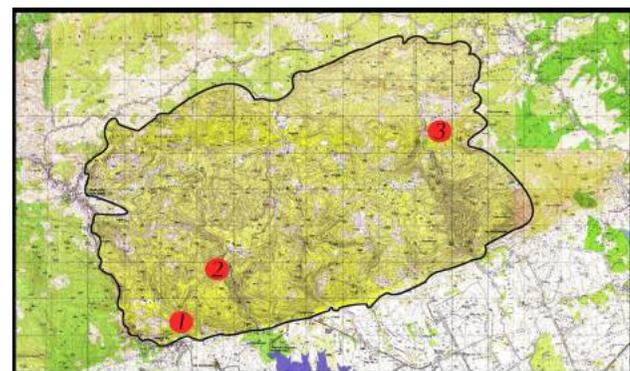
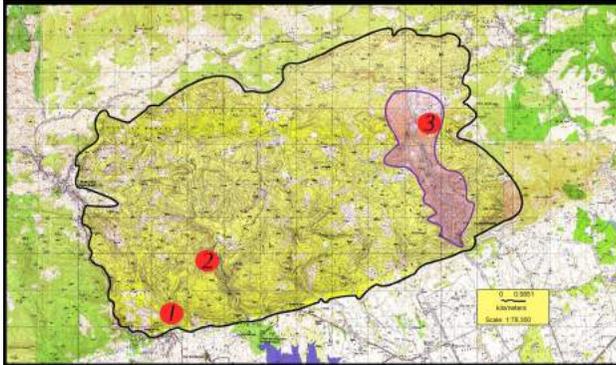


Figure 2. *Liguus blainianus* lineage likely distribution in the 18<sup>th</sup>-19<sup>th</sup> centuries, Sierra del Rosario, Guaniguanico mountain range, western Cuba.

Today perhaps less than 50% of primary (semi-deciduous and evergreen type) and secondary forest habitat remains suitable for *Liguus* populations. Of that only about 10% has been recently searched for *Liguus*.



**Figure 3.** *Liguus blainianus* lineage feasible distribution prior to human settlements in the region, San Cristóbal municipality, Pinar del Río province. Localities visited in 2007 and 2018. Locations noted are: 1 = Campo de Tiro; 2 = Jardines de Aspiro (Aspiro's Gardens); 3 = Cañón del Río Santa Cruz (Santa Cruz River Canyon).

Three remaining *L. blainianus* populations are known: Campo de Tiro from Consejo Popular Fierro, Jardines de Aspiro, and Cañón del Río Santa Cruz, both from Consejo popular Santa Cruz de los Pinos (the latter seemingly containing more hybrid forms than anything). González-Guillén found color forms that have not been described previously during a field trip in 2007, covering the area between El Cañón del Río de Santa Cruz (Santa Cruz River Canyon) and Arroyo del Loro vicinity [see Plate 2, Figures 3 & 9]. These color forms unexpectedly exhibited traits of being hybrids with the *L. fasciatus archeri* lineage [see Plate 3, Figures 14-20]. Periostracal green lines are a good indicator as *L. blainianus* never has green lines, however the presumed hybrids found almost always possess them as well as other “hybrid” color patterns.

Subsequent field trips done by Raimundo L. Silvero and L. A. Lajonchere to the Santa Cruz

River Canyon provided further indication of hybridization [see Plate 3, Figures 4-8, and 10-11]. In 2018, González-Guillén and Lajonchere also successfully found *L. b. pilsbryi* populations in the type locality of Campo de Tiro and found thriving populations of *L. b. blainianus* in Aspiro (see Figure 4).



**Figure 4.** *Liguus blainianus blainianus*, Jardines de Aspiro, San Cristóbal municipality, Pinar del Río province.

The *Liguus* population found in Campo de Tiro seemingly contains higher densities compared with the ones from Aspiro or Santa Cruz River Canyon. In all the populations examined in Campo de Tiro and Aspiro the snails were found aestivating on diverse host plants (frequently in cavities at lower heights) and karstic rock crevices.



**Figure 5.** *Liguus blainianus pilsbryi*, Campo de Tiro, San Cristóbal municipality, Pinar del Río province.

The colonies were found approximately between 120 to 300 meters above sea level (hereinafter “masl”), but we suspect that they reach higher altitudes surpassing the 500 masl. In the past, Clench and others hypothesized [Laureano Pequeño Sánchez (1890-1962) and Pedro Joaquín Bermúdez (1905-1979)] that *L. b. blainianus* only inhabited the mountain base and that *L. b. pilsbryi* lived at higher elevations. Recent field trips have not proven that hypothesis to be the case.



**Figure 6.** *Liguus blainianus* hybrid from Cañón del Río Santa Cruz, San Cristóbal municipality, Pinar del Río province.

In Clench’s description he indicates that the paratypes of *L. b. pilsbryi* also came from “Sierra de Rangel” and we know from detailed collection records that it also lived west of Rangel in the vicinity of Rancho Mundito (Niceto Pérez). Regrettably, in 2018 efforts to find populations in the Rangel vicinity were

futile. In the past, what was considered as the “Rangel” region covered a large area and no detailed locality records exist of shells that were collected there. It has likewise not been possible to determine the exact whereabouts of old label localities that were recorded as “Rancho Mundito” or “Hoyos del Manantial”.

**Note:** Consejos Populares (People’s Council) is a Cuban government geopolitical subdivision. All localities mentioned here belong to San Cristóbal municipality from the former Pinar del Río province (today’s Artemisa province).

## DISCUSSION / RECOMMENDATIONS

Much of the *L. blainianus* range remains to be searched for any other remaining snail populations, and a better understanding is needed of their ecology. The area is rugged with tall cliffs and steep valleys and travel is treacherous. While most of the top half of the range has probably been deforested for farming, the lower half likely still contains both primary and secondary forests suitable for *Liguus*.

The establishment of a protected area, probably encompassing the entire original *L. blainianus* range, would be a big step forward in protecting this unique form. Generally, *Liguus* do not become extinct from over-collecting but rather due to the loss of habitat. However, the range of *L. blainianus* is small and it is evident that collecting in the Aspiro area has continued to the present. The establishment of a protected area would dissuade people from collecting these snails there or anywhere within that range.

Finally, further study is needed as to the biology of all *Liguus* forms, together with rigorous mitochondrial and nuclear DNA studies. Although Luis A. Lajonchere is making an effort in that direction as resources become

available, this research has not gained much ground due to lack of funding.

### ACKNOWLEDGMENTS

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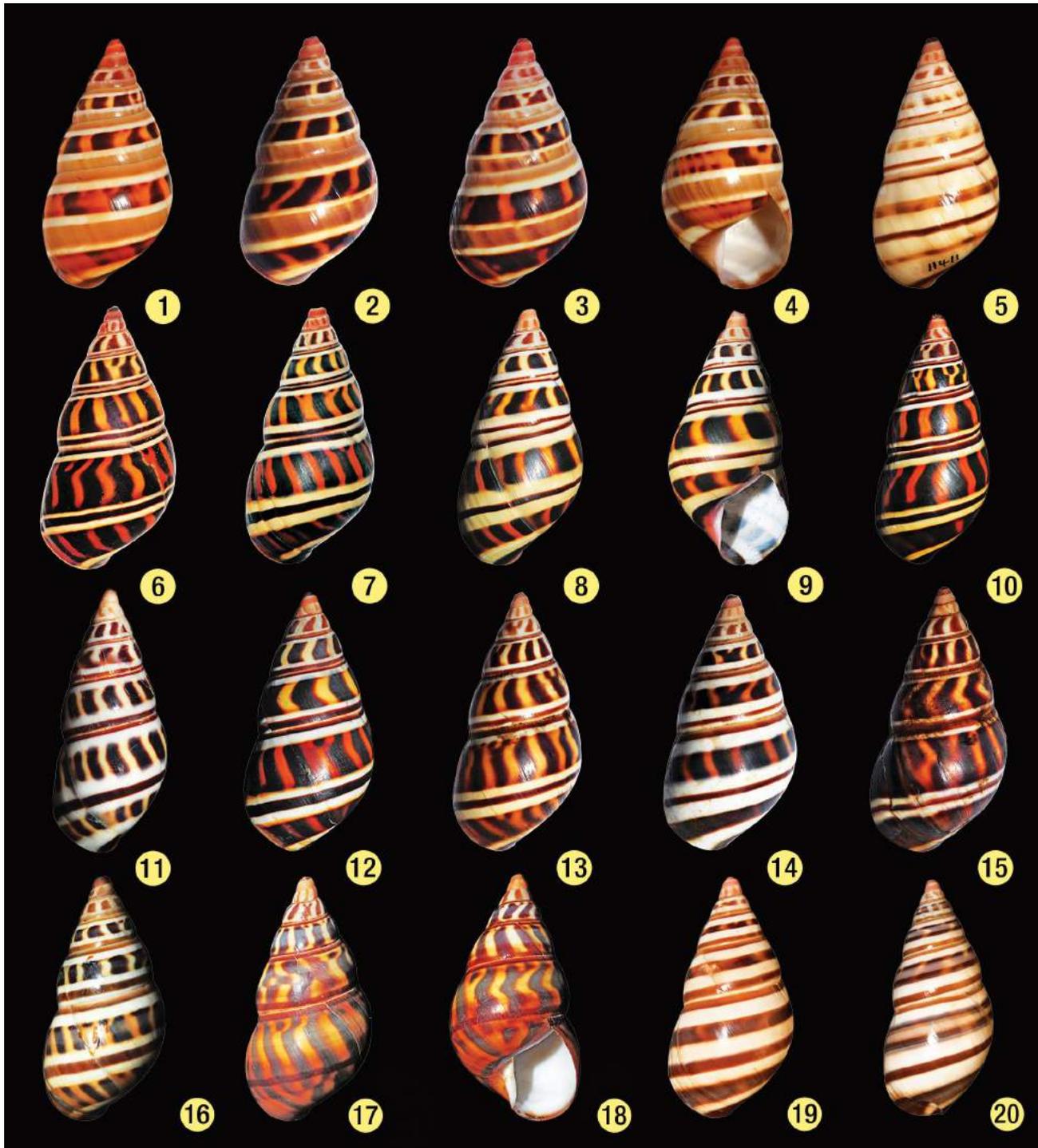
**Figure 7.** *Liguus blainianus* hybrid. Photo by Raimundo Lopez Silvero.



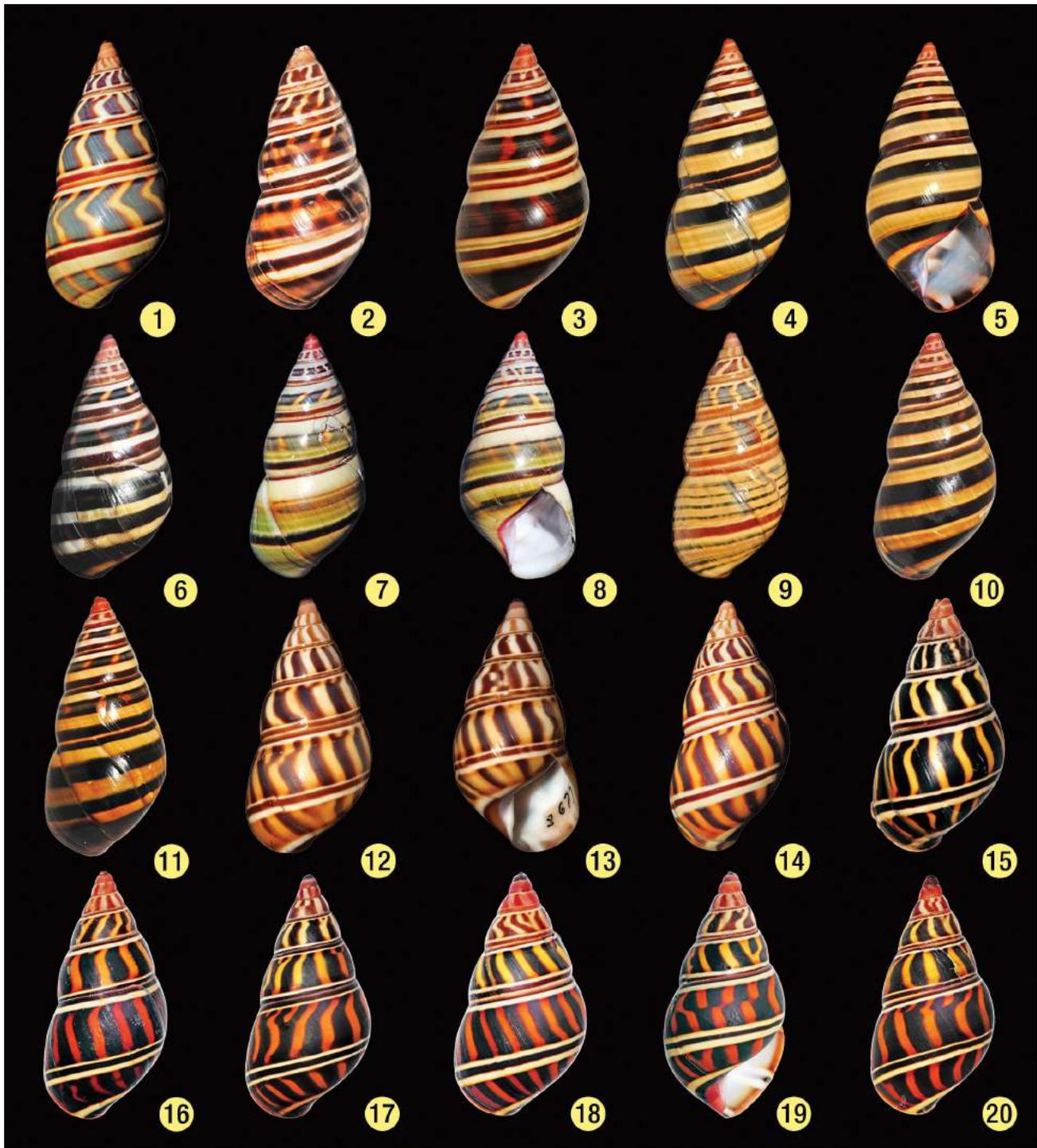
**Figure 8.** *Liguus blainianus* hybrid. Photo by Adrian González-Guillén.



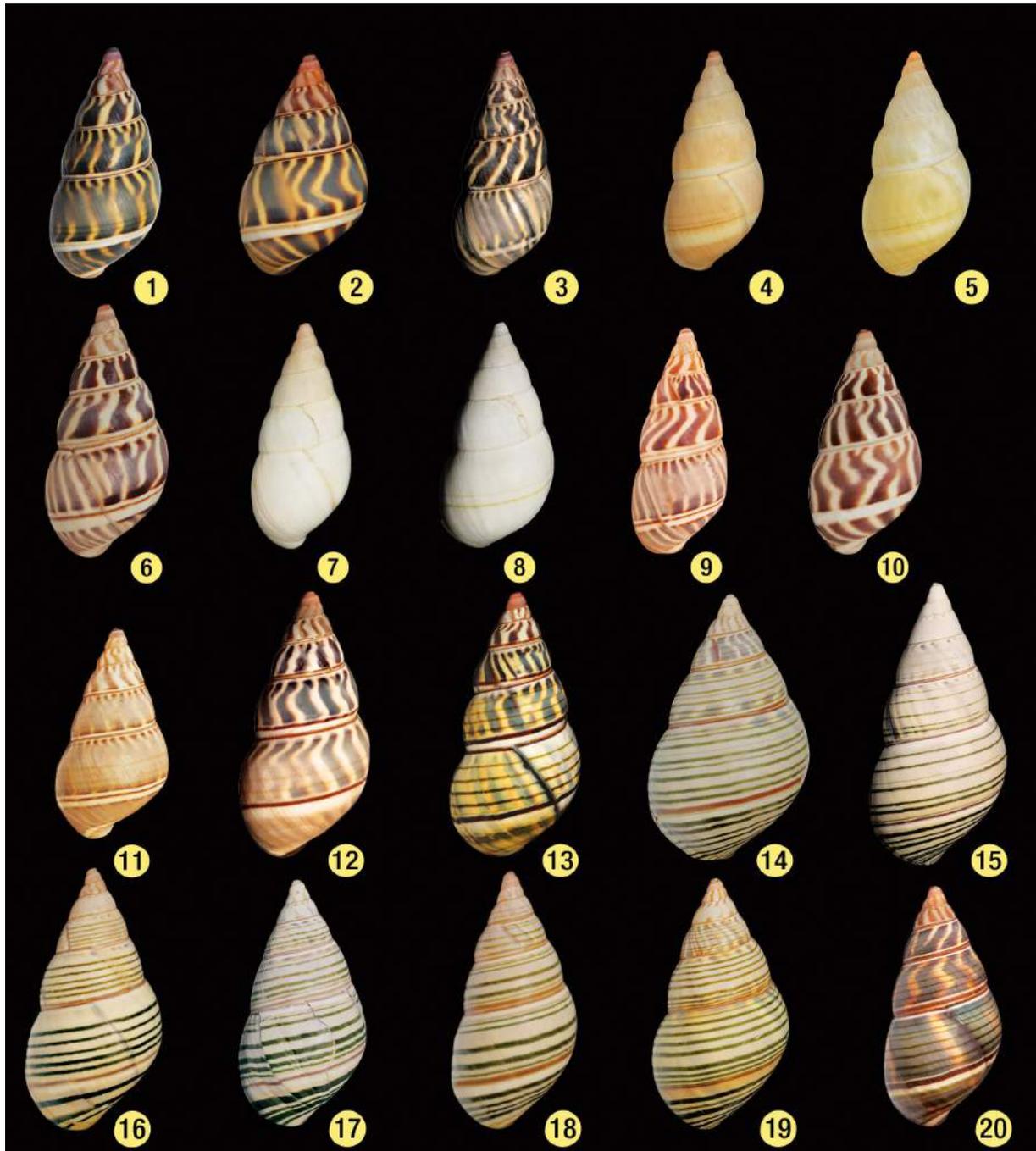
**Figure 9.** *Liguus blainianus* hybrid. Photo by Luis A. Lajonchere.



**Plate 1.** *Liguus blainianus blainianus* specimens. Figures 1-4: *Liguus blainianus blainianus* (manuscript form *mesai* by M.L.Jaume), Aspiro-Rangel-Santa Cruz River Canyon; 5: *Liguus blainianus blainianus* (holotype of manuscript form *rangelinus* by M.L. Jaume), Rangel; 6-12: *Liguus blainianus blainianus*, Aspiro-Taco; 13-15: *Liguus blainianus blainianus*, Campo de Tiro; 16-18: *Liguus blainianus blainianus*, Rangel; 19-20: *Liguus blainianus blainianus*, Santa Cruz River Canyon. All specimens are from the San Cristóbal municipality, Pinar del Río province, western Cuba.



**Plate 2. *Liguus blainianus* hybrids.** Figures 1: *Liguus blainianus* hybrid, “Rangel” vicinity; 2-11: *Liguus blainianus* hybrids, Santa Cruz River Canyon-Arroyo del Loro area; 12-13: *Liguus blainianus pilsbryi* paratype [Felipe Poey Museum, Havana], Campo de Tiro; 14-20: *Liguus blainianus pilsbryi* topotypes, Campo de Tiro. All specimens are from the San Cristóbal municipality, Pinar del Río province, western Cuba.



**Plate 3. Other *Liguus blainianus* and *Liguus fasciatus* lineages.** Figures 1-11: *L. b. murreus* lineage. 1: *L. b. fairchildi*, Güira de Melena; 2: *L. b. fairchildi*, Sierra de Anafe; 3: *L. b. fairchildi*, San Antonio de los Baños; 4: *L. b. guillermi*, Bauta; 5: *L. b. guillermi*, Batabanó; 6: *L. b. giganteus*, Finca Sotolongo, Güira de Melena; 7-8: *L. b. jaumei*, between Artemisa and Cañas towns; 9: *L. b. picturatus*, Ceiba del Agua; 10: *L. b. picturatus*, Hollywood beach, near Baracoa; 11: *L. b. minutus*, Puente de La Lisa, Havana city. All previous localities from Havana city and countryside. Figs. 12-13: *L. f. pallidus* lineage. 12: *L. b. guanensis*, Cueva del Obispo, Sierra de Guane; 13: *L. b. guanensis*, Los Portales, Guane. Figs. 14-20: *L. f. archeri* lineage. 14: *L. f. archeri*, Loma de Seboruco; 15: *L. f. archeri*, Las Yeguas, San Diego de los Baños; 16: *L. f. archeri*, Cañón del Río Santa Cruz; 17-18: *L. f. archeri*, Cañón del Río San Francisco; 19: *L. f. archeri*, Loma El Salon; 20: *L. f. ramosi*, Soroa hills. All specimens are from the Pinar del Río province, western Cuba.