

## Large Eastern Cuban Slugs: Overview of an Enigmatic and Forgotten Group

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**ABSTRACT** New findings of larger slugs from different localities of eastern Cuba, belonging to the family Veronicellidae (Gray, 1840), are revealed. Three of these species could be new to science. This paper verifies the geographic distribution, color forms and sizes, based on the evidence known to date.

**KEY WORDS** Cuban slugs, *Veronicella*, *Veronicella tenax*

### INTRODUCTION

Cuban slugs are not the most exciting of the archipelago land molluscs and have received little or no attention since the earlier malacology works. The genus *Veronicella* (Blainville, 1817) is currently represented by only three species [*Veronicella cubense* (Pfeiffer, 1840); *V. sloanei* (Cuvier, 1817); and *V. tenax* (Baker, 1931)] There are two other slugs known to occur on other Caribbean islands and part of the American continent mainland [*Leidyula floridana* (Leidy & Binney in Binney, 1851); *Sarasinula plebeia* (Fisher, 1868)]. Here we exclude the species reported for the Genus *Deroceras* (Rafinesque, 1820) [Limacidae]. Of all these species, only *V. tenax* is endemic to Cuba and noticeable for its larger size and color patterns.

In the late 1940's, Carlos Guillermo Aguayo and Miguel Luis Jaime acknowledged a new species of *Veronicella* from the Pico de Turquino vicinity without formally introducing the taxon (Aguayo & Jaime, 1947-1951;

Maceira, 2003). Thanks to the Nipe-Sagua-Baracoa Massif project, David Maceira, a local malacologist, began collecting large slugs from some of these localities in 1998 (e.g., Yumurí-Maisí plateau) (R. Teruel, personal communication). In 2002, a group of researchers published their work on the diversity of the Sierra de Cristal province (Fa, *et al.*, 2002. p. 5) noting that one of the *Veronicella* sp. was considered endemic from 3 localities in the montane forest.

In 2003, Maceira examined the species of the family Veronicellidae from Cuba but limited his work to a bibliographic revision. A couple of years later, the same author (Maceira, D. *et al.*, 2005. page 61), in a Rapid Biological Inventories Report about La Bayamesa National Park area, reported: “in the ground molluscs fauna, I found a terrestrial slug, *Veronicella* sp. nov., which is a new species for science and the sole representative of the *Gymnomorpha* subclass in the mountain rain forest”. He found this species under stones and leaf litter and concluded that it was an uncommon taxon from

Sierra Maestra Massif. In another similar report published the same year related to the Alexander of Humboldt National Park biodiversity, Maceira mentions another new local endemic *Veronicella* species “*living under rocks*” in all sectors of the park (Fong, A. *et al.*, 2005. pp. 82 and 319). In a general study of the mountain rainforests molluscan fauna of Cuba, this author added 2 new localities, Pico Bayamesa and El Zapato, for this new species (Maceira & Lauranzón, 2008). Unfortunately, these species were not described.

At the same time, on a field trip to Yunque de Baracoa peak in 2003, Adrián González-Guillén identified a new large specie of slug, blackish in color inhabiting that peak (González-Guillén, A. 2008. p. 64). This new species had not been previously reported from this location; an area where land snails collecting has been taking place since the late 19<sup>th</sup> century. About a year later a few pictures and references to unidentified eastern slugs appeared in a book on Cuban land snails, but without providing locality information (Espinosa & Ortea, 2009). More recently and since 2010, malacologists, zoologists, naturalists and even tourists have begun finding and recording larger slugs from Eastern Cuba (*i.e.*, Pico Turquino area, Sierra de Cristal, Yumurí, etc.).

One interesting publication (Fernández-Velázquez, *et al.*, 2015. p. 69) about the Moa region biodiversity briefly mentions a new *Veronicella* species from Farallones de Moa, but nothing more. Regrettably and until today, even with all the relevant collecting from the last 20 years, nothing has been published about these new *Veronicella* species, their taxonomy or ecology.

The external morphology of veronicellids, and slugs in general, is insufficient for taxonomical purposes. However, the variability in Cuba, as

well as the unique and remote places where some specimens have been recorded (*e.g.*, high altitude rainforests and remote isolated karstic hills), provide sufficient clues in the search for potential new species, which constitutes the main aim of our work.

Such reports are frequent and in some cases well illustrated but with localities omissions or vice versa. Some specimens of new species formerly registered reside in zoological collections that are, in most cases, unobtainable, and there are other inconsistencies as mentioned above. All these factors tend to fundamentally diminish any conservation efforts in these fragmented areas.

## MATERIALS AND METHODS

Here we have assembled all the findings of Eastern large slugs together with our knowledge of Western Guaniguanico mountain range slugs. All the specimens photographed and shown in this paper were not collected. However, previous material collected by David Maceira, Abelardo A. Méndez-Hernández and Luis A. Lajonchere confirmed our records. Collected specimens are placed in the malacology collection of the Zoology Department at Centro Oriental de Ecosistemas y Biodiversidad in Santiago de Cuba. Size measurements were taken when the animals were crawling naturally or motionless *in situ*.

## DISCUSSION

The following taxa are what we consider large slug species endemic to Cuba:

*Veronicella tenax* (Baker, 1931). Type locality: Cueva de Tiburón, Ensenada de San Vicente, Pinar del Río province. Distribution: Guaniguanico mountain range, from San Cristóbal river west side in Sierra del Rosario to

the southern end of Sierra de Guane in Sierra de Los Órganos, Pinar del Río province [see map 1]. Approximate size: 13-16 cm. Common name: Lengua de vaca (cow's tongue). Coloration: light to mustard yellow, cream to orange, beige, brownish, gray-green, light gray and lead gray. The slugs can have no markings or display dark black to light gray spotting [Plate 2, Figures 18-19; Plate 3, Figures 20-25]. Remarks: Some of us considered that specimens found in the areas encompassed by Taco-Taco and San Cristóbal rivers could be subspecies of *V. tenax* [Plate 2, Figures 13-17].

***Veronicella* sp. #1.** Distribution: Aguada de Joaquín [Plate 1, Figure 4], and “Paso de los Monos” [Plate 1, Figure 5], in Pico Turquino, Santiago de Cuba province (‘Monkeys Path’ locality is 300 meters up from the other locality, see Map 2.1) as well as Pico La Bayamesa and El Zapato, both from Granma province (see Map 2.2. Approximate size: 10-13 cm. Coloration: light to very dark gray background with small whitish dots more dense along the perimeter edge and a white dorsal line.

***Veronicella* sp. #2.** Distribution: La Tabla [Plate 1, Figures 1-3] (See Map 2.3) and neighboring localities, Carso de Baire, Segundo Frente municipality, Santiago de Cuba province. Approximate size: 10-11 cm. Coloration: gray-white, dark gray almost black bordered. These slugs exhibit irregular white and dark gray markings.

***Veronicella* sp. #3.** Distribution: Based on our findings, this species appears to inhabit 2 wider areas, the Maisí Plateau and Alturas de Baracoa, Guantánamo province at various localities listed below:

- **Locality:** El Beril, southwest Maisí upper marine terrace, Maisí municipality (see Map 2.4). Approximate size: 8-10 cm. Coloration:

the top of the animal is brownish to almost black with bright yellow foot underneath [Plate 2, Figure 12].

- **Locality:** Cañón de Yumurí (river canyon), Maisí and Baracoa municipalities (see Map 2.5). Approximate size: 10-13 cm. Coloration: Brown or black specimens have foot border mottled in bright yellow, beige or white. Other specimens almost white leaving only an irregular dark dorsal band. All showing bright yellow foot underneath [Plate 1, Figures 6-7].

- **Locality:** “Curva de los mancaperos” and other Yunque de Baracoa hill areas, Baracoa municipality (see Map 2.6). Approximate size: 10-15 cm. (larger size R. Teruel, personal communication). Coloration: Dark brown or black specimens with a yellow thin borderline. All showing bright yellow foot underneath [Plate 1, Figures 8-11].

- **Locality:** Duaba river vicinity, Baracoa municipality. Approximate size: 10-12 cm. Coloration: gray-yellow mustard background predominantly with yellowish or darker gradations of such pattern. Narrow dorsal band and foot borderline reinforced with gray-brownish.

- **Locality:** Taco vicinity, Baracoa municipality. Note: We were unable to obtain pictures from this locality population for this paper in order to describe its color deviations.

**Remarks:** The blackish pigmentation in these slugs is not as pure or deep as we often see in the adult European species *Arion ater* (Linnaeus, 1758), but could be similar to the velvet black coloring of American slug *Belocaulus angustipes* (Heynemann, 1885). Curiously, Maceira (2005) mentions the presence of these large slugs in all areas of Humboldt National Park.

- ***Veronicella* sp. #4.** Distribution: Sierra de Cristal, Holguín and Santiago de Cuba provinces (see Map 2.7). Approximate size: 10-

11 cm. Coloration: Uniform opaque brown-chestnut or brown-yellow mustard bordered in gray. These slugs may have no marking or display irregular dorsal spotting. Remarks: These slugs were collected and sighted in Levisa river east side (*i.e.* Cuesta de Seboruco in Farallones de la Italiana) and Arroyo Manzano [Plate 3, Figure 26], Miguel river affluent, in Santiago de Cuba province side.

*Phyllocaulis* species are large South American veronicellids that can reach or surpass 10 cm in length [*e.g.* *P. gayi* (Fisher, 1871), *P. boraceicensis* (Thomé, 1972) and *P. tuberculosus* (E.von Martens, 1868)]. However, large land slugs may reach 15 cm or more. Some of the world's largest well-known slugs are the colorful east Australian *Triboniophorus graeffei* (Humbert, A. 1863) and European black slug *Arion ater* (Linnaeus, 1758). These slugs can reach up to 18-20 cm. Other large species include the European leopard slug *Limax maximus* (Linnaeus, 1758) and some North America Pacific northwest banana slugs species from *Ariolimax* (Mörch, 1859) [*A. dolichophallus* (Mead, 1943) and *A. californicus* (Cooper, 1872)]. There are species like *Ariolimax columbianus* (Gould, 1851), that reach 25 cm. The European keel back slug *Limax cinereo-niger* (Wolf, 1803), can reach 30 cm. and is considered the largest land slug on Earth.

The largest Cuban slugs are *V. tenax* from the Sierra de los Orgasno range. Undoubtedly, in the west, the The largest specimens of *V. tenax* are spotted populations that come from the west Sierra de los Organos range. Further, the largest specimens of the eastern region could be those found at Yunque de Baracoa peak (*Veronicella* sp. #3). When crawling and stretching over rocks these slugs are able to enlarge their size considerably.

## CONCLUSIONS

New findings of larger slugs which apparently to belong to Veronicellidae (Gray, 1840) have been reported since the early 21<sup>st</sup> century from different localities in eastern Cuba [see maps]. There could be at least 3 new species. Populations from the Turquino and Bayamesa peaks vicinity and Baire Karst could be related to one another. These eastern new species relict populations are mainly living in karstic areas associated to distant mountain and cloud rainforests, which are evidence of of complex evolutionary processes throughout the last 25-20K years.

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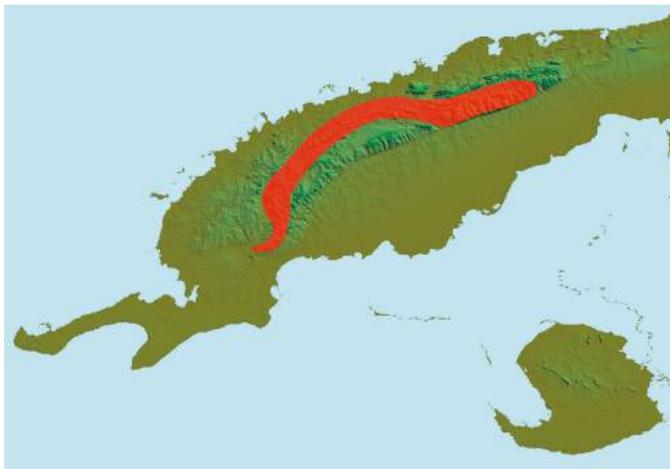
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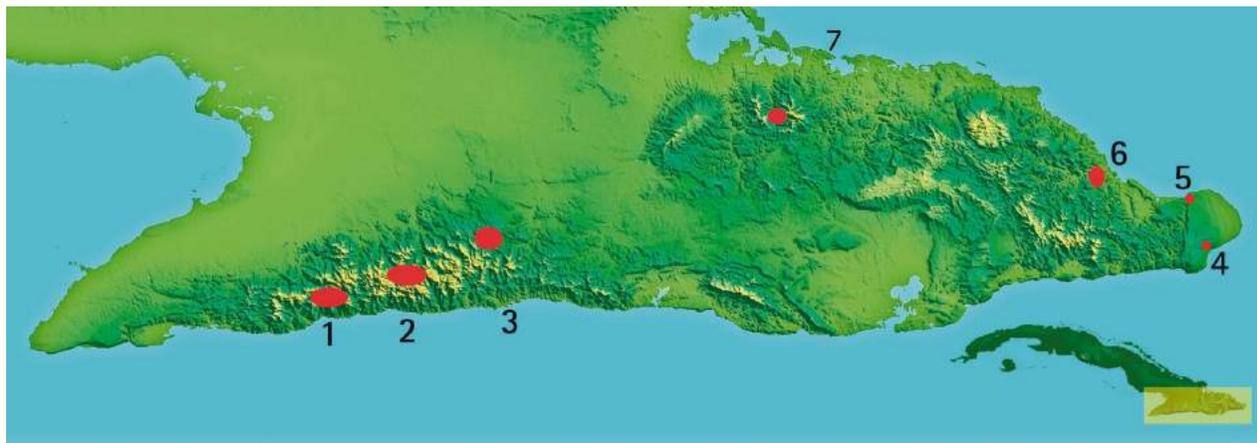
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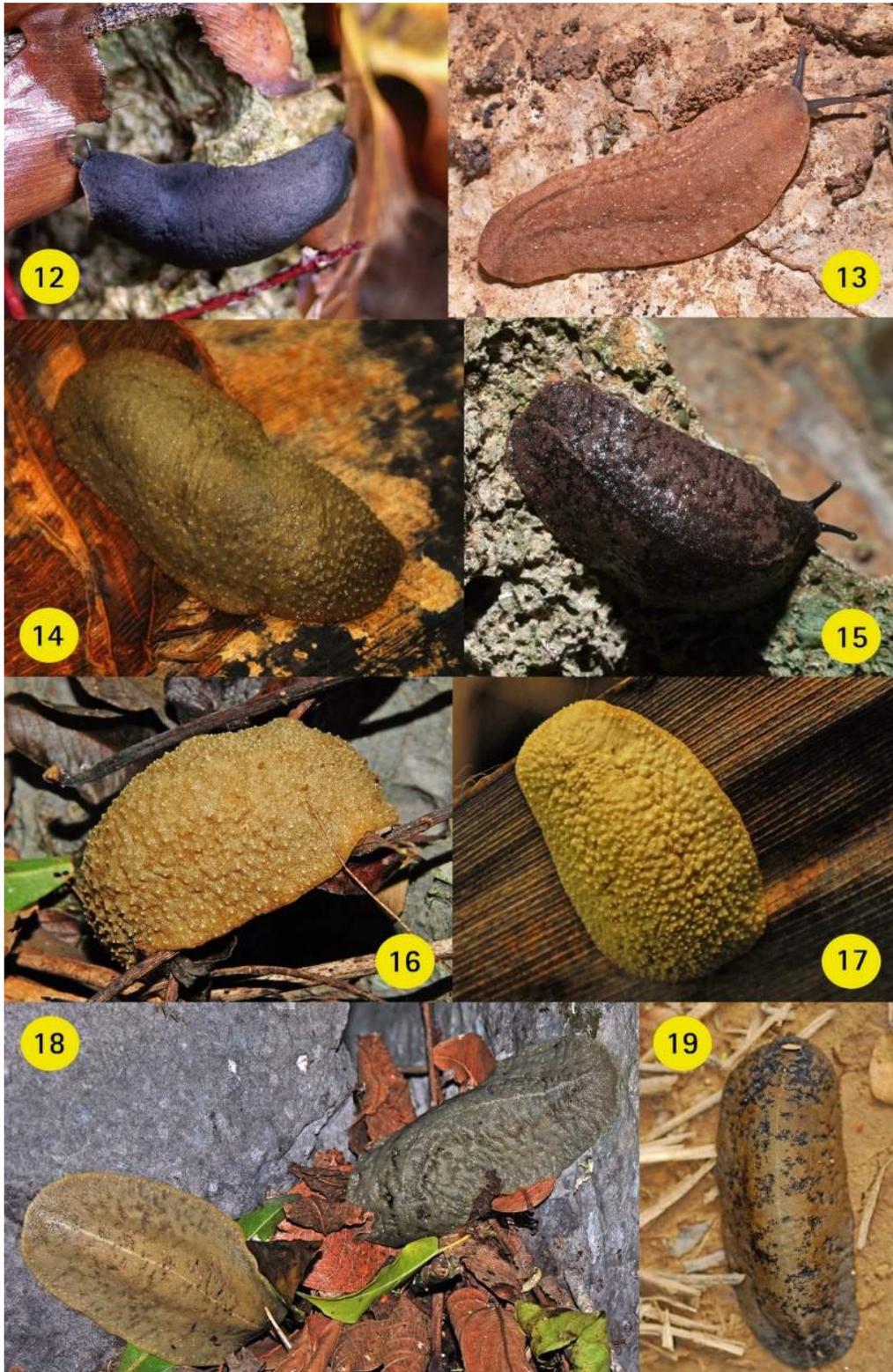
**Map 1.** Cordillera de Guaniguanico



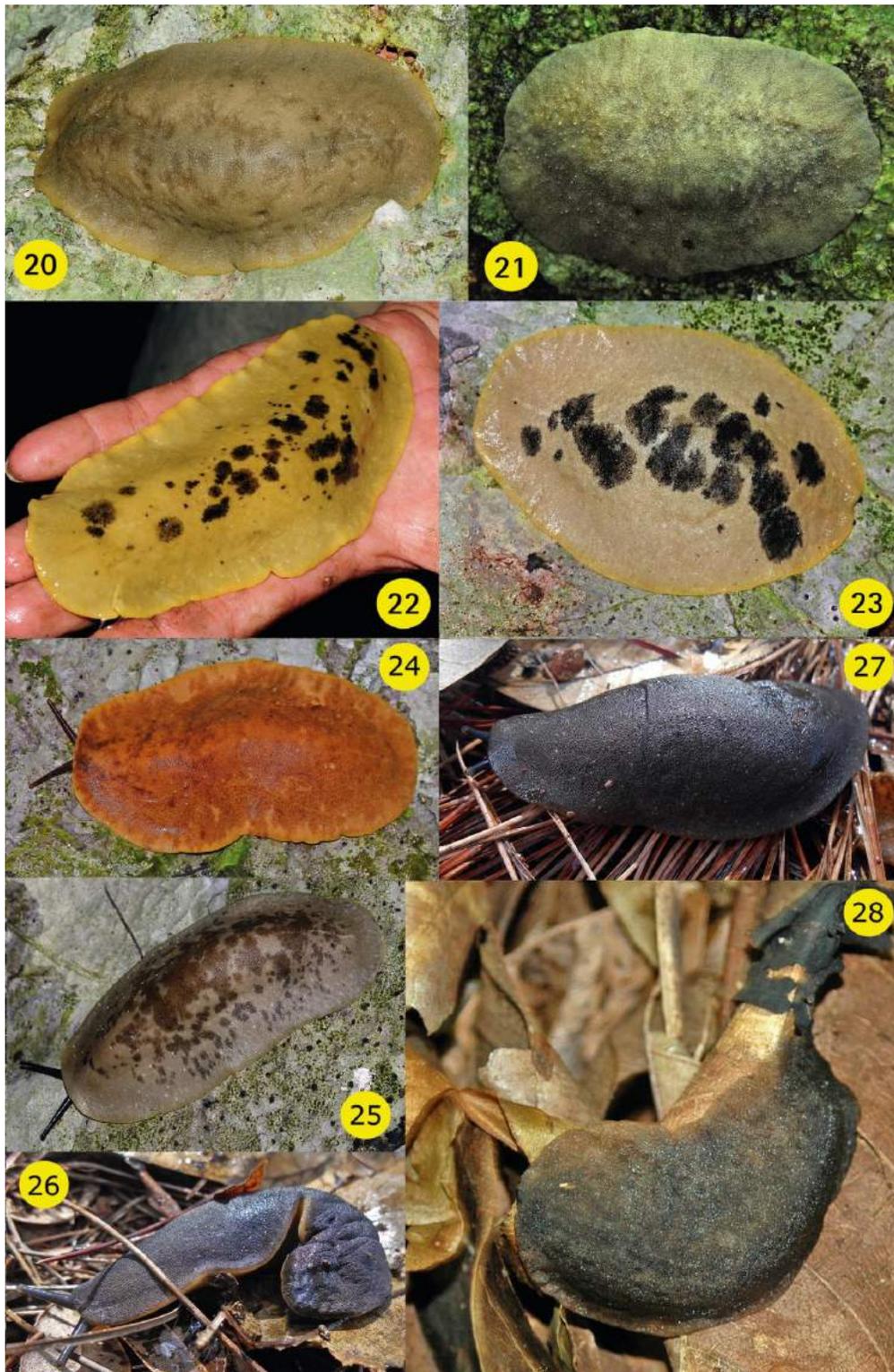
**Map 2. Various localities.** 1= Aguada de Joaquín and Paso de los Monos, Macizo del Turquino, Sierra Maestra; 2= El Zapato and Pico La Bayamesa, Sierra Maestra; 3= La Tabla, Carso de Baire; 4= El Beril, Meseta de Maisí; 5= Canon del río Yumurí, limite Barcoa-Maisí; 6= Yunque de Barcoa-Duaba, Barcoa; 7= Este del río Levisa and Arroyo Manzano, Sierra de Cristal.



**Plate 1.** *Veronicella* sp., 1-3: La Tabla and neighboring localities, Carso de Baire, Segundo Frente municipality, 4: Aguada de Joaquin, Pico Turquino, Santiago de Cuba Province, 5: Paso de los Monos, Pico Turquino, Santiago de Cuba Province, 6-7: Cañón de Yumuri, Maisí and Baracoa municipalities, 8-11: Curva de los Mancaperros and other Yunque de Baracoa hills area, Baracoa municipalities.



**Plate 2.** *Veronicella* sp., 12: El Beril, southwest Maisí upper marine terrace, Maisí municipality, 13-17: Taco-Taco and San Cristóbal rivers, 18-19: *V. tenax* Cueva de Tiburón Ensenada de San Vicente, Pinar del Rio province.



**Plate 3.** *Veronicella* sp., 20-25: *V. tenax*, Cueva de Tiburon, Ensenada de San Vicente, Pinar del Rio province, 26: Sierra de Cristal, Holquin and Santiago de Cuba provinces, 27-28: west Sierra de los Órganos range.