

THE UNCERTAIN HISTORY OF LAND SNAILS ON BARBADOS: IMPLICATIONS FOR CONSERVATION

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ABSTRACT

There is a growing need to document and conserve molluscan biodiversity, both for scholarly reasons and for public benefit. While the pursuance of these goals necessarily relies on historical records, the accuracy of such records is often taken for granted. We analyzed six previously published lists of land snails on the island of Barbados, and we compared them with results from our own field survey and our study of institutional collections. The current fauna contains six endemic species. Another endemic, *Bulimulus fuscus*, is probably extinct, and the status of two additional endemics, *Lucidella barbadensis* and *Pseudopineria barbadensis*, is unknown. Our total of 22 resident species is close to the total number of confirmed species collected by three earlier workers dating from 1862, but there are considerable differences in the four lists. When any one list is compared with any one of the others, each contains from one to six species that are absent from the other. Altogether, we confirm 31 species as present on Barbados at some time in the period 1862 to the present, compared with a total of 58 species reported by earlier workers. Our analysis allows us to confirm just 23 of the 37 species reported by Brown in 1903, whose list is the basis for a widely consulted conservation reference. By examining institutional collections and tracking down all pertinent literature, we discovered numerous errors of identity, locality and taxonomy. Adding to the task facing modern workers is the finding that at least 136 species names have been used to refer to 38 valid taxa, as a result of misidentifications, synonyms and genus/species combinations. We conclude that indications of historical trends in snail diversity should be treated with caution until critically evaluated.

Key words: Barbados, biodiversity, conservation, land snails, taxonomy.

INTRODUCTION

The goals of biological conservation now extend to land snails (van Bruggen et al., 1995; Killeen et al., 1998), and studies of the diversity of land snail populations, while formerly of interest only to biologists, are increasingly being used to document habitat degradation (Wäreborn, 1992; Gascoigne, 1994; Getz & Uetz, 1994; Graveland et al., 1994). For all these broadening purposes, it is generally recognised that historical records of fauna in a given locality are crucial, yet little consideration has been given to their accuracy. There exist many records collected not by trained professionals but by amateurs who sometimes lack adequate knowledge or experience. As Willing (1998) has pointed out, we should be grateful to the Conchological Society of Great Britain and Ireland, which has, since its founding in 1876, enforced protocols to ensure authenticity. However, organisations such as this do not exist in other localities, and even professional malacologists

make unwitting errors. Policymakers as well as scholars often refer to published summaries of faunal lists (e.g., Groombridge, 1992) without examining the factual accuracy of the data included therein. Thus, although snails provide good historical records because their shells have been collected for centuries, errors in reporting the data can lead to false interpretations and/or misguided conservation efforts.

There are many sources of error in faunal lists. To begin, surveys of snails in any geographic region must rely on samples collected at selected sites, which necessarily give only estimates of true distributions, and for which the optimal method remains controversial. Identification of species by shell morphology alone is often impossible and, when it is possible, genuine expertise is required. Because species names have changed so often, confusion can arise when two collectors or commentators apply different names to the same taxon. Voucher specimens are often missing or inaccessible. In addition to these problems,

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early workers sometimes reported second-hand information of dubious validity.

In this paper, we critically examine the historical record of land snails on Barbados. Our purpose was not to conduct a definitive survey of the extant fauna, but rather to assess the accuracy and reliability of previous records. Small islands have traditionally been favoured locations for malacological investigations because of their manageable size and geographical isolation (Peake, 1981; Solem, 1984). As a consequence, there is a fairly good record for Barbados, both in the literature and in institutional collections. Our concern in this paper is the extent to which errors and ambiguities from the past may cause difficulties for the modern investigator.

The historical record of land snails on Barbados begins with Griffith Hughes (1750), who included a brief description of three snails in his account of the island's natural history. Specifically, he mentioned the "land snail . . . generally of an ash-colour, or black" (possibly *Pleurodonte isabella*), the "small spiral snails . . . not above half an inch long, very slender, and sharp-pointed" (possibly one of the subulinids), and the "dung-snail . . . very small, and resembles a crusty wart" (possibly *Streptaxis glaber*). The first molluscan survey was by Thomas Bland, who lived and collected in Barbados from 1842 to 1849 (Abbott, 1973). Portions of Bland's material were deposited in ANSP, BMNH and MCZ.¹ It is unclear from Bland's publication (Bland, 1862) how many of the specimens he himself collected. He notes that some specimens were collected by Rev. J. Parkinson and Mr. Gill. Other specimens were likely collected by the governor of Barbados, Rawson W. Rawson, or his agents (records found in the MCZ). Next, in the period 1872–1876, Phillip Carpenter deposited material deposited in the RM. The Carpenter material was collected by Governor Rawson or his agents (letters in the

McGill University Archives). Kobelt (1880) published a list of species from Barbados based on Bland's list, but with the addition of *Hyalina incisa* (Pfeiffer). Colonel H. W. Feilden collected shells from Barbados during 1888 and 1889, and some of his material was deposited at ANSP and BMNH. A description was published by Smith & Feilden (1891), based on Feilden's collection. W. H. Rush was a member of a malacological expedition to a number of Caribbean islands that included a stopover at Bridgetown, Barbados (Rush, 1891). Some of Rush's material is in the ANSP collection. The Barbados snails were described by L. B. Brown (1903), who deposited some of his material in the ANSP and the BMNH. Brown also referred to "a type collection of nearly all the species enumerated" that had "been placed in the recently-formed Museum attached to the Barbados Natural History Society." Unfortunately, there is today no trace of such a collection at that institution. The most recent records are by J. B. Henderson (1919), the malacologist aboard a zoological expedition to the Caribbean mounted by the University of Iowa.

METHODS

Museum Collections

Several major institutional collections (identified in footnote 1) were surveyed to locate material deposited by earlier workers. We attempted to confirm, or in some cases re-identify, the snails that had been collected from Barbados over the last 150 years. Additional material found in these museum collections, deposited by collectors other than those mentioned in the Introduction and in Table 1, provided further confirmations for certain taxa. The malacological literature was also surveyed, in particular for taxonomic works relating to species represented, or reportedly represented, in Barbados.

Field Survey

Surveys were conducted by R. Chase in December 1993, December 1994, and March 1996. D. Robinson conducted a survey in October 1997. The survey sites are shown in Figure 1, and descriptions are given below. Most sites were examined at least twice, for a total of 2–12 hours per site. All sites were examined at least once during rainfall or immedi-

¹Institutional acronyms:

ANSP	Academy of Natural Sciences, Philadelphia, Pennsylvania, USA
BMNH	Natural History Museum, London, England, UK
FLMNH	Florida Museum of Natural History, Gainesville, Florida, USA
FMNH	Field Museum of Natural History, Chicago, Illinois, USA
MCZ	Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA
RM	Redpath Museum, McGill University, Montréal, Québec, Canada

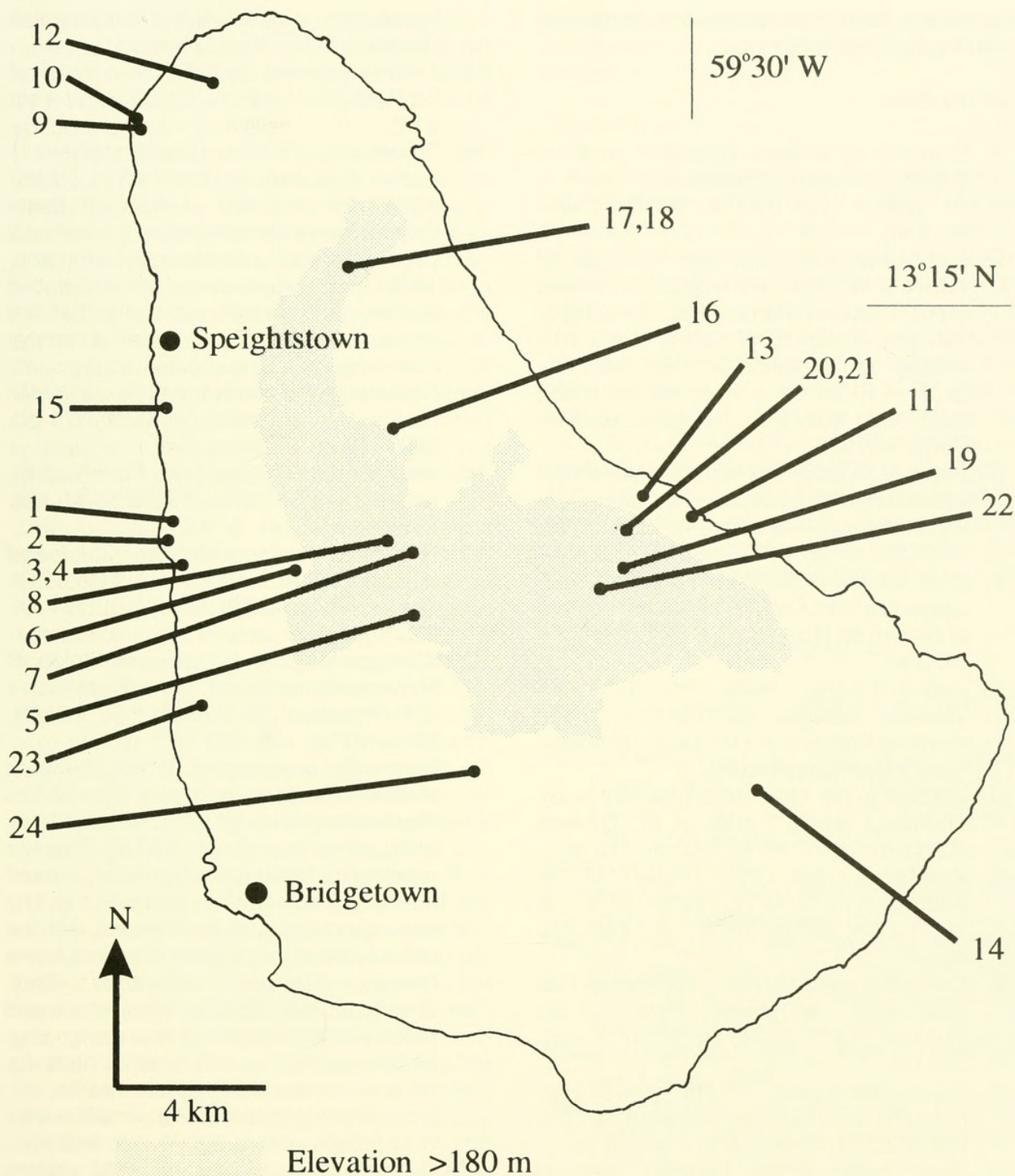


FIG. 1. Map of Barbados showing locations of sampling sites.

ately thereafter. The sites were chosen to provide a fair representation of the island's geography and to maximise the total species count. Soil samples were taken at some localities (Stations 1, 2, 7 and 9) where there appeared to be greater potential for small species (loose soil with considerable organic and calcareous particulate matter) and examined under a binocular microscope. cursory examinations of numerous other sites failed to

produce any species additional to those found at the listed sites. The southern portion of the island was surveyed less than other regions because it is heavily populated, relatively dry, and low lying. It is also widely cultivated with sugar cane, and the cane fields are treated with pesticides. Coordinates were taken using a hand-held GPS (Eagle Explorer), but in instances where this was not possible (for example the presence of the tree canopy block-

ing satellite readings), coordinates were taken from topographic maps.

Survey Sites

1. Grounds of Bellairs Research Institute (McGill University), Holetown, Parish of St. James [13°11'33"N, 59°38'21"W—alt. 1 m].
2. Mahogany stand on the grounds of Porter's House, and adjacent wooded gully, Holetown, Parish of St. James [13°11'44"N, 59°38'18"W—alt. 2–4 m]. This locality is specifically mentioned by Brown (1903) as one of his collecting sites. Also known as Porter's Estate or Porter's Wood.
3. Partially wooded hill northeast of Royal Westmoreland Landscape Garden Centre, Holetown, Parish of St. James [13°12'01"N, 59°38'04"W—alt. 10 m].
4. Gully east of Royal Westmoreland Landscape Garden Centre, Holetown, Parish of St. James [13°12'01"N, 59°38'04"W—alt. 3 m].
5. Jack-in-the-Box Gully, Parish of St. Thomas. Located approximately 2 km south of Welchman Hall Gully [geodesic coordinates unavailable].
6. Edge of sugar cane field, adjacent to St. Thomas Church, Parish of St. Thomas [13°11'07"N, 59°36'46"W—alt. 115 m].
7. Welchman Hall Gully, Parish of St. Thomas [13°11'44"N, 59°34'37"W to 13°11'17"N, 59°34'34"W—alt. 240–270 m].
8. Unnamed gully between Welchman Hall Gully and Lion Castle, Parish of St. Thomas [13°11'44"N, 59°34'35"W—alt. 240 m].
9. Dry coastal forest ~200 m south of Harrison Point Lighthouse, Parish of St. Lucy [13°18'23"N, 59°38'58"W—alt. 30 m].
10. Steep rocky slope beneath Harrison Point Lighthouse, Parish of St. Lucy [13°18'31"N, 59°38'55"W—alt. 15 m].
11. East Coast from Bathsheba, Parish of St. Joseph, south to the Congor Rocks, Parish of St. John [geodesic coordinates unavailable].
12. Friendship, halfway between Crabhill Police Post and Hannays intersection, Parish of St. Lucy [13°18'32"N, 59°37'45"W—alt. 45 m].
13. Andromeda Botanic Gardens, Bathsheba, Parish of St. Joseph [13°12'25"N, 59°31'04"W—alt. 60–90 m].
14. Ashford plantation, Parish of St. Philip [geodesic coordinates unavailable]. Courtesy of Dr. Joan Marsden.
15. 100 m southeast of Mullins Bay, Parish of St. Peter [13°14'00"N, 59°38'26"W—alt. 2 m].
16. Turner's Hall Woods [Scotland District], Parish of St. Andrew [13°13'23"N, 59°35'60"W—alt. 150–180 m]. Although these woods are often referred to as the only virgin stand left on the island (Carrington, 1993), the abundance of introduced snails would seem to indicate that the fauna, at least, is not as "virgin" as others have suggested.
17. Barbados Wildlife Reserve, Parish of St. Andrew [13°16'04"N, 59°35'37"W—alt. 220–240 m].
18. Grenade Hall Signal Site, Parish of St. Andrew [13°16'05"N, 59°35'33"W—alt. 255 m].
19. Roadside, between Malvern House and adjacent sugar cane field, Parish of St. Joseph [13°11'43"N, 59°31'30"W—alt. 275 m].
20. Woods alongside sugar cane fields of Malvern Plantation, on top of Hackleton's Cliff, Parish of St. Joseph [13°11'58"N, 59°31'21"W—alt. 300 m].
21. Relatively undisturbed forest, beneath Hackleton's Cliff, adjacent to Malvern Plantation, Parish of St. Joseph [13°11'58"N, 59°31'21"W—alt. 290 m]. This site represents probably the least altered habitat encountered during the study. The absence of any introduced snails, with the occurrence of only three endemic species (*Helicina fasciata substriata* Gray, *Brachypodella costata* (Guilting), and *Pleurodonte isabella* (Férussac)), suggests that further exploration here for other endemics would be worthwhile.
22. Grounds of Villa Nova, Parish of St. John [13°10'57"N, 59°31'32"W—alt. 240 m].
23. Oxnards Crescent, Parish of St. James [geodesic coordinates unavailable]. Courtesy of Dr. Angela Fields.
24. Town of Valley, Parish of St. George [geodesic coordinates unavailable]. Courtesy of Dr. Angela Fields.

RESULTS

Survey Results Compared with Previous Records

The results of our survey, together with those of earlier workers, are shown in Table 1. A taxonomy of the species is given in the sec-

tion below. For convenience, Carpenter is referred to as an "author" even though he did not publish his findings; his records are dated by the year (1876) in which he last received specimens from Barbados.

We found a total of 22 species of land snails. Three of these are new records for Barbados, namely *Happiella* cf. *decolorata*, *Luntia insignis* and *Zachrysis provisoria*. *Happiella* cf. *decolorata* and *Luntia insignis* may be new to the island or they may have been missed by earlier workers because they are uncommon and relatively inconspicuous. *Zachrysis provisoria* is particularly common in lowland parts of the island, especially along the East Coast where it is the dominant snail species in some areas. It is an introduced species not previously reported as a member of the Barbadian fauna.

We failed to find specimens of seven species for which there are either confirmed records for Barbados or unconfirmed records but with a likelihood of occurrence based on distributions on nearby islands (Table 1). Three of the missing species are endemics. Following Breure (1974), it appears that *Bulimulus fuscus* is extinct. However, further diligent search may yet turn up *Lucidella barbadensis* and *Pseudopineria barbadensis*.

Although the 22 species found in our survey corresponds fairly closely to the total numbers of confirmed species found by the most productive of earlier workers (Bland: 21; Smith & Feilden: 19; Brown: 23), an analysis of the records shows that the composition of the faunal lists has undergone constant change. Table 2 shows the number of species reported by any one worker but not by another, which is a measure of faunal instability and/or inaccurate reporting. If the analysis is restricted to the present study plus the three most productive earlier workers (bold font in Table 2), an average of 3.58 species is reported by one worker but not by another (mean of all bolded numbers; range, 1–6). Examination of the row totals reveals no clear historical trend, suggesting a constant rate of novel observations. Similarly, there is no clear historical trend in the column totals, suggesting that the authors worked with the same degree of accuracy.

In reviewing the results from earlier surveys, many errors or ambiguities were discovered. Several categories of uncertain records are indicated in Table 1, and a numerical summary is given in Table 3. The sources of uncertainty include misidentifications, unverified records, and incomplete naming. Further details are provided in the

taxonomic section below. Overall, we are unable to confirm about one-fifth of all previous records.

Taxonomy

All species reported from Barbados are included below, whether from the faunal studies conducted by earlier workers, or from mention of individual species in taxonomies of particular genera or families. Specimens or lots from major institutional collections were examined. The examined specimens comprised voucher materials from earlier workers and any other lots specifically with locality data for Barbados. An essential synonymy is provided for each taxon, meaning that the treatment is not exhaustive for species other than the Barbados endemics. Species citations are given as used by the original authors, plus any locality data provided. Our intention is to provide sufficient detail to convey the intricacy of the historical record.²

Family HELICINIDAE

Helicina fasciata substriata Gray, 1824

Helicina substriata Gray, 1824: 66, pl. 6, fig. 4; Bland, 1862: 351; Gibbons, 1879: 134; Kobelt, 1880: 284; Smith & Feilden, 1891: 256; Brown, 1903: 271

Holotype: not found

Helicina Occidentalis Guilding, 1828a: 529 (*partim*: Barbados only)

Helicina conoidea Pfeiffer. Sowerby, 1864: pl. 270 (Helicinidae pl. 5), figs. 168, 169; 1873: pl. 6, fig. 49; Smith & Feilden, 1891: 256, *non* Pfeiffer, 1854

Helicina convexa Pfeiffer. Rush, 1891: 67, *non* Pfeiffer, 1849

Helicina fasciata substriata Gray. Wagner, 1911: 334, pl. 67, fig. 6–7; Henderson, 1919: 95–96; Pilsbry, 1930: 229

Distribution: Subspecies (variation ?) *H. f. substriata* Gray appears to be restricted to Barbados. The typical subspecies, *H. f. fasciata*, has a wider distribution in the Lesser Antilles.

Status in Barbados: Locally abundant.

Material Collected From: Sites 2, 3, 4, 9, 10, 20, and 21.

Additional Material Examined: ANSP 85450 (12 specimens *legit* Brown); BMNH 1998103

²*legit* = collected by; *ex* = from the collection of

TABLE 1. Historical record of species diversity and results of the present survey. Symbols indicate the degree of authenticity of the individual records. Only valid species names are listed. In many cases, synonyms were used in the original records, for details of which see the taxonomy section in Results. Records in section e may also appear under the correct name in sections a–d. Column counts for sections a–d include only “X” and “x” symbols.

	Bland 1862	Carpenter 1876	Smith & Feilden 1891	Rush 1891	Brown 1903	Henderson 1919	Present Study
(a) Endemic Taxa (9)							
<i>Brachypodella costata</i> (Guilding, 1828)	X	X	x		X	x	X
<i>Bulimulus fuscus</i> Guilding, 1828	X	X	x				
<i>Glyphyalinia barbadensis</i> , new name			—		—		X
<i>Helicina fasciata substriata</i> Gray, 1824	x		X	x	X	x	X
<i>Lucidella barbadensis</i> (Pfeiffer, 1854)	X		—		X		
<i>Pleurodonte isabella</i> (Férussac, 1822)	X	X	x		X	x	X
<i>Pseudopineria barbadensis</i> Krauss, 1996	x		x		X		
<i>Succinea barbadensis</i> Guilding, 1828	x	X	X	X	X	x	X
<i>Truncatella barbadensis</i> Pfeiffer, 1857	x		X		X		X
(b) Lesser Antillean and/or South American Taxa (8)							
<i>Ceciloides consobrinus minutissima</i> (Guppy, 1868)					X		
<i>Gastrocopta barbadensis</i> (Pfeiffer, 1853)	x		x		X		X
<i>Happiella</i> cf. <i>decolorata</i> (Drouët, 1859)							X
<i>Luntia insignis</i> Smith, 1898							X
<i>Megalobulimus oblongus</i> (Müller, 1774)	x	X	x	x	X	x	X
<i>Miradiscops implicans</i> (Guppy, 1868)					p		
<i>Orthalicus maracaibensis subpulchella</i> (Pilsbry, 1899)			x	x	x	x	X
<i>Streptaxis glaber</i> (Pfeiffer, 1849)			x	x	X	x	X
(c) Pan-Caribbean Taxa (5)							
<i>Bulimulus guadalupensis</i> (Bruguière, 1789)	x	X	x	X	X	x	X
<i>Ceciloides aperta</i> (Swainson, 1840)	x		x		x		
<i>Lacteoluna selenina</i> (Gould, 1848)	x		x		X	x	X
<i>Lucidella plicatula</i> (Pfeiffer, 1849)	X				x		
<i>Zachrysia provisorio</i> (Pfeiffer, 1858)							X
(d) Pan-Tropical Taxa (8)							
<i>Allopeas gracile</i> (Hutton, 1834)	X		x		X		X
<i>Allopeas micra</i> (d'Orbigny, 1835)	X			x	X		X
<i>Beckianum beckianum</i> (Pfeiffer, 1846)	X	X	x	x	X		X
<i>Bradybaena similaris</i> (Rang, 1831)	X		x	X	X	x	X
<i>Gulella bicolor</i> (Hutton, 1834)					p		
<i>Leptinaria lamellata</i> (Potiez & Michaud, 1835)	X		x		X	x	X
<i>Opeas hannense</i> (Rang, 1831)	x				X		X
<i>Subulina octona</i> (Bruguière, 1792)	x	X	x	x	X	x	X
Total number of confirmed taxa:	21	8	19	10	23	12	22
(e) Dubious or Unrecognizable Taxa (12)							
<i>Bulimulus diaphanus fraterculus</i> (Potiez & Michaud, 1835)	u				—		
<i>Bulimulus tenuissimus</i> (d'Orbigny, 1835)			?		—		
<i>Ceciloides acicula</i> (Müller, 1774)					?		
<i>Cerion uva</i> (Linné, 1758)					?		
<i>Gastrocopta pellucida</i> (Pfeiffer, 1848)	u		u		?		
<i>Lacteoluna subaquila</i> (Shuttleworth, 1834)				?			
<i>Lacteoluna turbiniformis</i> (Pfeiffer, 1839)			—		—		
<i>Lucidella rugosa</i> (Pfeiffer, 1839)					?		
<i>Opeas</i> sp.						#	
<i>Polydontes perplexa</i> (Férussac, 1821)			??		—		
<i>Pleurodonte dentiens</i> (Férussac, 1821)					?		
<i>Succinea bermudensis</i> Pfeiffer, 1857	u						
<i>Truncatella</i> sp.				#			

X Confirmed taxa (seen): species collected and reported by authors, and confirmed by the existence of corresponding specimens in institutional collections.

x Confirmed taxa (unseen): species collected and reported by authors; specimens not found in institutional collections but the record is confirmed by ourselves or other workers.

— Attributed taxa: species reported by authors, but only by attribution to earlier publications.

p Unconfirmed taxa (likely): species collected and reported by authors; specimens not examined by us; possible occurrence on Barbados based on distribution patterns on nearby islands and on the South American mainland.

u Unconfirmed taxa (unlikely): species collected and reported by authors, but unlikely to be part of the Barbados fauna based on published accounts of geographic distribution.

?? Dubious taxa (locality): species reported with correct identification based on our own examination of the same specimens, but with dubious or incorrect locality data.

? Dubious taxa (identification): species reported with suspected incorrect identification based on our own examination of the same specimens.

Unrecognizable taxa: taxon name given incompletely by authors.

TABLE 2. Matrix of discrepancies between reports of confirmed species. Numbers represent species reported by author(s) listed at the left but not reported by author(s) listed at the top. **Bold** is used to highlight studies that reported approximately the same number of total species (range, 19–23).

	Bland	Carpenter	Smith & Feilden	Rush	Brown	Henderson	Present Study	ROW TOTALS
Bland	—	12	4	13	1	10	5	45
Carpenter	0	—	0	2	1	2	1	6
Smith & Feilden	2	11	—	10	1	6	3	33
Rush	2	5	1	—	0	2	0	10
Brown	3	15	5	11	—	10	4	48
Henderson	2	5	0	4	0	—	0	11
Present study	5	15	6	12	4	10	—	52
COLUMN TOTALS	14	63	16	52	7	40	13	

TABLE 3. Species uncertainty. Numerical summary of the degree of authenticity of faunal studies. The characterization of taxa is taken from Table 1, with the same definitions of categories as given there.

	Confirmed taxa		Unconfirmed taxa		Dubious taxa		Attributed taxa (–)	Unrecognizable taxa (#)
	Seen (X)	Not seen (x)	Likely (p)	Unlikely (u)	ID (?)	Locality (??)		
Bland, 1862	11	11		3				
Carpenter, 1876	8							
Smith & Feilden, 1891	3	16		1		1	3	
Rush, 1891	3	7			1			1
Brown, 1903	20	3	2		5		5	
Henderson, 1919		12						1
Present study	22							

(28 specimens *legit* Brown); BMNH 1888.8.7.93-105 (13 specimens *legit* Feilden); FLMNH 185624 (4 miles east of Holetown, St. James – 19 specimens); MCZ 90491 (24 specimens *legit* Rawson *ex* Bland); MCZ 90492 (27 specimens *legit* Rawson *ex* Bland; MCZ 318942 (specimens *legit* Rawson *ex* Binney); MCZ 107933 (Blowers – 2 specimens *legit* Kugler); MCZ 83527 (Bridgetown – 1 specimen *legit* Garman).

Discussion: This taxon belongs to the *Helicina fasciata* complex, the typical subspecies having been described from Puerto Rico and being distributed throughout the Lesser Antilles, as well as on some western Caribbean islands. Minor differences in island populations have led to a number of names being proposed, and only a taxonomic work beyond the scope of this study would determine their validity. Pilsbry (1930) considered that Barbados specimens match the description and figure of *Helicina substriata* Gray, and on that basis he designated Barbados as the type locality for this taxon without designating a lectotype.

The specimens of this species on Barbados range considerably in size, larger specimens

living in more humid conditions at higher elevations than the smaller form that predominates in drier areas, especially along the northwestern coast. This arboreal species was collected at many of the localities studied, and is particularly abundant where there is less human disturbance, crawling on leaf surfaces, tree trunks and aerial tree roots.

Lucidella (Poeniella) barbadensis
(Pfeiffer, 1854)

Helicina Barbadosensis Pfeiffer, 1854: 60 (“Barbadoes”); Bland, 1862: 351; Kobelt, 1880: 284; Smith & Feilden, 1891: 256; Brown, 1903: 266, 271

Type material: BMNH 1998024 (Cuming collection)

Helicina conoidea Pfeiffer, 1854: 53 (“Barbadoes, West Indies”)

Possible type – BMNH 1998025 (Cuming collection)

Not *Helicina conoidea* Pfeiffer. Sowerby, 1864: pl. 270 (Helicinidae pl. 5), figs. 168, 169; 1873: pl. 6, fig. 49 (= *Helicina fasciata* var. *substriata* Gray, 1824)

Lucidella holoserica Wagner, 1910: 350–351, pl. 69, fig. 16–19 (“die Insel Barbados”)
Lucidella (*Poeniella*) *barbadensis* (Pfeiffer).
 Baker, 1962: 18)

Distribution: Endemic to Barbados.

Status: Extinct?

Material Examined: ANSP 14916 (4 specimens *legit* Bland); ANSP 14926 (14 specimens [labelled as “*Helicina conoidea* Pfr.?”] *legit* Shuttleworth); ANSP 85468 (12 specimens *legit* Brown); BMNH (5 specimens *legit* Brown); BMNH 97.10.12.3–7 (Hackleton’s Cliff—5 specimens *legit* Pavey); MCZ 90489 (2 specimens *ex* Bland); MCZ 107932 (Blowers—1 specimen *legit* Kugler).

Discussion: The identity of *Helicina conoidea* has been problematical since its first description. Pfeiffer’s taxon is a synonym of *Lucidella barbadensis*, described by him in the same year in the same paper. An examination of the material in the BMNH used by Pfeiffer to describe the two taxa shows them to be within the range of variation of a single species. Sowerby (1873) in his *Helicina* monograph illustrated a totally different species, a fact that was somewhat acidly pointed out by Bland (1857: 247), although Bland himself seemed confused as to the identity of the taxon (see under *Lucidella plicatula* below). Smith & Feilden (1891) merely referred to the specimens in the Cuming collection. Brown even expressed doubt as to the occurrence of *Helicina conoidea* Pfeiffer on Barbados; he may indeed have been considering *H. conoidea* of Bland, as Brown did collect specimens of *L. barbadensis* from Porter’s Wood.

This species was reported as uncommon in the past, and no specimens were encountered during our survey.

Lucidella (*Poeniella*) *plicatula* (Pfeiffer, 1849)

Helicina plicatula Pfeiffer, 1849: 123 (“Martinique”)

Helicina conoidea Pfeiffer. Bland, 1862: 351; Kobelt, 1880: 284, *non* Pfeiffer, 1854

Helicina rugosa (Pfeiffer). Brown, 1903: 266, 271, *non* Pfeiffer, 1839

Distribution: Hispaniola; Puerto Rico and the Lesser Antilles.

Status in Barbados: Extirpated?

Material Examined: ANSP 14783 (3 specimens *legit* Bland); MCZ 318945 (10 speci-

mens *ex* Bland); MCZ 107931 (Blowers—1 specimen *legit* Kugler).

Discussion: The only known Barbados specimens of this widely distributed West Indian species available for inspection were collected by Bland, but misidentified as *Helicina conoidea* Pfeiffer. Brown’s (1903) reference to the Cuban taxon *Helicina rugosa* Pfeiffer, describing it as a “smaller shell” and “identified by the very strong diagonal striation,” clearly is a reference to this species, and establishes its occurrence in Porter’s Wood (St. James) at the time.

Family TRUNCATELLIDAE

Truncatella barbadensis Pfeiffer, 1857

Truncatella Barbadensis Pfeiffer, 1857: 337 (“Island of Barbadoes”); Bland, 1862: 351; Kobelt, 1880: 284; Smith & Feilden, 1891: 255–256; Brown, 1903: 271; Torre, 1960: 87

Types: BMNH (Cuming Collection)—lost.

?*Truncatella* sp. Henderson, 1919: 96

Truncatella (*Truncatella*) *bilabiata* Pfeiffer.
 Clench & Turner, 1948: 153–154 (*partim*)

Truncatella sp. nov. Rosenberg, 1996: 682–693

Distribution: Endemic to Barbados.

Status: Locally abundant.

Material Collected From: Sites 9 and 10.

Additional Material Examined: ANSP 85463 (8 specimens *legit* Brown); ANSP 397286 (Harrison Point Lighthouse—100+ specimens *legit* Rosenberg); BMNH 88.8.7.106–17 (12 specimens *legit* Feilden); BMNH 88.8.7.84–92 (9 specimens *legit* Feilden); BMNH 1998105 (8 specimens *legit* Brown); FLMNH 271905 (Harrison’s Cave—6 specimens *legit* F. G. Thompson);

Discussion: Although Pfeiffer described *Truncatella barbadensis* as a distinct species from Barbados, Clench & Turner (1948) synonymized it with the marine littoral and more widespread *T. bilabiata* (Pfeiffer), and despite Torre’s (1960) arguments that the Barbadian species should be considered distinct, this has generally been followed by workers ever since. Rosenberg (1996) recognized that the form he found on Barbados was quite different from other known *Truncatella* species from elsewhere in the Caribbean, suggested

that it was a new species, but he did not describe it. Feilden's material in the British Museum and Brown's material at both the British Museum and the Academy of Natural Sciences clearly are this species. Unfortunately, the matter cannot be laid to rest conclusively, because Pfeiffer's type material is lost, and a neotype will have to be designated in order to define the taxon. Henderson's (1919) reference to a *Truncatella* species could be this taxon, or it could be one of the marine littoral *Truncatella* species that are also part of the Barbados fauna.

This species lives primarily in the leaf litter of coastal forest under completely terrestrial conditions at over 30 m altitude, at the top of the coastal cliffs. However, it can tolerate habitats influenced by the marine environment, some individuals living closer to the ocean under stones and boulders in areas somewhat affected by distant sea spray. It does not appear to live in the supralittoral zone environment, with which other species of this genus are normally associated.

Family SUCCINEIDAE

Succinea barbadensis Guilding, 1828

Succinea Barbadensis Guilding, 1828a: 532; Bland, 1862: 351, table 2; Gibbons, 1879: 132; Kobelt, 1880: 284; Smith & Feilden, 1891: 255; Rush, 1891: 69; Brown, 1903: 270

Succinea Bermudensis Pfeiffer. Bland, 1862: 351, tabl. 2; Kobelt, 1880: 284, *non* Pfeiffer, 1857

Succinea sp. Henderson, 1919: 96

Distribution: Barbados; throughout the West Indies?

Status in Barbados: Locally abundant.

Material Collected From: Sites 3, 4, 7, 9, 13, 16, 18, and 20.

Additional material examined: ANSP 10249 (1 specimen *legit* Rush); ANSP 85459 (6 specimens *legit* Brown); ANSP 332700 (Porter's Estate — 1 specimen *legit* Hussey); RM 12075 (5 specimens *legit* Rawson ex Carpenter); BMNH 88.8.7.118–26 (9 specimens *legit* Feilden); BMNH 1998104 (11 specimens *legit* Brown); MCZ 90372 (11 specimens *legit* Rawson ex Bland); MCZ 90373 (5 specimens *legit* Rawson ex Bland); MCZ 74182 (9 specimens *legit* Rawson); MCZ 318943 (near

Gray's Cove, St. Lucy-St. Peter — 14 specimens *legit* Clench).

Discussion: A widespread and variable species in Barbados. Despite the variability in shell shape, all the specimens dissected during this study show an absence of anatomical variation and are considered to represent a single species. Unfortunately, the taxonomy of Caribbean *Succinea* species is in a state of disarray, little anatomical work having been done to properly define the numerous named taxa. It is therefore impossible to determine the true geographical extent of this species. The name *S. barbadensis* has been used in the literature for shells collected throughout the West Indies, but those records are here excluded from the synonymy.

Family VERTIGINIDAE

Gastrocopta barbadensis (Pfeiffer, 1853)

Pupa Barbadensis Pfeiffer, 1853: 554 ("in insula Barbadoes"); Bland, 1862: 351; Kobelt, 1880: 284

Pupa Jamaicensis Adams. Bland, 1862: 351; Kobelt, 1880: 284

Pupa pellucida Pfeiffer. Bland, 1862: 351; Gibbons, 1879: 132; Kobelt, 1880: 284; Smith & Feilden, 1891: 254–255; Brown, 1903: 270, *non* Pfeiffer, 1848

Gastrocopta barbadensis (Pfeiffer). Pilsbry, 1916: 83–85, pl. 18, figs. 1–5

Distribution: Lesser Antilles, Venezuelan offshore islands and coastal Venezuela.

Status in Barbados: Uncommon.

Material Collected From: Site 9.

Additional Material Examined: ANSP 85464 (11 specimens *legit* Brown); ANSP 332704 (Porter's Estate — 2 specimens *legit* Hussey); ANSP 328617 (Blowers, St. James — 1 specimen *legit* Kugler); MCZ 90573 (Blowers — 1 specimen *legit* Kugler).

Discussion: Various workers have used three different names for this species, *Pupa pellucida* Pfeiffer, 1848, originally described from Cuba, its junior synonym *P. jamaicensis* Adams, 1849, from Jamaica, and *P. barbadensis* Pfeiffer, 1853, described from Barbados. Smith & Feilden (1891) suggested all were the same species. There is no evi-

dence for the occurrence of *Gastrocopta pelucida* (Pfeiffer) on Barbados; its known distribution is from eastern Mexico, the Bahamas Islands and the Greater Antilles, and Bermuda (Pilsbry, 1916).

Feilden collected *Pupa barbadensis* at Maxwell Hall (Parish of Christchurch), Hussey at Porter's Estate (St. James), and specimens were collected during this study from eastern Parish of St. Lucy. One of the smallest species of the Barbados molluscan fauna, it is easily missed, and may have a wider distribution on the island.

Pupisoma (Ptychopatala) dioscoricola
(Adams, 1845)

Helix dioscoricola Adams, 1845: 16

Distribution: Ubiquitous throughout the Americas.

Status in Barbados: Rare?

Material Examined: FLMNH 119895 (Harrison's Cave, St. Thomas—1 specimen *legit* Thompson);

Discussion: Although a single specimen of this species has been collected in Barbados in recent years (none was collected during our field study), it is likely to be established in Barbados despite the lack of records, in view of its ubiquitous nature in anthropochorous environments throughout the Americas. It is minute and easily missed.

Family CERIONIDAE

Cerion uva (Linné, 1758)

Turbo uva Linné, 1758: 765

Cerion uva ("Lamarck"). Brown, 1903: 270

Distribution: Endemic to Aruba, Curaçao and Bonaire.

Status in Barbados: Dubious record.

Discussion: Although Brown mentioned the collection of two specimens of this species by a Rev. N. B. Watson, one from St. Peter's and one from St. Philip's Parishes, there is no physical evidence that this species, or indeed any species of *Cerion* has ever been collected from Barbados. No specimens of this species collected from anywhere other than from the Dutch islands off the northern Venezuelan coast are in the ANSP, FLMNH or BMNH collections.

Family BULIMULIDAE

Bulimulus guadalupensis (Bruguère, 1789)

Bulimus Guadalupensis Bruguère, 1789: 313
Bulimus exilis (Gmelin). Bland, 1862: 351,
non *Helix exilis* Müller, 1774

Bulimulus exilis (Gmelin). Gibbons, 1879:
130; Kobelt, 1880: 284; Smith & Feilden,
1891: 252; Brown, 1903: 267, 269; Hen-
derson, 1919: 202

Bulimulus exiles [sic] (Gmelin). Rush, 1891:
69

Bulimulus (Thaumastus) exilis (Gmelin).
Smith, 1895: 302, 305

Distribution: West Indies, and northern South America.

Status in Barbados: Locally abundant.

Material Collected From: Sites 2, 3, 4, 5, 7,
12, 13, and 22.

Additional Material Examined: ANSP 85439
(6 specimens *legit* Brown); ANSP 85440
(6 specimens *legit* Brown); ANSP 85441 (6
specimens *legit* Brown); ANSP 85442 (8 spe-
cimens *legit* Brown); ANSP 62059 (6 speci-
mens *legit* Rush); RM 13620 (8 specimens
[labelled as *Bulimus exilis*] *legit* Rawson ex
Carpenter); RM 13623 (St. Thomas Parish—3
specimens [labeled as *Bulimus guadalupen-
sis*] *legit* Rawson ex Carpenter); FLMNH
113848 (Harrison's Cave, St. Thomas—4
specimens *legit* Thompson); MCZ 90167
(100+ specimens—*legit* Rawson ex Bland);
MCZ 83525 (Bridgetown—2 specimens *legit*
Garman); MCZ 108728 (St. Joseph's—4
specimens *legit* Cockerell); MCZ 251316 (St.
Ann's Fort, St. Michael *legit* Ray & Allen).

Discussion: This West Indian species is found throughout Barbados wherever there has been any kind of human activity. Breure (1974) considers this species native to the Windward Group of the Lesser Antilles, so it was probably introduced to Barbados by human commerce.

Bulimulus fuscus Guilding, 1828

Bulimulus fuscus Guilding, 1828b: 170 (Bar-
bados)

Bulimus Barbadosis Pfeiffer, 1854: 61 ("in in-
sula Barbados"); Bland, 1862: 351; Pils-
bry, 1897: 48–49, pl. 12, fig. 61

Bulimus fuscus (Guilding). Bland, 1862: 351

Bulimulus fuscus (Guilding). Kobelt, 1880: 284

Bulimulus tenuissimus (Férussac). Smith & Feilden, 1891: 252; Brown, 1903: 268 (doubtful occurrence; attributed to earlier workers), *non Bulimus tenuissimus* d'Orbigny, 1835

Bulimulus (*Bulimulus*) *fuscus* Guilding. Breure, 1974: 38–39, pl. V, figs. 1–4; pl. VII, fig. 5.

Distribution: Endemic to Barbados.

Status: Extinct?

Material Examined: BMNH 197454 (lectotype designated by Breure, 1974); BMNH 197455 (2 paralectotypes); ANSP 3506 (3 specimens *legit* Bland); ANSP 3507 (1 specimen *legit* Bland); ANSP 3512 (3 specimens *legit* Bland); ANSP 25612 (8 specimens *legit* Bland); RM 13650 (4 specimens *legit* Rawson ex Carpenter); MCZ 90415 (6 specimens *legit* Rawson ex Bland).

Discussion: Smith & Feilden (1891) synonymized *Bulimus barbadensis* Pfeiffer [= *Bulimulus fuscus* Guilding], which Feilden had collected in Barbados, with *Bulimulus tenuissimus*, a superficially similar Brazilian species. Pilsbry (1897: 49) also noted the similarity between the two taxa, but confirmed that the latter was a distinct Brazilian species. Breure (1974) in his treatment of Caribbean *Bulimulus* suggested that this species may be extinct, as all records are from the nineteenth century. No specimens were collected during this study.

Bulimulus diaphanus fraterculus
(Potiez & Michaud, 1835)

Helix (*Cochlogena*) *fraterculus* Férussac, 1821: 54 ("La Guadeloupe") (*nomen nudum*)

Bulimus fraterculus "Férussac." Potiez & Michaud, 1835: pl. 13, figs. 7–8; 1838: 141 ("La Guadeloupe")

Bulimus fraterculus "Férussac." Bland, 1862: 351

Bulimulus fraterculus "Férussac." Kobelt, 1880: 284; Smith & Feilden, 1891: 252

Bulimulus diaphanus (Pfeiffer). Pilsbry, 1897: 47 (Barbados record), *non Bulimus diaphanus* Pfeiffer, 1854

Bulimulus fraterculus "Férussac." Brown, 1903: 269 (doubtful occurrence; attributed to Bland)

Bulimulus (*Bulimulus*) *diaphanus fraterculus* (Potiez & Michaud). Breure, 1974: 32–34, pl. 3, figs. 6–10; pl. 7, fig. 1

Distribution: St. Martin; Saba; St. Eustatius; Barbuda; Guadeloupe; Barbados?

Status: Unknown. Dubious record.

Material Examined: ANSP 25609 (2 specimens *legit* Foderougher).

Discussion: Brown (1903) stated that he was unable to confirm the occurrence of this species in Barbados. Breure (1974) in his taxonomic review of the genus *Bulimulus* in the Caribbean indicated that the Barbados records of this taxon are "very doubtful," considering that the records by Bland (1862), and Smith & Feilden (1891) are probably misidentifications of the polymorphic *Bulimulus guadalupensis*. However, two specimens in the ANSP collection, reportedly from Barbados, are clearly *B. d. fraterculus*. Whether this indicates it was established in Barbados at one time, or represents an error in locality remains uncertain.

Plekocheilus aurissileni (Born, 1780)

Voluta auris Sileni Born, 1780: 212, pl. 9, figs. 3, 4

Plekocheilus (*Plekocheilus*) *aurissileni* (Born). Breure, 1975: 73–76, pl. VI, figs. 5–10

Distribution: St. Vincent.

Status in Barbados: Dubious record.

Discussion: Breure (1975) reported this large and distinctive species being collected from Porter's Wood (north of Holetown, Parish of St. James) in Barbados. This was based on a specimen that was in Alan Solem's private collection but was not collected by him personally (J. Slapcinsky, personal communication), and was deposited in the Field Museum of Natural History, Chicago (FMNH 146430). There is no record of Solem ever having been to Barbados to collect, and presumably he obtained the specimen from an unknown collector, together with erroneous locality data.

Orthalicus maracaibensis subpulchella
(Pilsbry, 1889)

Orthalicus zebra (Müller). Smith & Feilden, 1891: 253; Smith, 1895: 302, 306–307; Rush, 1891: 69 (Bridgetown); Brown,

1903: 269, *non Buccinum zebra* Müller, 1774

Oxystyla maracaibensis var. *subpulchella* Pilsbry, 1889: 141–142, pl. 28, fig. 38, 39 (Union Island, Grenadines)

Oxystyla sp. Henderson, 1919: 95

Oxystyla pulchella (Spix). McGinty, 1939: 7, pl. 2, fig. 9, *non Achatina pulchella* Spix, 1827

Distribution: Barbados and the Grenadines.

Status in Barbados: Common.

Material Collected From: Sites 1, 3, 4, 5, 7, 14, 15, 17, and 22.

Additional Material Examined: ANSP 89699 (nr. Bridgetown—1 specimen *legit* Clapp); ANSP 227834 (Bridgetown—2 specimens *legit* Bales); ANSP 303292 (St. John's Wood—18 specimens *legit* Jackson); FLMNH 113849 (Harrison's Cave, St. Thomas—1 specimen *legit* F. G. Thompson); FLMNH 113851 (Welchman Hall Gully—4 specimens); FLMNH 109541 (near Bank Hall—5 specimens); FLMNH 177917—St. Peter mangrove plantation); MCZ 251304 (Barbados Museum, St. Michael *legit* Ray & Allen); MCZ 21085 (near Bridgetown—3 specimens *legit* Kugler); MCZ 142231 (St. John's Church, St. David—49 specimens *legit* Howland); MCZ 108953 (Hastings—36 specimens *legit* Howland).

Discussion: The taxonomic status of this common Barbados tree snail is uncertain, although it most closely resembles *Orthalicus maracaibensis subpulchella* (Pilsbry, 1889), from the Grenadines (typical *maracaibensis* is from the mainland of Venezuela). Henderson (1919) also recognized the Barbadian form to be “more nearly related to a South American group” as opposed to *O. undatus jamaicensis* Pilsbry, 1889. Pilsbry (1889) had placed references to *Orthalicus zebra* (Müller) (including that of Smith & Feilden, 1891) in synonymy with *Oxystyla undatus* var. *jamaicensis* Pilsbry, 1889, presumably without seeing specimens from Barbados (the specimens in the ANSP collection were received after Pilsbry had written the relevant text in the Manual of Conchology). Brown (1903) also discussed the taxonomic uncertainty of this species. The taxonomy of the various Caribbean and mainland species and named forms of *Orthalicus* is in need of revision.

Smith & Feilden (1891) reported that Feilden had “brought a small basket full of

[*Orthalicus undatus jamaicensis*] from Jamaica to Barbados,” that was then released on Pelican Island, a quarantine station just off Bridgetown. Feilden is quoted as later discovering that he “found them in limited numbers already introduced to gardens in the suburbs of Bridgetown.” Doubtless he, too, was misled by the similarity of the two forms. Whether or not the Jamaican taxon has survived somewhere in the Bridgetown area is unknown.

Smith & Feilden's, and Rush's records (both 1891) are the earliest records of a species of *Orthalicus* in Barbados. It would seem that the species had recently been introduced from elsewhere, presumably the nearby Grenadines, as the species is now common in trees in inhabited areas and so visible as not to be easily missed.

Family UROCOPTIDAE

Brachypodella costata (Guilding, 1828)

Brachypus costatus Guilding, 1828b: 167 (“in arboribus Barbadosibus”)

Siphonostoma costata (Guilding). Swainson, 1840: 168, fig. 22 (*non* p. 333, fig. 97c, d)

Cylindrella costata (*Brachypus*) (Guilding). Pfeiffer, 1844: 183, pl. 1, fig. 16 only; Bland, 1862: 351; Kobelt, 1880: 284

Cylindrella (*Gongylostoma*) *costata* Guilding. Smith & Feilden, 1891: 255; Brown, 1903: 270

Urocoptis sp. Henderson, 1919: 96

Brachypodella costata (Guilding). Pilsbry, 1904: 78–79.

Brachypodella costata form *albida* Pilsbry, 1904: 79.

Distribution: Endemic to Barbados. Erroneous records from St. Lucia.

Status: Locally abundant.

Material Collected From: 2, 7, 8, 9, 13, 19, and 21.

Additional Material Examined: ANSP 73226 (10 specimens *legit* Bland); ANSP 73228 (8 specimens *legit* Bland—types of *Brachypodella costata* form *albida* Pilsbry, 1904); ANSP 73229 (13 specimens *legit* Bland); ANSP 85458 (13 specimens *legit* Brown); RM 14180 (7 specimens *legit* Rawson ex Carpenter); FLMNH 119898 (Harrison's Cave, St. Thomas—12 specimens *legit* Thompson); MCZ 171018 (13 specimens *legit* Rawson ex Bland); MCZ 26922 (4 specimens ex Bland);

MCZ 75023 (Blowers – 100+ specimens *legit* Kugler).

Discussion: This species is common throughout the island, in some areas being abundant, found crawling on tree trunks and other vertical surfaces, as well as on rocks and boulders. Brown (1903) listed this species also being from St. Lucia, but this record refers to the similar *Brachypodella tatei* (Crosse).

Pseudopineria barbadensis Kraus, 1996

Bulimus Viequensis Pfeiffer. Bland, 1862: 351, pl. 2; Pilsbry, 1904: 111–112, pl. 1, fig. 12, only, *non* Pfeiffer, 1856

Pineria Viequensis var. *minor* Pfeiffer, 1868: 343 (Barbados)

Stenogyra Viequensis (Pfeiffer). Kobelt, 1880: 284, *non* Pfeiffer, 1856

Pineria viequensis (Pfeiffer). Smith & Feilden, 1891: 253; Brown, 1903: 269, *non* Pfeiffer, 1856

Pseudopineria barbadensis Kraus, 1996: 109–113, figs. 8, 10

Distribution: Endemic to Barbados.

Status: Unknown.

Material Examined: FLMNH 50324 (holotype); FLMNH 180526 (5 paratypes *legit* J. J. Brown); ANSP 85454 (12 paratypes *legit* Brown); MCZ 23720 (17 paratypes *legit* Guppy).

Discussion: Brown (1903) reported this species as *Pineria viequensis* occurring along the coast of the Parish of St. Philip, and Feilden collected it from the Parishes of Christchurch and St. Philip. Kraus (1996) recognized the Barbados records as a distinct species based on museum specimens. No specimens were collected during this study, so its status is unknown.

Family SUBULINIDAE

Allopeas gracile (Hutton, 1834)

Bulimus gracilis Hutton, 1834: 84 (Mirzapoor . . . Futtehpoor Sikra . . . between Agra and Neemuch [India])

Bulimus subula (Pfeiffer). Bland, 1862: 351

Stenogyra subula (Pfeiffer). Kobelt, 1880: 284; Smith & Feilden, 1891: 253–254

Opeas subula (Pfeiffer). Brown, 1903: 270

?*Opeas* sp. Henderson, 1919: 96

Distribution: Tropics and subtropics worldwide; some Pacific island groups.

Status in Barbados: Uncommon.

Material Collected From: Sites 1, 3, and 13.

Additional Material Examined: ANSP 3101 (4 specimens *legit* Bland); ANSP 85451 (4 specimens *legit* Brown); MCZ 318940 (Blowers – 1 specimen *legit* Kugler).

Discussion: A worldwide species introduced by humans. Rush's (1891) reference to a species of *Opeas* could be either one of the *Allopeas* taxa listed here or *Opeas hannense*. It is included here as *Allopeas gracile*, because it is the largest of the three and the one most likely encountered by Rush.

Allopeas micra (d'Orbigny, 1835)

Helix (*Achatina*) *micra* d'Orbigny, 1835: 9 (Central America)

Stenogyra micra (d'Orbigny). Gibbons, 1879: 131

Bulimus octonoides Adams. Bland, 1862: 351
Stenogyra octonoides Adams. Kobelt, 1880: 284; Smith & Feilden, 1891: 254; Rush, 1891: 69

Opeas octonoides Adams. Brown, 1903: 270

Distribution: Mexico to Bolivia, and the West Indies; some Pacific island groups.

Status in Barbados: Uncommon.

Material Collected From: Sites 3, 7, and 9.

Additional Material Examined: ANSP 3107 (21 specimens *legit* Bland); ANSP 85460 (4 specimens *legit* Brown).

Discussion: A synanthropic species spread throughout the Americas and elsewhere.

Beckianum beckianum (Pfeiffer, 1846)

Bulimus beckianus Pfeiffer, 1846: 82 (Opara)
Bulimus Caraccasensis Reeve. Bland, 1862: 351

Stenogyra caracasensis (sic) Reeve. Kobelt, 1880: 284

Stenogyra Beckiana Pfeiffer. Smith & Feilden, 1891: 253; Rush, 1891: 69

Opeas Beckiana Pfeiffer. Smith, 1895: 302, 309; Brown, 1903: 270

Distribution: South and Central America, and the West Indies; some Pacific island groups.

Status in Barbados: Locally abundant.

Material Collected From: Sites 1, 2, 3, 7, 9, 19, and 22.

Additional Material Examined: ANSP 337234 (1 specimen *legit* Bland); ANSP 85461 (12 specimens *legit* Brown); ANSP 332714 (Porter's Estate—2 specimens *legit* Hussey); RM 15346 (8 specimens *legit* Rawson *ex* Carpenter); MCZ 27231 (12 specimens *legit* Rawson); MCZ 136007 (9 specimens *ex* Bland); MCZ 318944 (near Fresh Water Bay *legit* Balch); MCZ 90579 (Blowers—3 specimens *ex* Kugler).

Discussion: Smith & Feilden (1891) reported this species as being "not very common." Today the species is particularly widespread, often abundant, especially in disturbed habitats.

Leptinaria lamellata
(Potiez & Michaud, 1835)

Achatina lamellata Potiez & Michaud, 1835: pl. 11, figs. 7, 8; 1838: 128 (Hab. ?)

Tornatellina Antillarum Shuttleworth. Bland, 1862: 351

Leptinaria antillarum (Shuttleworth). Kobelt, 1880: 284

Leptinaria lamellata (Potiez & Michaud). Smith & Feilden, 1891: 255; Smith, 1895: 302, 309; Brown, 1903: 270

Leptinaria sp. Henderson, 1919: 96

Distribution: Tropics and subtropics worldwide.

Status in Barbados: Locally common.

Material Collected From: Sites 2, 7, 13, and 19.

Additional Material Examined: ANSP 24089 (2 specimens *legit* Bland); ANSP 85456 (4 specimens *legit* Brown); MCZ 90578 (Blowers—3 specimens *legit* Kugler).

Discussion: This species is widely distributed on Barbados, although never in great numbers. It is associated with areas of human disturbance.

Luntia insignis Smith, 1898

Luntia insignis Smith, 1898: 28, fig. 8 (Trinidad)

Distribution: Trinidad; Aruba; Saba; Barbados.

Status in Barbados: Uncommon.

Material Collected From: Sites 2, 3, 9, and 13.

Discussion: This small subulinid is here reported from Barbados for the first time. It was originally known only from Trinidad, until it was reported on Aruba by Wagenaar Hummelink (1940), and then on Saba by Haas (1962). It is probably distributed throughout the Lesser Antilles.

Opeas hannense (Rang, 1831)

Hélice (Cochlicelle) hannensis Rang, 1831: 41–42, pl. 3, fig. 8 ("Village de Hann sur la presque-île du Cap-Verd" [West Africa])

Bulimus Goodalli (Miller). Bland, 1862: 351

Stenogyra Goodalli (Miller). Kobelt, 1880: 284; Smith & Feilden, 1891: 254

Opeas goodalli (Miller). Brown, 1903: 270

Opeas ascendens Poey. Brown, 1903: 270

Distribution: Tropical Central America; introduced worldwide.

Status in Barbados: Rare.

Material Collected From: Site 9.

Additional Material Examined: ANSP 85462 (4 specimens *legit* Brown).

Discussion: We follow Proschwitz (1994) and Cowie (1997) in using *Helix hannensis* Rang as senior synonym of *Helix goodalli* Miller, 1822, and *Bulimus pumilus* Pfeiffer, 1840. Although Brown (1903) listed both *O. goodalli* and *O. ascendens*, a note in the text by E. A. Smith (in Brown, 1903: 270) indicates that they are the same species.

Although reported by various other workers on the Barbadian fauna, we found only two specimens of this species at a single locality.

Subulina octona (Bruguière, 1792)

Bulimus octonus "Chemnitz" Bruguière, 1792: 325 ("Les Îles Antilles")

Achatina octona (Bruguière). Bland, 1862: 351

Stenogyra octona (Bruguère). Gibbons, 1879: 131; Kobelt, 1880: 284; Smith & Feilden, 1891: 253

Subulina sp. Rush, 1891: 69

Subulina octona (Bruguère). Smith, 1895: 302, 309; Brown, 1903: 270

Distribution: Tropics and subtropics worldwide, as well as in greenhouses in the temperate zones of Europe and North America.

Status in Barbados: Common; locally abundant.

Material Collected From: Sites 1, 2, 3, 5, 6, 7, 9, 12, 13, 15, 16, 19, 20, and 22.

Additional Material Examined: ANSP 85453 (8 specimens *legit* Brown); RM 12742 (8 specimens *legit* Rawson *ex* Carpenter); MCZ 27131 (7 specimens — *legit* Rawson); MCZ 136006 (9 specimens *ex* Bland); MCZ 107934 (Blowers — 31 specimens *ex* Kugler).

Discussion: One of the commonest and most widespread species on Barbados. Smith & Feilden (1891) reported that “it is very abundant throughout the island, and is met with in colonies under stones and rocks.” Specimens are often observed containing a number of white eggs in the last two or three whorls of the shell, even when the shell is only half the length of the largest specimens encountered. It would appear that this snail, as other subulinids, is capable of reproduction well before its maximum size is reached.

Family FERUSSACIIDAE

Cecilioides acicula (Müller, 1774)

Buccinum acicula Müller, 1774: 150–151

Caecilianella acicula (Müller). Brown, 1903: 266, 270

Distribution: Europe; isolated records of introductions to other continents and Pacific islands.

Status in Barbados: Dubious record.

Discussion: Brown (1903) reported collecting a single specimen at Porter’s Wood (St. James), together with specimens of *C. consobrinus minutissima* (Guppy) (see below). However, he also misidentified specimens of *C. aperta*, which upon closer examination are clearly individual variations of *C. consobrinus*

minutissima. It is likely that his determination of this European species was also in error.

Cecilioides (Geostilbia) aperta (Swainson, 1840)

Macrospira aperta “Guilding” Swainson, 1840: 335, fig. 97e, f

Achatina Gundlachi Pfeiffer. Bland, 1862: 351

Stenogyra Gundlachi (Pfeiffer). Kobelt, 1880: 284

Stenogyra Gundlachi “Arango” Smith & Feilden, 1891: 254 (attributed to Bland, 1862)

Caecilianella aperta “Guilding” Brown, 1903: 269–270

Opeas gundlachi “Arango.” Brown, 1903: 266, 270 (doubtful occurrence; attributed to Bland)

Caecilianella gundlachi Pfeiffer. Brown, 1903: 270

Distribution: West Indies.

Status in Barbados: Unknown.

Material Examined: MCZ 90580 (Blowers — 10 specimens *ex* Kugler).

Discussion: Although Bland (1862) and Brown (1903, in Porter’s Wood listed as *C. gundlachi*) reported this species from Barbados (Smith & Feilden, 1891, merely quoted Bland’s record), we have been unable to find specimens from the island in any of the institutional collections surveyed, although there is no reason to suppose this widely distributed Caribbean species has never been present on the island. Smith (1895) reported it from the neighbouring island of St. Vincent. Brown attributed *Opeas gundlachi* Arango to Bland. However, it was Smith & Feilden who used this name combination, although they were referring to *Bulimus gundlachi* Pfeiffer [= *Cecilioides aperta* (Swainson)], a species Brown believed he had collected (see next species). No specimen attributable to this taxon was collected during our survey.

Cecilioides (Karolus) consobrinus minutissima (Guppy, 1868)

Caecilioides minutissima Guppy, 1868a: 239 (Trinidad)

Caecilianella minutissima (Guppy). Brown, 1903: 269

Caecilianella aperta Guilding. Brown, 1903:

270, *non Macrospira aperta* Swainson, 1840

Cæcilianella (*Cæcilioides*) *consobrinus* var. *minutissima* (Guppy). Pilsbry, 1909: 41–42, pl. 5, figs. 83, 85

Distribution: Trinidad; St. Vincent; Barbados.

Status in Barbados: Unknown.

Material Examined: ANSP 85457 (5 specimens [labelled as *Cæcilianella minutissima*] *legit* Brown); ANSP 85466 (3 specimens [labelled as *Cæcilianella aperta*] *legit* Brown).

Discussion: Pilsbry (1909) recognized the race/variety *minutissima* from the southern Lesser Antilles as distinct from the typical form. Brown collected two confirmed lots of this species from Barbados, although it was not found by any subsequent workers, including ourselves. It is a minute species living cryptically, and as such, it would be premature to conclude that it no longer lives on the island.

Family STREPTAXIDAE

Streptaxis (*Streptartemon*) *glaber*
(Pfeiffer, 1849)

Streptaxis glabra Pfeiffer, 1849: 126 (Demerara)

Streptaxis deformis (Férussac). Smith & Feilden, 1891: 251; Rush, 1891: 68; Brown, 1903: 268; Henderson, 1919: 95; Pilsbry, 1908: x, pl. 52, fig. 5, *non Helix deformis* Férussac, 1821

Streptaxis (*Odontertemon*) *glaber* (Pfeiffer). Baker, 1925: 39–40

Streptaxis (*Streptartemon*) *glaber* Pfeiffer. Venmans, 1963: 53–68, figs. 12–16

Distribution: Brazil; Suriname; Guyana; Venezuela; Isla Margarita; Trinidad; Barbados; St. Lucia; Dominica; St. Thomas; St. Croix; Virgin Islands.

Status in Barbados: Common; locally abundant.

Material Collected From: Sites 2, 3, 4, 7, 9, 16, 19, 20, and 22.

Additional Material Examined: ANSP 1202 (1 specimen *legit* Bland); ANSP 5029 (1 specimen *legit* Bland); ANSP 85445 (11 specimens *legit* Brown); FLMNH 113853 (Welchman Hall Gully—1 specimen); FLMNH 119894 (Har-

ison's Cave—2 specimens *legit* Thompson); MCZ 318941 (near Fresh Water Bay *legit* Balch).

Discussion: Although Férussac's name *deformis* has been used by most authors for this streptaxid species, that taxon remains of unknown origin (Baker, 1925). One of the more common species in Barbados, it occurs wherever there has been any kind of human disturbance. Other than Hughes' (1750) description of snails that may correspond to this species, the first published record is by Smith & Feilden (1891). It is clear that Bland collected this species, based on specimens that were deposited in the ANSP collection, but he did not list it in his 1862 publication, possibly because he was unable to identify the specimens.

Gulella (*Huttonella*) *Bicolor* (Hutton, 1834)

Pupa bicolor Hutton, 1834: 86, 93 (Mirzapur, India)

Ennaea (*Huttonella*) *bicolor* (Hutton). Brown, 1903: 269

Distribution: Tropics and subtropics worldwide.

Status in Barbados: Unknown.

Discussion: This species of Old World origin has been reported as introduced to various Caribbean islands, and there are several lots in the ANSP and FLMNH collections from throughout the West Indies. However, it appears to be fairly uncommon at all localities. Brown (1903) also reported the species from St. Thomas, Dominica, as well as several localities in Barbados (Bridgetown, Belle Plantation Wood and St. Philip's). He is, however, the only worker to report its occurrence on the island. Nevertheless, there is insufficient reason to conclude that the species is no longer living on Barbados.

Family ZONITIDAE

Glyphyalinia barbadensis

Chase & Robinson, new name

Helix incisa Pfeiffer, 1866: 78 ("Habitat in insula Barbados"); 1868: 107, *non Helix incisa* Gmelin, 1791

Hyalina incisa (Pfeiffer). Kobelt, 1880: 284

Vitrea incisa (Pfeiffer). Smith & Feilden, 1891: 249; Brown, 1903: 268 (doubtful occurrence)

? *Vitrea* sp. Henderson, 1919: 96

Retinella (*Glyphyalinia*) *incisa* (Pfeiffer).
Baker, 1930: 209 (?*Retinella* (*Gly-*
phyalinia) *carolinensis* (Cockerell, 1890)

Distribution: Endemic to Barbados.

Status: Rare.

Material Examined: ANSP 997 (3 specimens *legit* Bland); ANSP 48818 (2 specimens); FLMNH 119896 (Harrison's Cave—4 specimens *legit* Thompson)

Discussion: The identity and even the existence of this species has been confused ever since it was described by Pfeiffer (1866). It appears not to have been collected by any of the subsequent workers on the Barbados fauna. Kobelt (1880) merely listed it (immediately after the publication of Pfeiffer's description); Smith & Feilden (1891) and Brown (1903) doubted its occurrence on the island. Smith & Feilden (1891), studying Pfeiffer's type material, commented on "the distinct impressed lines of growth which divide the last whorl into numerous segments," characteristic of the shell of *Glyphyalinia*. There are two lots matching Pfeiffer's description in the ANSP collection. Both lots were collected from Barbados, and one is labelled as having been collected by Bland. Baker (1930) referred to one of the lots as containing potentially mislocalized specimens of *Glyphyalinia carolinensis* (Cockerell), an eastern North American species. As he also pointed out, the name *Helix incisa* is pre-occupied, so this taxon lacks a specific name. We therefore propose to provide the name *Glyphyalinia barbadensis* for this species, one that we consider endemic to Barbados. Several specimens of the species were collected by Thompson in 1987, confirming the continued survival of this species on the island.

Family SYSTROPHIIDAE

Miradiscops implicans (Guppy, 1868)

Zonites implicans Guppy, 1868b: 440 (Trinidad)

Vitrea implicans (Guppy). Brown, 1903: 268 (doubtful occurrence; attributed to Smith [& Feilden])

Distribution: Venezuela and Trinidad.

Status in Barbados: Unknown.

Discussion: We cannot confirm that this species was ever collected from Barbados.

Although much of Brown's material (reportedly collected at Porter's Wood) is deposited at the ANSP and the BMNH, there are no specimens of this species collected by Brown in either of these collections, and no other known records from Barbados. However, the occurrence of the following species, also of this South American family, suggests the possibility that the tiny *Miradiscops implicans* may have been collected from Barbados.

Happiella cf. *decolorata* (Drouët, 1859)

Zonites decolorata Drouët, 1859: 50–51, pl. 1, figs. 3–5

Distribution: Guyana and French Guyana.

Status: Rare.

Material Collected From: Sites 7 and 13.

Additional Material Examined: FLMNH 119897 (Harrison's Cave—4 specimens *legit* Thompson).

Discussion: Examination of specimens collected at two localities during this study shows them to be virtually indistinguishable in terms of shell morphology from specimens of *Happiella* cf. *decolorata* (Drouët, 1859), a species known from Guyana and French Guiana. The generic placement of this species follows that of Ramírez (1993).

Family MEGALOBULIMIDAE

Megalobulimus oblongus (Müller, 1774)

Helix oblongus Müller, 1774: 86

Bulimus oblongus (Müller). Bland, 1862: 351; Kobelt, 1880: 284; Rush, 1891: 65, 69; Smith, 1895: 302, 306

Bulimus (*Borus*) *oblongus* (Müller). Smith & Feilden, 1891: 251–252

Strophocheilus (*Borus*) *oblongus* Müller. Brown, 1903: 268; Henderson, 1919: 94–95

Distribution: South America; Trinidad; Tobago; Grenada; St Vincent; Barbados.

Status in Barbados: Uncommon.

Material Collected From: Sites 2, 4, 5, 7, 14, and 16. Fragmentary specimen (observed, not collected) at site 19.

Additional Material Examined: ANSP 83178 (1 specimen *legit* Brown); ANSP 85470 (3 specimens *legit* Brown); RM 13457 (2 speci-

mens *legit* Rawson ex Carpenter); MCZ 232161 (Lancaster Plantation, St. James *legit* Gooding); MCZ 230453 (Airy Hill, St. John — 1 specimen *legit* Humes); MCZ 90359 (6 specimens *legit* Junious ex Bland); MCZ 50505 (Bridgetown — 2 specimens *legit* Walker).

Discussion: *Megalobulimus oblongus* is widely distributed throughout the island, although it was considerably more common in the past. Rush (1891) remarked on its abundance in Bridgetown, and Henderson (1919) reported the species as living “abundantly all over the island especially in gardens.” Bland (1862) believed the species was introduced to Barbados from St. Vincent by Rev. J. Parkinson, although the purpose for the introduction is unknown.

Family SAGDIDAE

Lacteoluna selenina (Gould, 1848)

Helix selenina Gould, 1848: 38 (Georgia and Florida)

Helix vortex Pfeiffer. Bland, 1862: 351; Pfeiffer, 1876: 153 (reported from Barbados), non Linné, 1758

Helix (*Microphysa*) *vortex* (Pfeiffer). Smith & Feilden, 1891: 251

Microphysa vortex (Pfeiffer). Kobelt, 1880: 284

Helix subaquila Shuttleworth. Rush, 1891: 68, non Shuttleworth, 1854

Thysanophora vortex (Pfeiffer). Brown, 1903: 268

? *Thysanophora* sp. Henderson, 1919: 96

Lacteoluna selenina barbadensis Pilsbry, 1930: 244 (Barbados); Baker, 1963: 242

Distribution: Bermuda; Florida and the West Indies.

Status in Barbados: Rare.

Material Collected From: Site 9.

Additional Material Examined: ANSP 8039 (lectotype of *L. s. barbadensis* Pilsbry, 1930, designated by Baker, 1963); ANSP 28317 (11 paralectotypes of *L. s. barbadensis* Pilsbry); ANSP 85469 (2 specimens *legit* Brown); MCZ 905 (Blowers — 3 specimens *legit* Kugler).

Discussion: This synanthropic species, widely distributed throughout the Caribbean Basin, appears not to be common in Barba-

dos. Pilsbry (1930) considered the Barbados populations as a distinct subspecies because they are a little larger than is typical for the species. Smith & Feilden (1891) reported 2 specimens, Brown deposited 2 specimens in the ANSP collection, and 2 specimens were collected during this study.

Lacteoluna (*Aerotrochus*) *turbiniformis* (Pfeiffer, 1839)

Helix turbiniformis Pfeiffer, 1839: 350 (Cuba)

Helix (*Microphysa*) *turbiniformis* Pfeiffer. Smith & Feilden, 1891: 251 (unconfirmed)

Thysanophora turbiniformis (Pfeiffer). Brown, 1903: 266, 268 (doubtful occurrence; attributed to earlier workers)

Distribution: Cuba and Jamaica.

Status in Barbados: Dubious record.

Discussion: Smith & Feilden (1891) reported a single specimen of this species, reputedly from Barbados, in the Cuming collection (in the British Museum). However, they also noted that the collection was “somewhat notorious for errors of locality” (Smith & Feilden, 1891: 248), and they could not confirm the occurrence of the species based on Feilden’s collections from Barbados. No other workers reported the species, and Brown (1903) concluded that its occurrence was doubtful. We concur with earlier workers that this Greater Antillean species was erroneously reported from Barbados.

Family CAMAENIDAE

Pleurodonte isabella (Férussac, 1822)

Helix Isabella Férussac, 1821: 32, (“Les Antilles, Cayenne”) (*nomen nudum*); Bland, 1862: 351, table 2

Helicogena isabella Férussac, 1822a: pl. 47, fig. 2

Helix Barbadensis Lamarck, 1822: 78–79 (“la Barbade”)

Carocolla Barbadensis Guilding, 1828b: 167 (“sub lapidibus Barbadensibus”)

Helix (*Dentellaria*) *Barbadensis* Lamarck. Beck, 1837: 35

Helix barbadensis (*Carocolla*) Guilding. Pfeiffer, 1847: 310

Helix dentiens Férussac. Deshayes, 1850: 147–148, pl. 47, fig. 2 only; Pfeiffer,

1853: 213 (*partim non Helix dentiens* Férussac)

Dentellaria Isabella (Férussac). Kobelt, 1880: 284

Helix (Dentellaria) isabella Férussac. Pilsbry, 1889: 85–86, pl. 24, figs. 42, 43; E. A. Smith & Feilden, 1891: 250

Pleurodonte isabella Férussac. Brown, 1903: 268

Pleurodonte (Caprinus) isabella (Férussac). Henderson, 1919: 95

Distribution: Endemic to Barbados.

Status: Locally abundant.

Material Collected From: Sites 2, 3, 4, 5, 7, 8, 11, 13, 15, 16, 17, 20, 21, and 22.

Additional Material Examined: ANSP 987 (3 specimens), ANSP 988 (4 specimens), ANSP 989 (1 specimen), ANSP 990 (4 specimens), ANSP 991 (3 specimens), ANSP 992 (3 specimens), ANSP 993 (2 specimens), ANSP 994 (1 specimen), ANSP 995 (2 specimens), ANSP 32584 (8 specimens), all *legit* Bland; ANSP 85443 (8 specimens *legit* Brown); ANSP 85444 (2 specimens *legit* Brown); RM 14301 (9 specimens *legit* Rawson ex Carpenter); FMNH 146396 (Wentwood Gully—1 specimen); FMNH 147023 (Codrington College—4 specimens); FMNH 172045 (Speightstown—6 specimens); MCZ 251322 (Farley Hill, St. Peter—15 specimens *legit* Ray & Allen); MCZ 258049 (4 miles east of Hometown, St. James—4 specimens *legit* Scheafer); MCZ 136004 (Christ Church—1 specimen *legit* Bland); MCZ 251320 (cave near Hillaby, St. Thomas—9 specimens *legit* Ray & Allen); MCZ 107935 (Blowers—10 specimens *legit* Kugler); MCZ 108727 (St. Joseph's—1 specimen *legit* Cockerell); MCZ 90325 (1 specimen ex Bland).

Discussion: *Pleurodonte isabella* is a ubiquitous Barbados endemic that appears to be relatively unaffected by human activity on the island, being extremely common in suburban gardens as well as relatively unspoiled forest areas.

Pleurodonte dentiens (Férussac, 1822)

Helix (Helicodonta) dentiens Férussac, 1821: 33 (“La Guadeloupe, la Martinique, Saint-Domingue, les forêts de Cayenne et de la Guyanne”) (*nomen nudum*)

Helix dentiens Férussac, 1822b: pl. 48, fig. 2

Helix dentiens Férussac. Deshayes, 1850: 147–148; Pfeiffer, 1853: 213 (*partim*)

Pleurodonte dentiens (Férussac). Brown, 1903: 268 (unconfirmed)

Distribution: Guadeloupe, Dominica, and Martinique.

Status in Barbados: Erroneous record.

Discussion: Although Brown (1903) reported that *Pleurodonte dentiens* had been collected “by a Mr. E. W. Williams” in Pine Wood Estate, St. Michael’s, he could not personally confirm the occurrence of this species. Apparently the confusion was created when both Deshayes (1850) and Pfeiffer (1853) placed *Helix isabella* as a junior synonym of *Helix dentiens*, and Brown was unaware of this taxonomic error.

Polydontes perplexa (Férussac, 1832)

Helix (Helicodonta) perplexa Férussac, 1832: pl. 56A, fig. 1

Helix (Dentellaria) perplexa Férussac. Smith & Feilden, 1891: 249

Pleurodonte perplexa (Férussac). Brown, 1903: 268 (doubtful occurrence; attributed to Smith [& Feilden])

Distribution: Grenada and the Grenadines.

Status in Barbados: Dubious record.

Material Examined: BMNH 70.10.12.7 (4 specimens *legit* Rawson).

Discussion: Smith & Feilden (1891) referred to specimens of *Helix perplexa* Férussac, as being “said to have come from that locality” [Barbados] that were collected by Sir Rawson and deposited at the British Museum (Natural History). Smith later (1895) listed this species from Grenada and the Grenadines, but not from Barbados. We have examined these specimens (BMNH 70.10.12.7), and although the identification can be confirmed, it is unlikely that they were collected from Barbados. Brown (1903) also was unable to confirm the occurrence of this species on the island.

Zachrysia provisoria (Pfeiffer, 1858)

Helix provisoria Pfeiffer, 1858: 39–40 (Manzanillo, Cauto, and Guisa, Cuba)

Distribution: Originally from Cuba; established in southern Florida, the Bahamas, St. Croix, and Barbados.

Status in Barbados: Locally abundant.

Material Collected From: Sites 1, 2, 3, 4, 13, and 15.

Discussion: Although this large Cuban species has well established populations in southern Florida, as well as the Bahamas (Pilsbry, 1928), it has not been reported until now from anywhere in the Lesser Antilles. Nevertheless, this recently introduced arrival is particularly common in lowland parts of the island, especially along the East coast. In some areas, especially in gardens, it is the most conspicuous snail species. It is likely to have been introduced via the horticultural trade, possibly from Florida.

Family BRADYBAENIDAE

Bradybaena similaris (Rang, 1831)

Helix similaris Férussac, 1821: 43 ("Timor") (*nomen nudum*)

Hélice (Hélicelle) similaris "Férussac" Rang, 1831: 15 ("Bourbon . . . l'île de Cuba; . . . Rio-Janeiro et particulièrement au jardin de Saint-Christophe . . . Brésil."); Bland, 1855: 153; 1862: 351, table 2

Fruticicola similaris "Férussac." Kobelt, 1880: 284

Helix (Fruticicola) similaris "Férussac." Smith & Feilden, 1891: 250–251

Helix (Dorcasia) similaris "Férussac." Rush, 1891: 69

Eulota similaris "Férussac." Brown, 1903: 268; Henderson, 1919: 96

Distribution: Originally eastern Asia; established throughout the tropics and subtropics.

Status in Barbados: Locally common.

Material Collected From: Sites 3, 23 and 24.

Additional Material Examined: ANSP 998 (4 specimens *legit* Bland); ANSP 85448 (4 specimens *legit* Brown); ANSP 62063 (2 specimens *legit* Rush); MCZ 136009 (5 specimens *ex* Bland).

Discussion: First reported from Barbados by Bland (1855), Smith & Feilden (1891: 250) later reported this species as being "the com-

monest *Helix* in the island," presumably more so than *Pleurodonte isabella*, which they also referred to as a *Helix*. They also noted that it was "abundant on the lowlands as well as on the high ground of Scotland District. . . ." Today, *Bradybaena similaris* appears to be much more restricted in distribution. In our survey, it was found in only three localities, both in St. James Parish, where it is common but considerably less so than *Zachrysia provisor* and *Pleurodonte isabella*.

DISCUSSION

We have described significant discrepancies in the faunal lists obtained by seven groups of workers in Barbados, including ourselves. The variability cannot easily be attributed to simple incompetence, because all the groups comprised, or at least included, persons with considerable experience as collectors and malacologists. While the results of our study clarify the current conservation status of land snails on Barbados, we believe they also have important implications for conservation efforts generally.

The reported faunal lists for Barbados separate into two groups according to the length of the list, which presumably reflects the intensity of the collection effort (Table 1). In one group, the lists of Carpenter, Rush and Henderson are very likely incomplete. In the second group, comprising Bland, Smith and Feilden, Brown, and ourselves, the total numbers of confirmed species range from 19 to 23. The absence of any evident historical trend in these totals should not be taken to imply an absence of faunal change over the intervening 137 years. On the contrary, faunal change is indicated by our analysis in Table 2, which shows consistent disagreement among the workers with respect to the content of the lists. For example, the earliest worker, Bland, reported five confirmed species that were not found by us, and conversely, we found five species not reported by Bland. Similarly, Smith & Feilden reported three confirmed species not found by us, and we found six species not reported by Smith & Feilden. When Smith & Feilden's list is compared with Brown's, there is one "different" species reported by Smith & Feilden and five "different" species reported by Brown. Given that the foregoing account is based exclusively on

taxa for which the location in Barbados has been confirmed by our examination of institutional collections, or by other workers, the pattern of inconsistency is likely to reflect a combination of sampling error and actual fluctuations in the fauna.

To know the exact size of the current fauna would require a more thorough field survey than we were able to conduct. All together, we confirmed 30 species from our own survey plus those of earlier authors (Table 1). In addition, we confirmed *Pupisoma dioscoricola* from the FLMNH collection, to give a total of 31 confirmed species present on the island at some time in the period 1862 to the present. Beyond these confirmed species, *Miradiscops implicans* and *Gulella bicolor* are also likely to have been found on the island, although we did not examine any specimens, and some small, inconspicuous species may have escaped the notice of all collectors. On the other hand, three endemic species (*Bulimus fuscus*, *Lucidella barbadensis* and *Pseudopineria barbadensis*) are probably extinct, and one introduced species (*Lucidella plicatula*) is possibly extirpated. In summary, the total number of extant species is about 30, or slightly less.

While we confirm 31 species for Barbados in the period 1862 to the present, a total of 46 species were listed by the six authors whose works have been analyzed here. We also found 12 additional species reported by other workers scattered throughout the malacological literature. The disparity between the number of confirmed species (31) and the total number of reported species (58) can be attributed to a combination of synonyms and erroneous reports.

Brown's (1903) faunal list has special significance because it is presumably the basis for a widely circulated estimate of the number of species present on Barbados. We refer to a report (Groombridge, 1992) compiled by the World Conservation Monitoring Centre in collaboration with a number of highly respected international conservation organisations. This report contains a list (p. 151, table 14.3) of the total number of land snails on various islands. Data in the list were compiled by the Species Survival Commission Mollusc Specialist Group of the International Union for Conservation of Nature and Natural Resources (IUCN/SSC), but without specific references. Barbados is said to have 37 species, which is the exact, and unique, number reported by

Brown (1903). In light of the special status afforded to Brown's total, and noting that we have been able to confirm the validity of only 23 of the 37 "species" from his list (Table 1), a detailed analysis of Brown's list is warranted. In addition to the 23 confirmed species, two species are unconfirmed but likely to occur in Barbados, five species are correctly identified but of dubious locality, and five species were listed by Brown only by attribution to others (Table 3). By this reckoning, the total of confirmed and unconfirmed species from Brown's list is 35. The two remaining taxa from Brown's list are redundant synonyms: *Opeas goodalli* and *Opeas ascendens* are both *Opeas hannense*; *Cecilioides gundlachi* and *Opeas gundlachi* are both *Cecilioides aperta*. Brown introduced further confusion by labelling as *Cecilioides aperta* specimens that are in fact *Cecilioides consobrinus minutissima*.

No doubt the reason that Groombridge (1992) lists the land snail fauna of 86 islands is that islands have been well studied by malacologists (e.g., Peake, 1981; Solem, 1984; Cowie, 1997). On the face of it, the data set is a good basis for monitoring international conservation efforts. However, given the likelihood that islands other than Barbados also have erroneous entries, the information contained therein, particularly by older workers, must be viewed with caution. Additionally, the notoriously disputed taxonomy of pulmonate gastropods can create major problems for modern workers. In our taxonomical section, in which 38 species are treated, 136 variant names are listed, covering synonyms, misidentifications and variant genus/species combinations, but excluding different taxon authorships (often incorrect) and citations at the genus level only. We think it appropriate to advise that serious conservation work on many of these islands must be preceded by careful checking of the historical records. A similar laborious effort will be required for many non-island localities.

Our survey results can be compared with those of earlier workers to assess the conservation status of the Barbadian land snails, albeit with the reservations implicit in the comments above. It is evident, from all records, that species diversity on Barbados (430 km²) is low relative to other small Caribbean islands, for example, Saba (13 km², 14 species; Clench, 1970) and St. Martin (98.5 km², 39 species; Coomans, 1967). This is likely a re-

sult of several factors, but principally the absence of mountains on Barbados, the large distance of Barbados from neighboring islands, and the fact that Barbados lies to the east of other islands, hence upwind and up-current. In our surveys, we found six endemic species, five species native to the Lesser Antilles and/or South America, three pan-Caribbean species and seven pan-tropical species. Conservation interest naturally focuses on the endemic species, of which three were not found by us, including one, *Bulimus fuscus*, that is almost certainly extinct. On the other hand, we located specimens of *Glyphyalinia barbadensis*, which had been considered as an endemic based on Pfeiffer's original description of *Helix incisa* (1866), but which had not been subsequently confirmed for the Barbados locality. Even if *Lucidella barbadensis* and *Pseudopineria barbadensis* are eventually found, it is clear that the fauna is dominated by introduced taxa. Of these, several synanthropic species are particularly abundant, namely *Bulimulus guadalupensis*, *Allopeas gracile*, *Allopeas micra*, *Beckianum beckianum*, *Leptinaria lamellata*, *Zachrysia provisoria* and *Streptaxis glaber*. The synanthropes represent a group of invasive species that are spreading by human transportation, hence referred to as "traveling species" (Robinson, 1999).

While the overall diversity of land snails appears to be approximately as great today as it was 150 years ago, its composition has evolved over time. Change will continue as new species are introduced from elsewhere (Cowie, 1998, Robinson, 1999), and tropical faunas worldwide become increasingly homogenized. The synanthropic species, whether of Antillean or pan-tropical origin, are clearly the most abundant throughout Barbados, as little if any of the island remains in a truly undisturbed state. Whether the synanthropes have actually displaced native species, or have simply occupied increasingly available habitats created by man, needs to be investigated. Of those endemic species that have survived, only those that are relatively catholic in their ecological requirements, or those whose natural habitat approximates an anthropochorous environment, seem to be maintaining stable populations. The remainder seem destined to become extinct, if they have not already become so. In any case, it is clear from our study that any effort to understand the snail fauna of Barbados, or any other locality, with a view to identifying and

protecting its indigenous elements, must carefully evaluate the evidence of historical trends. Indeed, the lessons learned here are equally applicable to all studies whose aim is to characterize biodiversity and conserve native species.

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LITERATURE CITED

- ABBOTT, R. T., 1973, *American malacologists*, Falls Church, Virginia, 494 pp.
- ADAMS, C. B., 1845, Specierum novarum conchyliorum in Jamaica repertorum, synopsis. *Proceedings of the Boston Society of Natural History*, 2: 1–17.
- BAKER, H. B., 1925, The Mollusca collected by the University of Michigan-Williamson Expedition in Venezuela. Part III. Pupillidae to Oleacinidae. *Occasional Papers of the Museum of Zoology, University of Michigan*, (156): 1–56, 11 pl.
- BAKER, H. B., 1930, The North American Retinellae. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 82: 193–219, pl. 9–14.
- BAKER, H. B., 1962, Puerto Rican land operculates. *Nautilus*, 76(1): 16–22.
- BAKER, H. B., 1963, Type land snails in the Academy of Natural Sciences of Philadelphia. Part II. Land Pulmonata, exclusive of North America, north of Mexico. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 115(8): 191–259.
- BECK, H. H., 1837, *Index molluscorum praesentis aevi musei Principis Augustissimi Christiani Frerici*. Hafniae, 124 pp.
- BLAND, T., 1855, Notes on certain terrestrial mollusks which inhabit the West Indies. *Annals of the Lyceum of Natural History of New York*, 6: 147–155.
- BLAND, T., 1862, On the geographical distribution of the genera and species of land shells of the West India islands; with a catalogue of the species of each island. *Annals of the Lyceum of Natural History of New York*, 7: 335–361.
- BLAND, T., 1875, Examen critique de certaines es-

- pèces du Continent Américain et des Antilles, décrites dans la monographie des *Helicina* (Conchologia Iconica) de L. Reeve, comme appartenant à ce genre. *Journal de Conchyliologie*, 23: 245–252.
- BORN, I. VON, 1780, *Testacea Musei Cæsarei Vindobonensis*. Vienna, xxxvi + 442 + 17 pp., 18 pls.
- BROWN, L. B., 1903, Notes on the land and freshwater shells of Barbados. *Journal of Conchology*, 10: 266–273.
- BREURE, A. S. H., 1974, Caribbean land molluscs: Bulimulidae I. *Bulimulus*. *Studies on the Fauna of Curaçao and other Caribbean Islands*, 45(145): 1–80, 7 pl.
- BREURE, A. S. H., 1975, Caribbean land molluscs: Bulimulidae II. *Plekocheilus* and *Naesiotus*. *Studies on the Fauna of Curaçao and other Caribbean Islands*, 46(152): 71–93, pls. 6–8.
- BRUGGEN, A. D., VAN, S. M. WELLS & T. C. M. KEMPERMAN, eds., 1995, *Biodiversity and conservation of the Mollusca*. Leiden, Backhuys, 228 pp.
- BRUGUIÈRE, J. G., 1789–1792, *Encyclopédie méthodique. Histoire naturelle des vers. Tome premier*. Panckoucke, Paris, xviii + 757 pp.
- CARRINGTON, S., 1993, *Wild plants of Barbados*, MacMillan, London, vii + 128 pp.
- CLENCH, W. J., 1970, Land Mollusca of Saba Island, Lesser Antilles. *Occasional Papers on Mollusks*, Harvard University, 3(38): 53–60.
- CLENCH, W. J. & R. D. TURNER, 1948, The genus *Truncatella* in the western Atlantic. *Johnsonia*, 2(25): 149–164, pl. 63–73.
- COOMANS, H. E., 1967, The non-marine mollusca of St. Martin (Lesser Antilles). *Studies on the fauna of Curaçao and other Caribbean islands*, 24: 118–145.
- COWIE, R. H., 1997, Catalog and bibliography of the nonindigenous nonmarine snails and slugs of the Hawaiian Islands. *Bishop Museum Occasional Papers*, (5): 1–66.
- COWIE, R. H., 1998, Patterns of introduction of non-indigenous non-marine snails and slugs in the Hawaiian Islands. *Biodiversity and Conservation*, 7: 349–368.
- DESHAYES, G. P., 1850, in D. DE FÉRUSAC & G.-P. DESHAYES, *Histoire naturelle générale et particulière des mollusques terrestres et fluviatiles, tant des espèces que l'on trouve aujourd'hui vivantes, que des dépouilles fossiles de celles qui n'existent plus; classés d'après les caractères essentiels que présentent ces animaux et leurs coquilles, tome premier*. A Bertrand, Paris, 402 pp.
- DROUËT, H., 1859, *Essai sur les mollusques terrestres et fluviatiles de la Guyane Française*. Baillière, Paris, 116 pp.
- FÉRUSAC, A. E. J. P. J. F. D'A., BARON DE., 1821, *Tableaux systématiques des animaux mollusques classés en familles naturelles, . . . Tableau de la famille des limaçons, Cochleæ*. Bertrand, Paris & Sowerby, London, 90 pp.
- FÉRUSAC, A. E. J. P. J. F. D'A., BARON DE., 1822a, *Histoire naturelle générale et particulière des mollusques terrestres et fluviatiles, tant des espèces que l'on trouve aujourd'hui vivantes, . . .*, livraison 14: pl. 8B, 8C, 25A, 42, 45, 47.
- FÉRUSAC, A. E. J. P. J. F. D'A., BARON DE., 1822b, *Histoire naturelle générale et particulière des mollusques terrestres et fluviatiles, tant des espèces que l'on trouve aujourd'hui vivantes, . . .*, livraison 17: pl. 48, 53, 63, 75A, 75B, 113.
- FÉRUSAC, A. E. J. P. J. F. D'A., BARON DE., 1832, *Histoire naturelle générale et particulière des mollusques terrestres et fluviatiles, tant des espèces que l'on trouve aujourd'hui vivantes, . . .*, livraison 22: pl. 50, 54A, 56, 56A, 56B, 117.
- GASCOIGNE, A., 1994, The biogeography of land snails in the islands of the Gulf of Guinea. *Biodiversity and Conservation*, 3: 794–807.
- GETZ, L. C. & G. W. UETZ, 1994, Species diversity of terrestrial snails in the southern Appalachian mountains, U.S.A. *Malacological Review*, 27: 61–74.
- GIBBONS, J. S., 1879, Notes on the habits and distribution, &c., of certain W. Indian Pulmonifera. *Journal of Conchology*, 2: 129–134.
- GMELIN, J. F., 1791, *Caroli a Linné systema naturae*, ed. 13, 1(6): 3021–3909.
- GOULD, A. A., 1848, [New species from United States]. *Proceedings of the Boston Society of Natural History*, 3: 37–41.
- GRAVELAND, J., R. VAN DER WAL, J. H. VAN BALEN & A. J. VAN NOORDWIJK, 1994, Poor reproduction in forest passerines from decline of snail abundance on acidified soils. *Nature*, 368: 446–448.
- GRAY, J. E., 1824, Monograph of the genus *Helicina*. *Zoological Journal*, 1(1): 62–71, pl. 6.
- GROOMBRIDGE, B., ed., 1992, *Global biodiversity: status of the earth's living resources*. Chapman & Hall, London, 585 pp.
- GUILDING, L., 1828a, Observations on the zoology of the Caribbean islands (continued). *Zoological Journal*, 3(12): 527–544, pl. 6.
- GUILDING, L., 1828b, Observations on the zoology of the Caribbean islands (continued). *Zoological Journal*, 4(14): 164–175.
- GUPPY, R. J. L., 1868a, Further additions to the catalogue of the land and freshwater Mollusca of Trinidad. *Proceedings of the Scientific Association of Trinidad*, 1: 237–245.
- GUPPY, R. J. L., 1868b, On the terrestrial Mollusca of Dominica and Grenada; with an account of some new species from Trinidad. *The Annals and Magazine of Natural History*, (4) 1: 429–442.
- HAAS, F., 1962, Caribbean land molluscs: Subulinidae and Oleacinidae. *Studies on the Fauna of Curaçao and other Caribbean Islands*, 13(58): 49–60, pl. 7–11.
- HENDERSON, J. B., 1919, Mollusca, pp. 88–96, in C. C. NUTTING, Barbados-Antigua Expedition, narrative and preliminary report of a zoological expedition from the University of Iowa to the Lesser Antilles under the auspices of the Graduate College. *Studies in Natural History*, 8(3): 274 pp.

- HUGHES, G., 1750, *The natural history of Barbados*. London, 314 pp.
- HUTTON, T., 1834, On the land shells of India. *Journal of the Asiatic Society of Bengal*, 3(26): 81–93.
- KILLEEN, I. J., M. B. SEDDON & A. M. HOLMES, 1998, Molluscan conservation: a strategy for the 21st century. *Journal of Conchology, Special Publication* 2: 320 pp.
- KOBELT, W., 1880, Die geographische Verbreitung der Mollusken. *Jahrbücher der Deutschen Malakozoologischen Gesellschaft*, 7: 241–285.
- KRAUS, F., 1996, A revision of the Caribbean genus *Pseudopineria* (Gastropoda; Pulmonata: Urocoptidae). *Malacological Review*, 28(1–2): 107–117.
- LAMARCK, J. B. P. A. DE M. DE, 1822, *Histoire naturelle des animaux sans vertèbres*, 6(2): 1–230.
- LINNÆI [= LINNÉ], C., 1758, *Systema naturæ per regna tria naturæ . . . , tomus I, editio decima, reformata*. Holmiæ, 824 pp.
- MCGINTY, T. L., 1939, *Oxystyla* from western Mexico (continued). *Nautilus*, 53(1): 4–7, pl. 2.
- MÜLLER, O. F., 1774, *Vermium terrestrium et fluviatilium, seu animalium infusorium, helminthorum, et testaceorum, non marinorum, succincta historium*. Volumen alterum. Heineck et Faber, Havnæ [= Copenhagen] et Lipsiæ [= Leipzig]. xxxv + 214 + 10 pp.
- ORBIGNY, A. D., 1835, Synopsis terrestrium et fluviatilium molluscorum, in suo per America meridionale itinere. *Magasin de Zoologie*, 5(Cl. V, No. 61): 1–22.
- PEAKE, J. F., 1981, The land snails of islands—a dispersalist's viewpoint. Pp. 247–263, IN P. L. FOREY, ed., *The evolving biosphere*, British Museum (Natural History) and Cambridge University Press, London and Cambridge, 311 pp.
- PFEIFFER, L., 1839, Bericht über die Ergebnisse meiner Reise nach Cuba im Winter 1838–1839, *Archiv für Naturgeschichte*, 5(1): 346–358.
- PFEIFFER, L., 1844, *Cylindrella* Tab. 1. In R. A. PHILIPPI, ed., *Abbildungen und Beschreibungen neuer oder wenig gekannter Conchylien*, 1(8): 179–186.
- PFEIFFER, L., 1846, *Symbolae ad historiam heliceorum, sectio tertia*. T. Fischer, Cassel, 100 pp.
- PFEIFFER, L., 1847, *Monographia heliceorum viventium*, Lipsiæ, 1: 1–484.
- PFEIFFER, L., 1848, *Monographia heliceorum viventium*, Lipsiæ, 2: 1–594.
- PFEIFFER, L., 1849, Descriptions of twenty-four new species of Helicea, from the collection of H. Cuming, Esq. *Proceedings of the Zoological Society of London*: 126–131.
- PFEIFFER, L., 1853, *Monographia heliceorum viventium*, Lipsiæ, 3: 1–711.
- PFEIFFER, L., 1854, Descriptions of sixty-six new land shells, from the collection of H. Cuming, Esq. *Proceedings of the Zoological Society of London* (for 1852), 20: 56–70.
- PFEIFFER, L., 1856, Diagnosen neuer Land-schnecken. *Malakozoologische Blätter*, 3: 43–52.
- PFEIFFER, L., 1857, Descriptions of sixteen new species of *Pneumonopoma*, from the collection of H. Cuming, Esq. *Proceedings of the Zoological Society of London* (for 1856), 24: 336–339.
- PFEIFFER, L., 1858, Zur Molluskenfauna der Insel Cuba. *Malakozoologische Blätter*, 5: 37–49.
- PFEIFFER, L., 1866, Beschreibung neuer Land-schnecken. *Malakozoologische Blätter*, 13: 76–91.
- PFEIFFER, L., 1868, *Monographia heliceorum viventium*, 5: 1–565.
- PFEIFFER, L., 1876, *Monographia heliceorum viventium*, 7: 1–674.
- PILSBRY, H. A., 1889, *Manual of conchology*, (2)5: 1–216.
- PILSBRY, H. A., 1897–1898, *Manual of conchology*, (2)11: 1–339.
- PILSBRY, H. A., 1904, *Manual of conchology*, (2)16: 1–329.
- PILSBRY, H. A., 1907–1908, *Manual of conchology*, (2)19: 1–366.
- PILSBRY, H. A., 1909–1910, *Manual of conchology*, (2)20: 1–336.
- PILSBRY, H. A., 1916–1918, *Manual of conchology*, (2)24: xii + 380.
- PILSBRY, H. A., 1928, Studies on West Indian mollusks: the genus *Zachrysia*. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 80: 581–606, pls. 28–30.
- PILSBRY, H. A., 1930, Results of the Pinchot South Sea Expedition, - I. Land mollusks of the Caribbean Islands, Grand Cayman, Swan, Old Providence and St. Andrew. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 82: 221–261.
- POTIEZ, V. L. V. & A. L. G. MICHAUD, 1835–1839, *Galerie des mollusques, ou catalogue méthodique, descriptif et raisonné des mollusques et coquilles du Muséum de Douai*, tome premier. Paris & Londres, xxxvi + 560 + 4 p. [1838]; Atlas: 79 pp., 70 pls. [pls. 1–15: 1835].
- PROSCHWITZ, T. VON, 1994, *Lamellaxis clavulinus* (Potiez & Michaud) as a greenhouse species in Sweden. *Journal of Conchology*, 35(2): 184–185.
- RAMÍREZ, R. L., 1993, A generic analysis of the family *Systrophiiidae* (Mollusca; Gastropoda): taxonomy, phylogeny and biogeography. Unpublished M.A. thesis, Univ. Kansas, 218 pp.
- RANG, S., 1831, Description des coquilles terrestres recueillies pendant un voyage à la côte occidentale d'Afrique, et au Brésil. *Annales des Sciences Naturelles*, 24: 5–63, pls. 1–3.
- ROBINSON, D. G., 1999, Alien invasions: the effects of the global economy on non-marine gastropod introductions into the United States. *Malacologia*, 41(2): 413–438.
- ROSENBERG, G., 1996, Independent evolution of terrestriality in Atlantic truncatellid gastropods. *Evolution*, 50(2): 682–693.
- RUSH, W. H., 1891, List of species collected on the islands St. Thomas, St. Kitts, Barbados, Jamaica and at Pensacola, Florida; with prefatory notes. *Nautilus*, 5(6): 65–70.

- SMITH, E. A., 1895, Report on the land and fresh-water shells collected by Mr. Herbert H. Smith at St. Vincent, Grenada, and other neighbouring islands. *Proceedings of the Malacological Society of London*, 1: 300–322.
- SMITH, E. A., 1898, On some land shells from Trinidad. *Journal of Conchology*, 9(1): 27–29, figs. 1–6.
- SMITH, E. A. & H. W. FEILDEN, 1891, A list of the land and freshwater shells of Barbados. *Annals & Magazine of Natural History*, (6)8: 247–257.
- SOLEM, A., 1984, A world model of land snail diversity and abundance. Pp. 6–22, In: A. SOLEM & A. H. C. VAN BRUGGEN, eds., *World-wide snails*. E. H. J. Brill, Leiden, 289 pp.
- SOWERBY, G. B., II, 1864, *Thesaurus conchyliorum, or figures and descriptions of Recent shells*, 3(23): pls. 266–278 (*Helicina* Second monograph, pl. 1–13).
- SOWERBY, G. B., II, 1866, Second monograph of the genus *Helicina*, including the genera *Trochatella*, *Lucidella*, *Helicina*, *Schiascheila* and *Alcadia*, of authors. *Thesaurus conchyliorum, or monographs of genera of shells*, 3: pls. 277–302.
- SOWERBY, G. B., II, 1873–1874, *Conchologia iconica*, 19 (*Helicina*): pls. 1–34.
- SWAINSON, W., 1840, *A treatise on malacology; or the natural classification of shells and shell fish*. Longman, Orme, Brown, Green & Longmans & John Taylor, London, viii + 419 pp.
- TORRE, C. DE LA, 1960, Caribbean species of *Truncatella*. *Nautilus*, 73(3): 79–88.
- VENMANS, L. A. W. C., 1963, Caribbean land molluscs: Streptaxidae. *Studies on the Fauna of Curaçao and Other Caribbean Islands*, 14(61): 41–76.
- WAGENAAR HUMMELINK, P., 1940, A survey of the mammals, lizards and mollusks. *Studies on the Fauna of Curaçao and Other Caribbean Islands*, 1: 59–108.
- WAGNER, A. J., 1907–1911, Die Familie der Helicinidae. *Systematisches Conchylien-Cabinet von Martini & Chemnitz*, (n. s.)1(18:2): 1–391, pls. 1–170.
- WÄREBORN, I., 1992, Changes in the land mollusc fauna and soil chemistry in an inland district in southern Sweden. *Ecography*, 15: 62–69.
- WILLING, M. J., 1998, The conchological society and molluscan conservation: Past, present and future. Pp. 139–145, In I. J. KILLEEN, M. B. SEDDON. & A. M. HOLMES, *Molluscan conservation: a strategy for the 21st century*, *Journal of Conchology, Special Publication*.
- Helicina fasciata substriata* Gray, 1824 — ANSP 399360 & 399361
- Truncatella barbadensis* Pfeiffer, 1857 — ANSP 401921 & 401922
- Succinea barbadensis* Guilding, 1828 — ANSP 399354
- Gastrocopta barbadensis* (Pfeiffer, 1853)—ANSP 401923
- Bulimulus guadalupensis* (Bruguière, 1789)—ANSP 399359
- Orthalicus maracaibensis subpulchella* (Pilsbry, 1889)—ANSP 399357
- Brachypodella costata* (Guilding, 1828)—ANSP 399362
- Allopeas gracile* (Hutton, 1834)—ANSP 401924
- Allopeas micra* (d'Orbigny, 1835)—ANSP 401925
- Beckianum beckianum* (Pfeiffer, 1846)—ANSP 401926
- Leptinaria lamellata* (Potiez & Michaud, 1835)—ANSP 401927
- Luntia insignis* Smith, 1898 — ANSP 401928
- Opeas hannense* (Rang, 1831)—ANSP 401929
- Subulina octona* (Bruguière, 1792)—ANSP 399364
- Streptaxis glaber* (Pfeiffer, 1849)—ANSP 399355
- Happiella* cf. *decolorata* (Drouët, 1859)—ANSP 401930
- Megalobulimus oblongus* (Müller, 1774)—ANSP 399356
- Lacteoluna selenina* (Gould, 1848)—ANSP 401931
- Pleurodonte isabella* (Férussac, 1822)—ANSP 399358
- Zachrysia provisoria* (Pfeiffer, 1858)—ANSP 399363 & A18831
- Bradybaena similis* (Rang, 1831)—ANSP 401932

Synoptic collections have been deposited at the Bellairs Research Institute of McGill University, Holetown, Barbados, and the Department of Biological and Chemical Sciences, University of West Indies, Cave Hill campus, St. Michael, Barbados.

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NOTE ADDED IN PROOFS

APPENDIX

The following specimens collected during this study have been deposited as vouchers in the Department of Malacology at the Academy of Natural Sciences, Philadelphia.

Subsequent to completion of the manuscript we received one specimen of *Achatina fulica* Bowdich, 1833, from Barbados. Its introduction probably occurred within the previous year, but its distribution is yet to be determined.



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