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Overview of the North American terrestrial gastropod fauna*

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Abstract: A revised database of terrestrial gastropods from North America north of Mexico was assembled in the spring of 2012, which included not only all likely species-level entities, updated family and naturalized exotic assignments, but also shell and body size data. Analyses of these reveal that: (1) the fauna represents approximately 1,200 species, and is dominated by the Polygyridae, Helminthoglyptidae, and Vertiginidae. This number is surprisingly small, with other land masses of ½ to 1/100th the size possessing a larger fauna; (2) naturalized species make up 6% of the total fauna; (3) while slugs represent only 7% of the native fauna, they constitute over 1/3 of the naturalized fauna; (4) the accumulation curve for recognized species is sigmoidal, with current rates being the lowest experienced in 200 years. As a result, it appears that only 150–300 net additional taxa may await description, with the principle future taxonomic activity being revisionary work; (5) like other faunas, both native and naturalized land snails in North America possess bimodal height/width ratios; (6) native land snails possess a bimodal, right-skewed biovolume distribution along a log axis, which differs greatly from the unimodal left-skewed distribution typical of many other taxa groups; and, (7) the distribution of species within families and genera, and of the number of species described by a given researcher all possess Power Law/Log Normal distributions characteristic of complex adaptive systems.

Key words: Body size patterns, complex systems, diversity, land snail, macroecology

With the publication of the last volume of the "Land Mollusca of North America (North of Mexico)" by Henry Pilsbry in 1948, this fauna became the first to be taxonomically well-described at the continental level. However, since this time efforts to maintain and update his work have been principally limited to Leslie Hubricht's county-scale range maps for eastern U.S.A. species (Hubricht 1985) and two checklists of common and scientific names for the Mollusca of the United States and Canada published by the American Fisheries Society (Turgeon *et al.* 1988, 1998). While representing a massive undertaking, the latter include only very transcribed ecological information (limited to native or alien status), use a now outdated family-level taxonomy, and do not consider any taxa listed by Pilsbry (1948) or subsequent workers as subspecies. Because Hubricht (1985) tended to split these entities into separate species, this is less of an issue for the eastern U.S.A. fauna. However, since little revisionary work has been conducted on the western U.S.A. fauna, a strong potential exists for this policy to lead to underreporting of valid species in this region. And, obviously, no species described in the almost 15 years since publication of the second edition of Turgeon *et al.* were included.

To address these concerns, an updated list of the North American terrestrial gastropod fauna north of Mexico was assembled during the spring of 2012. It not only updates family level taxonomy to current concepts, but also includes all likely species that Pilsbry (1948) lists as subspecies, and includes all species described through May 2012. This dataset also records median shell/body size dimensions from the published literature and from this calculates shell biovolume for each entry. As a result, a current and modern overview of this terrestrial gastropod fauna can be constructed.

MATERIALS AND METHODS

Faunistic enumeration

Only species having native or naturalized populations in North America north of Mexico were considered; species occurring south of the U.S.A. boundary are considered part of the Central American fauna for purposes of this work. While an initial listing of the Central American fauna is now available (Thompson 2011), these taxa have not been included because of: (1) the historical limitation of previous works (*e.g.,* Pilsbry 1948, Turgeon *et al.* 1998) to North America north of Mexico; (2) the much poorer understanding of alpha-level taxonomy in the Central American fauna; and (3) their often distinct evolutionary affinities. Although a number of North American

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elements extend south into at least northern Mexico (*e.g.*, the genus *Ashmunella* Pilsbry and Cockerell, 1899 and the subgenus *Immersidens* Pilsbry and Vanatta, 1900 within the genus *Gastrocopta* Wollaston, 1878), and some Caribbean and Central American elements extend north into the southern U.S.A. (*e.g.*, the Urocoptidae and Orthalicidae), the artificial demarcation used here is similar to those erected by molluscan biogeographers elsewhere, such as in Eurasia where European, Asian, east Asian, and south Asian faunas are usually considered as largely separate entities (Naggs and Raheem 2005, Pokryszko and Cameron 2005).

The initial point of departure was all terrestrial gastropod entries from Turgeon *et al.* (1998). To this were added all subsequently described species as determined via the *Zoological Record* database. Additionally, all species listed by Hubricht (1985) – but not by Turgeon *et al.* (1998) – were included. Most of these represent dead shells limited to drift along the south Texas Gulf Coast. While their presence in North America may be due to long-distance rafting from extralimital colonies (the apparent rationale used to justify exclusion), it seems equally likely that they were sourced from nearby, localized extant colonies. Inclusion of these taxa, thus, seems prudent to ensure that no extant species were ignored. The list was also expanded to include all subspecies-level entities from Pilsbry (1948) that appear, based on their unique shell features, ranges, and/or ecological preferences, to represent valid species-level entities. Pilsbry (1948) took a conservative approach to species designations, and chose to lump numerous forms as subspecies until appropriate data existed to falsify these hypotheses. As a result, many species-level entities were listed by Pilsbry (1948) as subspecies, as has been recently shown within the Polygyridae (Emberton 1988), Helminthoglyptidae (Lang and Gilbertson 2010), and Vertiginidae (Nekola *et al.* 2009). However, not all of Pilsbry's subspecies concepts appear to warrant species-level listing: examples are the minor shell variants limited to specific canyons within a given species range, as demonstrated not only by subspecies described within *Ashmunella proxima* Pilsbry, 1905 and *A. levettei* (Bland, 1881) of the Chiricahua and Huachuca ranges of southeastern Arizona, respectively, but also in various species within the genus *Oreohelix* Pilsbry, 1904.

Finally, fourteen undescribed new species encountered by the author during field sampling across North America have also been included. These represent six *Vertigo* Müller, 1774, plus single representatives of *Columella* Westerlund, 1878, *Daedalochila* Beck, 1837, *Glyphyalinia* von Martens, 1892, *Hawaiia* Gude, 1911, *Helicodiscus* Morse, 1864, *Paravitrea* Pilsbry, 1898, *Punctum* Morse, 1864, and *Succinea* Draparnaud, 1801.

Taxonomic information

The authorship of each entry was recorded, as was the year of description. Family assignments were updated to Bouchet and Rocroi (2005), with the placement of genera into these families basically following Schileyko's 1998–2006 "*Treatise on Recent Terrestrial Pulmonate Molluscs*" as used in the Academy of Natural Sciences of Drexel University (ANSP) collection.

Ecological information

Species native or naturalized status was based largely on Turgeon *et al.* (1998) with subsequent additions and changes based on Nekola and Coles (2010). Species with documented pre-Columbian occurrences in North America are treated as native even though some (*e.g.*, *Cepaea hortensis* Müller, 1774) may represent earlier European colonizations via the Norse or Basque. Each entry was assigned either as a slug or snail, with semislugs being classed as snails due their presence of a relatively large external shell. Body dimensions for each entry was determined from either the published literature, or in the case of undescribed taxa from lots held in the Nekola collection. For snails, median reported shell height (mm), width (mm) and proportion of shell height which is columnar were recorded. Shell biovolume in mm^3 was then estimated as a conic-section placed on top of a column (McClain and Nekola 2008) using the formula:

$$V = \pi r^2 ht + \left[\frac{\pi r^2 h(1-t)}{3}\right]$$

where: V = biovolume in cubic mm; h = height; r = width/2; t = taper proportion varying from 1 = completely columnar shell height to 0 = completely tapered shell height.

For slugs, the median width and diameter in mm was recorded for relaxed individuals. Slug biovolume in cubic mm was simply estimated as a cylindrical column:

$$V = \pi r^2 h$$

Analyses

Richness at the species, genus, and family level were calculated for the native and naturalized fauna. The largest families and genera in terms of species richness were also determined. The accumulation of currently accepted names over time was plotted for the native fauna, with the mean number of described entities calculated for five different chronological eras (1774–1815, 1816–1889, 1890–1942, 1943–1990, and 1991–present) whose boundaries were based upon rate discontinuities in the accumulation graph. The number of species described per author was also determined within the native fauna. Two general analyses were conducted on the biovolume data: First, the body-size spectrum of the native and naturalized faunas were displayed for snails and slugs via histograms based on 41 $\log_2$ volume classes with bins starting at -2.5 and increasing by 0.5 $\log_2$ units to 18.0. The first bin value ranged from -2.5 to -2.0 (~0.18–0.25 mm^3) and

the last bin from 17.5–18.0 (185,363.8–262,144 mm^3). The number of species were tabulated within each log_2 volume bin and plotted. Second, a histogram of natural log-transformed height-width ratios was generated for both the native and naturalized land snail faunas. Log transformation was used along the height-width axis as it allowed for a similar spread in values for shells less than or greater than 1.0. Without this transform, the range of variation for shells wider than tall would be compressed into ¼ of the range covered by shells that were taller than wide, complicating analysis.

RESULTS

Fauna size and composition

A total of 1,204 terrestrial gastropod species level entities were recorded (Table 1; Appendix 1), representing 170 genera and 51 families; 1,128 species, 136 genera, and 41 families are native to the continent, or at least of pre-Columbian occurrence. Seventy six of these had been previously recorded as subspecies by Pilsbry (1948). Across the native fauna, 84 species, 28 genera, and eight families represent slugs. The naturalized fauna represents 76 species, 46 genera, and 26 families, of which 26 species, 12 genera, and six families are slugs.

By far the most diverse family represented in the native fauna (Table 2) is the Polygyridae with 271 species (24.0% of native fauna), followed by the Helminthoglyptidae (178; 15.8%), Vertiginidae (102; 9.0%), Oreohelicidae (84; 7.4%), and Pristilomatidae (65; 5.8%). The ten richest families contain a total of 884 likely species-level entities, or 78.4% of the total fauna. On the other side of the distribution, one family (Cochlicopidae) is represented by only three species, four families (Charopidae, Pomatiidae, Pomatiopsidae, and Vitrinidae) by only two species, and six families (Cepolidae, Ferrussaciidae, Helicidae, Oleacinidae, Sagdidae, and Veronicellidae) by only a single native species. The most diverse genus in the fauna is *Oreohelix* (79 species, or 7.0% of the native fauna) followed by *Sonorella* Pilsbry, 1900 (71; 6.3%), *Helminthoglypta* Ancey, 1887 (70; 6.2%), *Vertigo* (65; 5.8%), and *Ashmunella* (53; 4.7%). The ten most diverse genera contain 498 species, or 44.1% of the total fauna. On the other side of the distribution, eleven genera are represented by only three species, 17 genera by only two species, and 45 genera by on a single one native species.

Eight families (Arionidae, Helicidae, Hygromiidae, Limacidae, Oxychilidae, Pleurodontidae, Subulinidae, and Veronicellidae) constitute almost three-quarters of the post-Columbian naturalized fauna (Table 2B). On the other end of the distribution, one family is represented by only three species, three families by only two species, and fourteen families by only a single naturalized species. By far and away *Arion* Férussac, 1819 represents the most diverse genus of naturalized species (10 species, or 14.1% of the naturalized fauna), followed equally by *Lamellaxis* Strebel and Pfeffer, 1882, *Limax* Linné, 1758, and *Oxychilus* Fitzinger, 1833 (4; or 5.6% each). Two genera are represented by only three species, eight genera by only two species, and 32 genera by only a single naturalized species.

Alpha-level taxonomy history

Since the first description of a native North American terrestrial gastropod species by Danish naturalist Otto Friedrich Müller in 1774, a total of 149 investigators have

Table 1. Overview of North American terrestrial gastropod fauna.

	Species	Genera	Families
Total	1204	170	51
(slugs)	84	28	8
Native	1128	136	41
(slugs)	58	18	6
Introduced	76	46	26
(slugs)	26	12	6

Table 2. Most diverse families and genera at the species level.

A. Native fauna

Family	Species	Genera	Species
Polygyridae	271	*Oreohelix*	79
Helminthoglyptidae	178	*Sonorella*	71
Vertiginidae	102	*Helminthoglypta*	70
Oreohelicidae	84	*Vertigo*	65
Pristilomatidae	64	*Ashmunella*	53
Succineidae	48	*Paravitrea*	42
Oxychilidae	45	*Daedalochila*	34
Gastrodontidae	35	*Stenotrema* Rafinesque, 1819	29
Urocoptidae	31	*Triodopsis* Rafinesque, 1819	28
Discidae	26	*Gastrocopta*	27

B. Naturalized Introduced fauna:

Family	Species	Genera	Species
Arionidae	10	*Arion*	10
Subulinidae	8	*Lamellaxis*	4
Hygromiidae	8	*Limax*	4
Helicidae	7	*Oxychilus*	4
Veronicellidae	7		
Limacidae	5		
Oxychilidae	4		
Pleurodontidae	4		

contributed to the naming of the native fauna. The top ten contributors include (Table 3): Henry A. Pilsbry, James H. Ferriss, Leslie Hubricht, Thomas Say, S. Stillman Berry, Victor Sterki, Walter B. Miller, Thomas B. Bland, Augustus A. Gould, and William G. Binney. On the other side of this distribution fourteen individuals have contributed to the description of only three species, twenty to only two species , and 61 to only a single native species.

The accumulation of recognized native North American taxonomic descriptions over time exhibits a sigmoidal pattern (Fig. 1). Initial description rates were low (0.2 species / year), and restricted to charismatic or Holarctic species described by European researchers. Beginning with Thomas Say in 1816, North American malacologists began in earnest the naming of their fauna, describing through the 1880s and average of 4.4 species a year. The most productive era began in 1890 with the start of Pilsbry's career at ANSP: through 1942 an average of 10.3 new North American terrestrial gastropod species would be described per year. These rates decreased to an average of 4.6 per year from 1943–1990, and have decreased further to an average of 1.8 per year for the last decade of the 20th Century through the first dozen years of the new millennium.

Body Size and Shell Shape Patterns

Native North American land snails (Table 4a) range in size from the 1.1 mm x 0.6 mm *Punctum minutissimum* (I. Lea, 1841) to the 34 mm x 61 mm *Orthalicus floridensis* Pilsbry, 1889. Native slugs range in size from the 4.0 mm x 2.0 mm *Deroceras leave* (Müller, 1774) to the 222 mm x 37 mm *Ariolimax columbianus* (Gould, 1851). While 264 native species (24.7% of total) have a maximum dimension < 5 mm, 201 (18.8%) range from 5 ≤ 10 mm, 403 (37.7%) from 10 ≤ 20 mm, 197 (18.4%) from 20 ≤ 40 mm, and 5 (0.5%) are ≥ 40 mm. One native slug (1.7% of all native slugs) has a maximum dimension < 5 mm, while five (8.6%) range from 5 ≤ 10 mm, 15 (25.9%) from 10 ≤ 20 mm, 18 (31.0%) from 20 ≤ 40 mm, and 19 (32.8%) are ≥ 40 mm.

Naturalized land snails (Table 4b) range in size from the 0.9 mm x 1.8 mm *Carychium minimum* Müller, 1774 to the 36 mm x 35 mm *Helix pomatia* Linnaeus, 1758. Naturalized exotic slugs range in size from the 20.0 mm x 3.3 mm *Arion intermedius* Normand, 1852 to the 150 mm x 25 mm *Limax maximus* Linnaeus, 1758. While eleven naturalized land snails (22.07% of total) have a maximum dimension < 5 mm, thirteen (26.0%) range from 5 ≤ 10 mm, fourteen (28.0%) from 10 ≤ 20 mm, and twelve (24.0%) from 20 ≤ 40 mm. No naturalized North American snail equals or exceeds 40 mm in maximum dimension. No naturalized exotic slug has maximum dimensions < 20mm. Eight naturalized slugs (30.8% of all naturalized slugs) have a maximum dimension from 20 ≤ 40 mm while eighteen (69.2%) are ≥ 40 mm.

Biovolume represents a more accurate expression of body size because it considers both height and width. Native North American land snails range from the 0.18 mm^3 *Carychium nannodes* G. H. Clapp, 1905 to the 33,230 mm^3 *Orthalicus floridensis*. The body size spectrum (Fig. 2a) exhibits a bimodal distribution with one mode ranging from 1.4–2.0 mm^3, and the other from 512–724 mm^3. The minimum between these two modes occurs from 16–22.6 mm^3. The right mode exhibits a clear left-skew, although the left mode appears approximately log-normal. Native slugs range from the 7.9 mm^3 *Udosarx lyrata* Webb, 1959 to the ~240,000 mm^3 *Ariolimax columbianus*, with the mode occurring at 362–512 mm^3. The biovolume distribution of these species was approximately log-normal, but shifted slightly to the right of land snails.

Naturalized land snails range from the 0.51 mm^3 *Carychium tridentatum* (Risso, 1826) to the 23,091 mm^3 *Helix pomatia*. The body size spectrum (Fig. 2b) exhibits essentially a uniform distribution across this range. Naturalized exotic slugs range from the 171 mm^3 *Arion intermedius* to the ~74,000 mm^3 *Limax maximus*, with the mode occurring at 362–512 mm^3. The biovolume distribution of these species was approximately log-normal, but shifted to the right of land snails.

Lastly, the height vs. width ratio for both native and naturalized North American land snails is also strongly bimodal (Fig. 3) with the left mode ranging from 0.50–0.67 (1:2–2:3) in both and from 1.8–2.2 (9:5–11:5) in the native and from 3.3–4.1 (10:3–4:1) in the naturalized faunas. Almost no native or naturalized species possess shell height vs. width ratios ranging from 1.0–1.5 (1:1–3:2).

Table 3. Most prolific describers of the North American terrestrial gastropod fauna.

Individual	Species Described	Inclusive Years	Emphasis
Henry A. Pilsbry	305	1889–1953	Whole continent
James H. Ferriss	82	1900–1925	SW U.S.A.
Leslie Hubricht	79	1938–1983	E U.S.A.
Thomas Say	51	1816–1831	E. North America
S. Stillman Berry	46	1916–1955	California
Victor Sterki	35	1889–1919	Whole continent (pupillids)
Walter B. Miller	31	1966–2000	W U.S.A. (polygyrids and helminthoglyptids)
Thomas B. Bland	28	1856–1883	S and W U.S.A.
Augustus A. Gould	26	1840–1855	Whole continent
William G. Binney	26	1857–1892	Whole continent

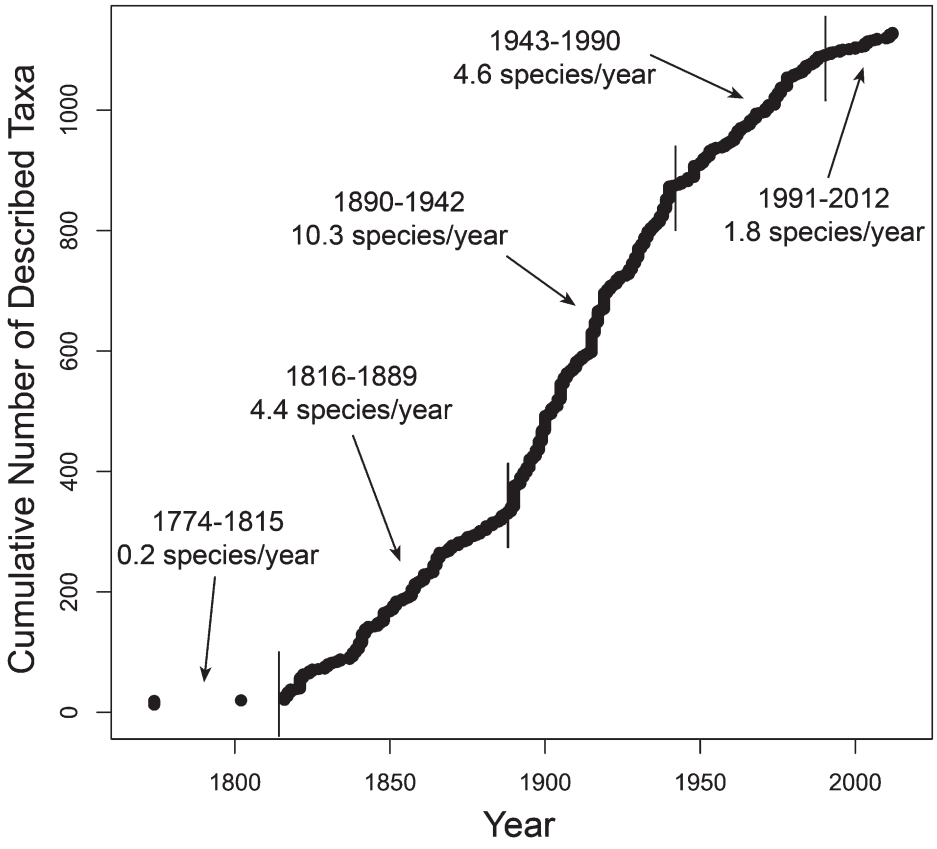

Figure 1: Accumulation curve for recognized native North American terrestrial gastropod species over time.

DISCUSSION

It is a testament to Pilsbry that over 60 years after publication of his North American monograph, in broad brushstrokes his summary of the terrestrial gastropod fauna remains largely unchanged: the fauna includes approximately 1,200 species, with the Polygyridae and Helminthoglyptidae dominating. Yet, there are a number of important additional insights which can be drawn:

Faunistic summary

First, an often overlooked but crucial component of the fauna are the vertiginids, which constitute the third most diverse family, with the genera *Vertigo* and *Gastrocopta* being the fourth and tenth most-speciose genera, respectively. Native vertiginids encompass approximately 1/3 of the total global richness for the entire family (Liggia 2012) and at least 2/3 of global richness for the genus *Vertigo* (Nekola *et al.* 2009), making North America a globally important biodiversity center for the group. At the site scale, the importance of this family is even greater: vertiginids represent roughly 1/3 of the species and individuals found on an average site across the continent, with regional values ranging from 56% of species and 60% of individuals on an average Alaskan site to 17% of species and 21% of individuals on an average Florida site (Nekola, *unpub. data*). The next most important family at the site scale (the Gastrodontidae) possesses values approximately three times smaller. Thus, whether the North American terrestrial gastropod fauna should be characterized as being dominated by polygyrids, helminthoglyptids or vertiginids is squarely dependent upon the observational scale: while the former two are most important at the regional to continental scale, on individual sites the vertiginids dominate.

Second, the overall proportion of exotic species is relatively low, representing only approximately 6% of the total fauna. However, this level can locally range much higher, especially at low latitudes. Many disturbed sites in south Florida, for instance, are dominated by a host of naturalized exotics in the Bradybaenidae, Helicarionidae, Orthalicidae, Pleurodontidae, Streptaxidae, and Subulinidae. Helicids and hygromiids may also be locally important components of disturbed faunas in both the northeast and southwest. The importance of naturalized exotics is especially notable in the slug fauna: while slugs represent only 7% of the entire native fauna, they represent 1/3 of the introduced fauna, with fully ten species within the genus *Arion* having become established on the continent. It also seems likely that additional naturalized species may exist within the fauna, even though historically having been considered native. For instance, *Pupilla muscorum* Linnaeus, 1758, is represented in North America by naturalized European populations which are restricted to the urban corridor of the Northeast west through the Great Lakes. Individuals occurring along roadside verges in Cedar Rapids, Iowa have identical mitochondrial and nuclear haplotypes to material originating from Brno in the Czech Republic (Nekola, *unpub. data*). Northern and western populations of *Pupilla* '*muscorum*', however, represent native taxa that are not closely related to this species (Nekola *et al.* in review). It seems likely that similar mixes of native and introduced populations will be uncovered in other anthropophilic Holarctic 'species', such

Table 4. Body size distribution across the North American fauna.

A. Native Species

Maximum Dimension	Minute (< 5 mm)	Small (5–10 mm)	Medium (10–20 mm)	Large (20–40 mm)	Very Large (40+ mm)
Land Snails					
Number of taxa	264	201	403	197	5
Percent	24.7	18.8	37.7	18.4	0.5
Slugs					
Number of taxa	1	5	15	18	19
Percent	1.7	8.6	25.9	31.0	32.8

B. Naturalized Species

Maximum Dimension	Minute (< 5 mm)	Small (5–10 mm)	Medium (10–20 mm)	Large (20–40 mm)	Very Large (40+ mm)
Land Snails					
Number of taxa	11	13	14	12	0
Percent	22.0	26.0	28.0	24.0	0
Slugs					
Number of taxa	0	0	0	8	18
Percent	0	0	0	30.8	69.2

as *Cochlicopa lubrica* (Müller, 1774), *Cochlicopa lubricella* (Porro, 1838), *Deroceras laeve* (Müller, 1774), *Vallonia costata* (Müller, 1774), *Vallonia excentrica* Sterki, 1893, and *Vallonia pulchella* (Müller, 1774).

Third, even though the North America terrestrial gastropod fauna supports roughly twice the number of species as better known invertebrate groups such as butterflies and skippers (Scott 1986), it is surprisingly depauperate as compared to other terrestrial gastropod faunas. Of the estimated 35,000 total global terrestrial gastropod species (Barker 2001), approximately 3,600 occur in Europe (Bank *et al.* 1998), more than 2,500 in Australia (John Stanisic, *pers. comm.*), and 1,400 in New Zealand (Barker and Mayhill 1999). Thus, North America supports fewer species than land masses ranging from one-half to 1/100th of its size.

Last, it is important to emphasize that these patterns are subject to change as additional data becomes available. For instance, in the time between initial drafting and editorial acceptance of this manuscript, preliminary results (Nekola, *unpub. data*) revealed that considerable revision of higher taxonomic concepts will likely be necessary within the Pupillidae and Vertiginidae. In particular, the Vertiginidae do not appear to be a distinct family, with most members being distributed throughout the Pupillidae. And, other families, such as the Valloniidae, also appear to represent pupillids. As a result, the importance of the Pupillidae within the North American fauna is likely even greater than indicated above. Additionally, some putative vertiginids—such as the genus *Columella*—are actually chondrinids. And, it is also clear that the genus *Vertigo* itself has been badly oversplit and actually includes other genera such as *Sterkia* Pilsbry, 1898. These data also strongly suggest that *Vertigo* AK2 and *Vertigo* AK4 represent populations of the Eurasian *V. ronnebyensis* Westerlund, 1871 and *V. microspharea* Schileyko, 1984, respectively. However, until such preliminary findings have been vetted through the review process, they must be ignored within the context of this work.

Taxonomic activities

These analyses document that the shape of the recognized species vs. description year curve is sigmoidal, with current rates for new species descriptions being the lowest seen in almost 200 years. It is important to note, however, that the asymptotic number of recognized species is only being approached but has not yet been met. As a result it seems likely that there are another 150-300 additional net species in the fauna awaiting description. These taxa, however, will likely be named at ever decreasing rates.

The taxonomic activity that will take on increasing precedence is, thus, revisionary work, in which the true status of the various named entities are subjected to empirical validation. Because of their relatively easy mutability, conchological features alone may not be adequate to demarcate species-level groups. For instance, the variable presence of an angular and basal lamella, of the length and degree of inset of the upper palatal lamella, depth of depression over the palatal lamellae,

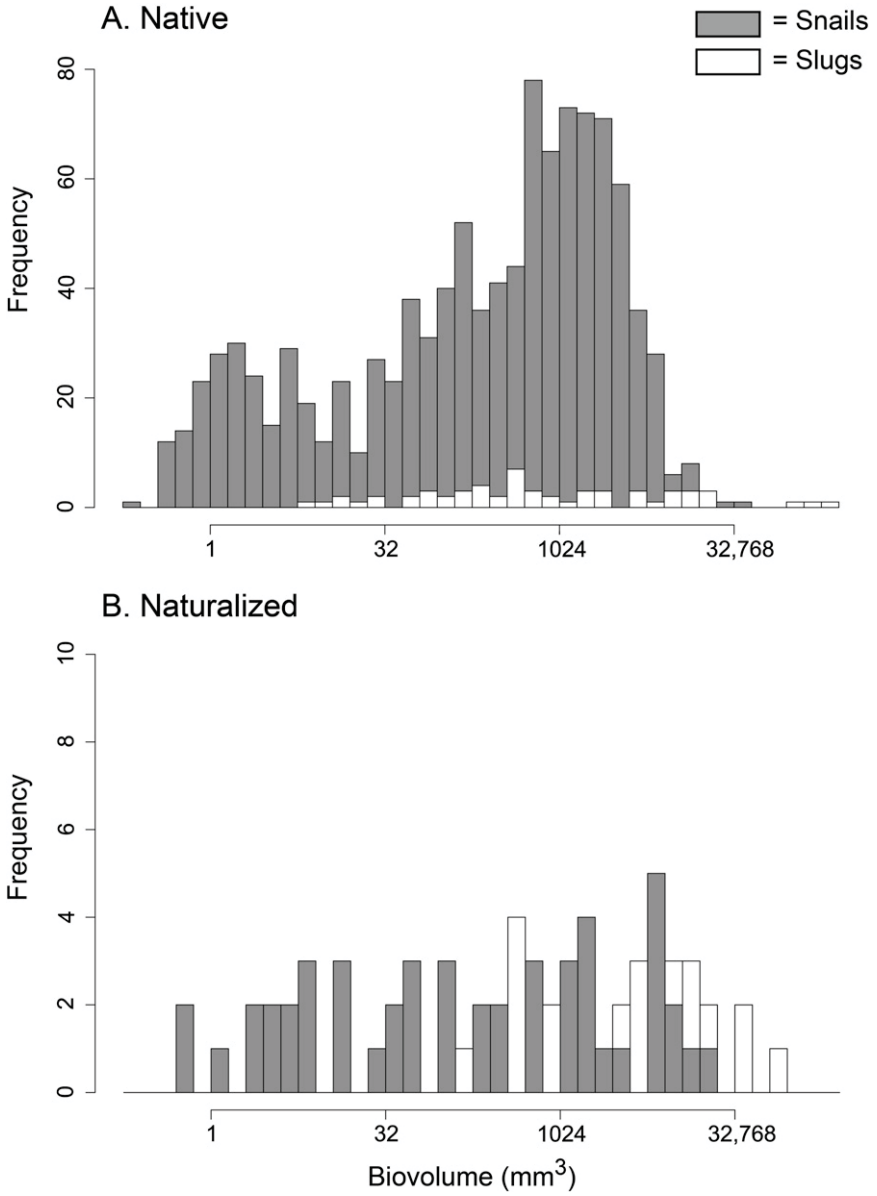

Figure 2: Body size spectra histograms for native and naturalized North American terrestrial gastropods along a $\log_2$ axis, using 0.5 unit bin widths. Filled boxes represent the frequency of snails, while the open boxes represent the frequency of slugs.

and strength of an apertural crest and callus in *Vertigo arthuri* von Martens, 1884 led to the splitting of this entity into six separate taxa (*Vertigo paradoxa* (Sterki, 1900), *V. gouldii basidens* Pilsbry and Vanatta, 1900, *V. hubrichti* (Pilsbry, 1934), *V. brierensis* Leonard, 1972, *V. occulta* Leonard, 1972, *V. iowaensis* Frest, 1991; Pilsbry 1948, Frest 1991), even though they display almost no genetic divergence (Nekola *et al.* 2009). Current analyses on *Pupilla* Leach in Fleming, 1828 across Europe, central Asia, Japan, and North America also indicates profound plasticity in some shell features, rendering invalid many historical species concepts (Nekola *et al.*, in review). However, even in extreme cases such as these, stable conchological traits usually exist to reliably demarcate genetically-distinct species level clades, although these may not be the features that have been historically considered.

Sole use of anatomical features may also lead to faulty conclusions about species-level distinctions. For instance, radular teeth number and configuration are potentially highly unreliable indicators of taxonomic relatedness because they can change with ontogeny (*e.g.,* Bertsch 1976) and are also often under strong ecological selection pressure (*e.g.*, Kesler *et al.* 1986). Also, because gastropods do not exhibit a hard exoskeleton, there is no reason to expect *a priori* that they will possess Arthropod-style lock-and-key genitalia. Rather, gene transfer is at least theoretically possible between individuals with varying genitalic morphologies. DNA sequence analysis demonstrates that at least some anatomically-described North American species are only simple forms within a single, larger variable species (Roth *et al.* 2013). Considerable ontogenetic variability also occurs in many genitalic features (Emberton 1985), with individuals within a single *Catinella* Pease, 1870 population passing through multiple described anatomical 'species' over the course of ontogeny (Brian Coles, *pers. comm.*). Little hard data exists regarding how much genitalic variability exists within and between populations of genetically-validated species-level entities over both space and time. Additionally, considerable potential for observational error exists in measuring various genitalic traits based upon the degree of animal retraction prior to dissection (Emberton 1989).

Molecular data is also not solely capable of resolving valid species-level entities. For instance, mitochondrial (*e.g.*, "bar-code"; Hebert *et al.* 2003) DNA sequence data is problematic in systems with non-zero rates of hybridization, with resulting phylogenetic trees often informing more about the geographic relationships between samples than their taxonomic relatedness (*e.g.*, Shaw 2002, Rubinoff and Holland 2005). Nuclear DNA can also be fallible, as it is possible

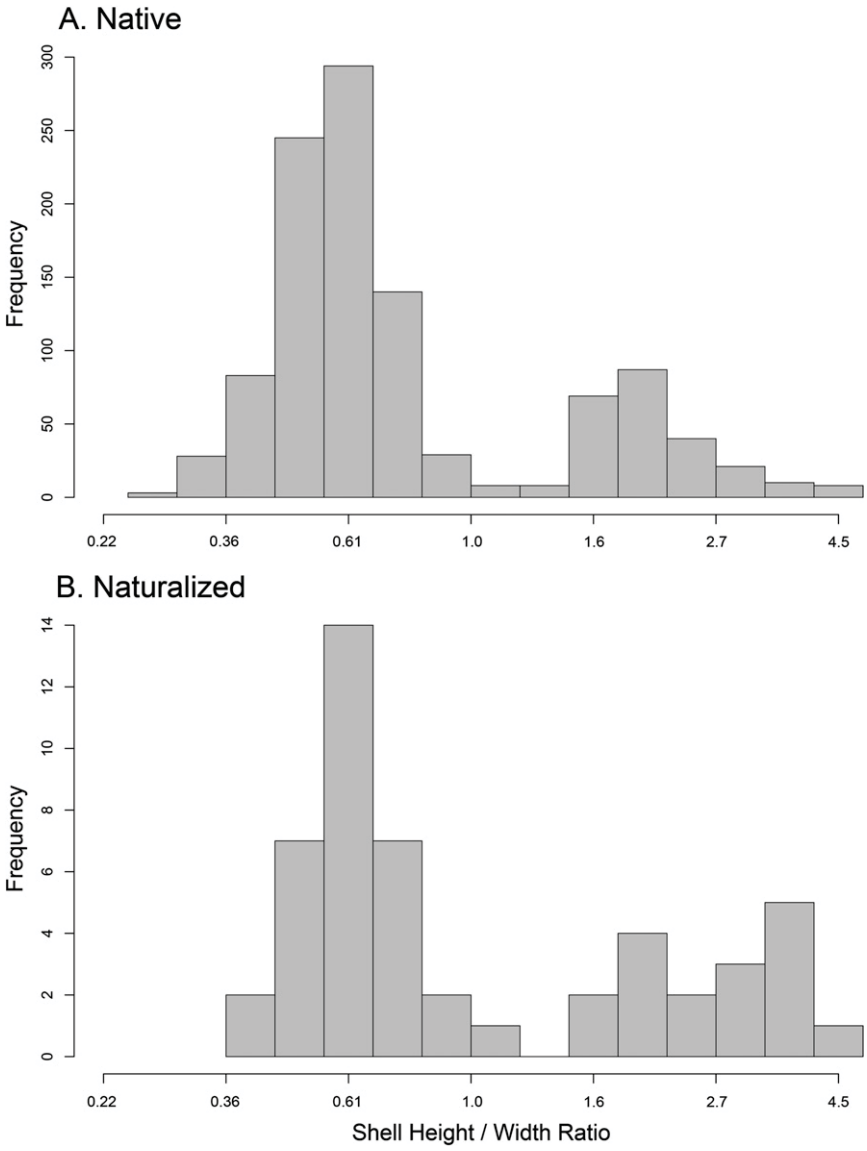

Figure 3: Height:Width ratio distribution for native and naturalized North American land snails along a natural log-transformed axis.

through hybridization and recombination for non-coding regions of one species to become sorted with the coding regions (and mitochondrial DNA) of another. An example of this can be found in Nekola *et al.* (2009) in which one Wisconsin *Vertigo nylanderi* Sterki, 1909 specimen with typical shell features and mitochondrial *cytochrome oxidase subunit 1* and *16S ribosomal RNA* (16S) sequences was found to have an *internal transcribed spacer-2* of the *nuclear ribosomal RNA* (ITS-2) sequence characteristic of *Vertigo gouldii* (A. Binney, 1843).

Current and future revisionary taxonomy must, thus, make use of all data—conchological, anatomical, genetic, and ecological—to identify the boundaries between biologically valid species-level entities.

The most desperately needed revisionary work appears to be the succineids and the western helminthoglyptids, oreohelicids, urocoptids, and *Ashmunella*. The Succineidae demonstrate profound plasticity in not only shell morphology but also genitalic anatomy, and it seems possible that many currently described species are simple ontogenetic and/or ecophenotypic variants within more cosmopolitan entities. For the western helminthoglyptids, oreohelicids, urocoptids and *Ashmunella*, many 'species' share essentially identical shells and habitat requirements, with diagnoses being largely based on geographic isolation in combination with minor variation in genitalic anatomy. Problematically, not only do we not know how much genitalic variation may be expected within these species, because of climatic variation current levels of population isolation can not be assumed for more than a few thousand years. During full-glacials, for instance, the desert southwest becomes much wetter (Pigati *et al.* 2011), potentially allowing currently isolated mesophile or hydrophile populations to come into contact.

Shell shape and body size patterns

Both the native and naturalized terrestrial gastropod fauna is strongly bimodal in terms of shell architecture, with many species being taller than wide or wider than tall, but with few being approximately as tall as wide. This is a global phenomenon in land snails (Cain 1977).

While native land snails also demonstrate a strongly bimodal and left-skewed interspecific body size distribution along a $\log_2$ axis, native slugs demonstrate a roughly lognormal distribution. Naturalized exotic snails possess a roughly uniform distribution with naturalized slugs being again roughly lognormal. These distributions are atypical within the Animalia, with right-skewed interspecific body size distributions prevailing at regional and larger scales (Kozlowski and Gawelczyk 2002) across a diverse suite of taxa groups including nematodes (Kirchner *et al.* 1980), insects (Siemann *et al.* 1996), fish (Knouft 2004), mammals

(Brown and Nicoletto 1991), and birds (Maurer and Brown 1988).

Why should terrestrial gastropods behave so differently? First, it is important to note because both native and naturalized slugs have a minimum biovolume much greater than for snails, the lower mode is expunged from the slug body size distribution (Fig. 2). Thus, there is no reason to assume that different sets of rules govern the two groups. Second, the body size distribution of individuals within the land snail fauna demonstrates the expected right-skewed unimodal distribution across all spatial scales (McClain and Nekola 2008). The underlying cause of these unique patterns, therefore, cannot simply represent rarefaction. Rather, per capita evolutionary rate must be at least partially inversely correlated to body size.

Although a number of factors may be at play (McClain and Nekola 2008), the role of dispersal strategy is likely paramount. Land snails generally possess very poor active dispersal abilities, with many individuals moving perhaps no more than 1–10 m over their lifetime (Schilthuizen and Lombaerts 1994, Hausdorf and Hennig 2003) and being unable to actively cross barriers of only 100–1,000 m (Baur 1988, Schilthuizen and Lombaerts 1994). However, small land snails in particular may also possess excellent passive dispersal abilities: members of the genus *Balea* Gray, 1824, for instance, have been repeatedly carried across 9,000 km of open eastern Atlantic Ocean by migrating birds (Gittenberger *et al.* 2006). Successful movement via passive vectors appears to be inversely correlated with land snail body mass for two principle reasons: First, smaller individuals are less likely to be pulled off of vectors by gravity and aerodynamic drag during migration. Second, the ability to uniparentally reproduce—and , therefore, to found a new population via movement of only a single individual—appears to be common in tiny snails such as *Vertigo* (Pokryszko 1987) and *Carychium* Müller, 1774 (Bulman 1990). To establish a new colony, obligatory outcrossing larger snails will require contemporaneous movement of at least two (likely immature) individuals or of a single adult individual that is storing sperm from prior copulatory activities. As a result, large snails are much more likely to experience isolation, restricted gene flow, and allopatric speciation as compared to small snails. It should, thus, not be surprising that while genera of small snails (such as *Euconulus* Reinhardt, 1883, *Gastrocopta, Pupilla, Punctum, Radiodiscus* Pilsbry and Ferriss, 1906, *Vertigo*) share similar faunas across multiple isolated high elevation mesic forests in the desert southwest, species of large snails (such as *Ashmunella, Holospira* von Marten, 1860, *Humboltiana* von Ihering, 1892, *Sonorella, Oreohelix*) living in these same sites tend to be single-mountain endemics (McClain and Nekola 2008).

Underlying Mathematical Mechanisms

Lastly, POwer-law/LOg-normal (POLO; Halloy 1998) distributions were noted for not only the number of species within families and genera, but also for the number of species described by a given researcher. Such distributions are characterized by a hollow "L"-shaped curve in which most entities are rare, but with a very few entities making up the bulk of the sample. Thus, in the native fauna, over ¾ of species are restricted to only ten families, while six families are represented by only single species. And, the top ten genera encompass over 44% of the entire fauna, while 45 genera are represented by only a single species. Likewise, while Henry Pilsbry alone contributed to description of over ¼ of the entire continental fauna, 61 investigators have described only single species. This type of distribution is common to a wide variety of apparently disparate systems, ranging from kinetic energy of gas molecules and earthquake magnitudes, to word use in written works, income distribution among households, citation rates for scientific papers, Internet web hits, copies of books sold, telephone calls received on a single day, lunar crater diameters, solar flare intensity, deaths in wars, wealth of rich people, surname frequencies, city populations, service times for restaurant glassware, and the first marriage age of Danish and U.S.A. women (Preston 1950, 1981, Newman 2005). These all represent complex dynamical systems, which are composed of many components of many different kinds that interact with each other and their extrinsic environment in many different ways and on multiple spatial and temporal scales, giving rise to complex structures and complicated non-linear dynamics (Nekola and Brown 2007). The presence of such POLO distributions both within the North American land snail fauna, as well as within the community of scientists describing this fauna, indicates that both represent complex systems. Those searching for the ultimate mechanisms underlying these patterns should, therefore, consider wisdom gained by not only by biologists and ecologists, but also complexity scientists.

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Appendix I. List of North American Terrestrial Gastropod Species. Note that this list should not be seen as a full taxonomic revision of the fauna, and as a result synonomy and references to validate the species-level hypotheses suggested below have not been provided. As it is essential that users of this list be able to easily trace a given name back in the prior literature, especially to the time of Hubricht (1985) and before, little effort has been made to update names to current taxonomic fads and fancies, particularly at the genus level. The deviations from this dictate are based on revisionary work which used robust empirical data, such as the Polygyridae as conducted by Emberton in the 1980s.

			Shell Dimensions (mm)				
Family/Species	**Author**	**Year**	**Height**	**Width**	**Taper**	**Slug**	**Exotic**
Agriolimacidae							
Deroceras hesperium	Pilsbry	1944	16.0	4.0	1.0	*	
Deroceras heterura	Pilsbry	1944	30.0	8.0	1.0	*	
Deroceras laeve	Müller	1774	4.0	2.0	1.0	*	
Deroceras monentolophus	Pilsbry	1944	21.0	5.3	1.0	*	
Deroceras panormitorum	Lessona and Pollonera	1882	28.0	4.7	1.0	*	*
Deroceras reticulatum	Müller	1774	43.0	7.2	1.0	*	*
Arionidae							
Anadenulus cockerelli	Hemphill	1890	28.0	4.7	1.0	*	
Ariolimax californicus	J. G. Cooper	1872	187.0	31.3	1.0	*	
Ariolimax columbianus	Gould	1851	222.0	37.1	1.0	*	
Ariolimax dolichophallus	Mead	1943	165.0	27.5	1.0	*	
Arion ater	Linnaeus	1758	120.0	20.0	1.0	*	*
Arion circumscriptus	Johnston	1828	36.0	6.0	1.0	*	*
Arion distinctus	Mabille	1868	27.5	4.6	1.0	*	*
Arion fasciatus	Nilsson	1823	45.0	7.5	1.0	*	*
Arion hortensis	Férussac	1819	27.5	4.6	1.0	*	*
Arion intermedius	Normand	1852	20.0	3.3	1.0	*	*
Arion owenii	Davies	1979	27.5	4.6	1.0	*	*
Arion rufus	Linnaeus	1758	120.0	20.0	1.0	*	*
Arion silvaticus	Lohmander	1937	35.0	6.0	1.0	*	*
Arion subfuscus	Draparnaud	1805	60.0	10.0	1.0	*	*
Carinacauda stormi	Leonard, Chichester, Richart and Young	2011	13.5	2.3	1.0	*	
Hesperarion niger	J. G. Cooper	1872	37.5	9.4	1.0	*	
Hesperarion plumbeus	Roth	2003	18.0	3.0	1.0	*	
Kootenaia burkei	Leonard, Chichester, Richart and Young	2003	7.6	1.3	1.0	*	
Magnipelta mycophaga	Pilsbry	1953	80.0	12.0	1.0	*	
Prophysaon andersoni	J. G. Cooper	1872	64.0	10.7	1.0	*	
Prophysaon boreale	Pilsbry	1948	17.0	4.3	1.0	*	
Prophysaon coeruleum	Cockerell	1890	43.0	7.2	1.0	*	
Prophysaon dubium	Cockerell	1890	8.0	2.0	1.0	*	
Prophysaon fasciatum	Cockerell	1890	19.0	4.8	1.0	*	
Prophysaon foliolatum	Gould	1851	89.0	14.8	1.0	*	
Prophysaon humile	Cockerell	1890	16.5	4.1	1.0	*	
Prophysaon obscurum	Cockerell	1890	20.0	5.0	1.0	*	
Prophysaon vanattae	Pilsbry	1948	30.0	7.5	1.0	*	
Securicauda hermani	Leonard, Chichester, Richart and Young	2011	9.0	1.5	1.0	*	
Staala gwaii	Ovaska, Chichester and Sopuck	2010	9.8	1.7	1.0	*	
Udosarx lyrata	Webb	1959	7.0	1.2	1.0	*	
Zacoleus idahoensis	Pilsbry	1903	14.0	2.3	1.0	*	
Binneyidae							
Binneya notabilis	J. G. Cooper	1863	4.0	13.3	0		
Gliabates oregonius	Webb	1959	10.0	1.7	1.0	*	
Hemphillia burringtoni	Pilsbry	1948	20.0	3.3	1.0	*	

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Hemphillia camelus	Pilsbry and Vanatta	1897	28.0	4.7	1.0	*	
Hemphillia danielsi	Vanatta	1914	34.0	5.7	1.0	*	
Hemphillia dromedarius	Branson	1972	29.8	5.0	1.0	*	
Hemphillia glandulosa	Bland and W. G. Binney	1872	12.0	3.0	1.0	*	
Hemphillia malonei	Pilsbry	1917	33.0	8.3	1.0	*	
Hemphillia pantherina	Branson	1975	14.2	3.6	1.0	*	
Bradybaenida							
Bradybaena similaris	Férussac	1821	11.0	17.0	0.5		*
Cepolidae							
Cepolis varians	Menke	1829	15.5	15.0	0.2		
Charopidae							
Radiodiscus abietum	H. B. Baker	1930	3.3	6.7	1.0		
Radiodiscus millecostatus	Pilsbry and Ferriss	1906	1.2	2.3	0.8		
Cochlicellidae							
Cochlicella barbara	Linnaeus	1758	10.0	13.0	0.2		*
Cochlicopidae							
Cochlicopa lubrica	Müller	1774	6.0	2.5	0.2		
Cochlicopa lubricella	Porro	1838	5.5	2.2	0.5		
Cochlicopa morseana	Doherty	1878	6.3	2.2	0.5		
Discidae							
Anguispira alabama	G. H. Clapp	1920	9.5	19.5	0.5		
Anguispira alternata	Say	1816	12.0	20.0	0.2		
Anguispira cumberlandiana	I. Lea	1840	10.0	16.7	0.5		
Anguispira fergusoni	Bland	1861	9.0	16.0	0.2		
Anguispira jessica	Kutchka	1938	16.0	24.0	0.2		
Anguispira knoxensis	Pilsbry	1899	12.1	24.0	0.5		
Anguispira kochi	Pfeiffer	1821	16.0	24.0	0.2		
Anguispira macneilli	Walker	1928	8.3	15.2	0.5		
Anguispira mordax	Shuttleworth	1852	6.0	16.0	0.5		
Anguispira nimapuna	H. B. Baker	1932	5.7	12.0	0.5		
Anguispira picta	G. H. Clapp	1920	9.5	17.8	0.4		
Anguispira rugoderma	Hubricht	1938	10.9	15.7	0.4		
Anguispira strongyloides	Pfeiffer	1854	8.1	17.1	0.5		
Discus brunsoni	S. S. Berry	1955	4.2	9.1	0.4		
Discus bryanti	Harper	1881	2.0	5.5	1.0		
Discus catskillensis	Pilsbry	1896	2.5	5.0	0.2		
Discus clappi	Pilsbry	1924	2.3	7.4	1.0		
Discus cronkhitei	Newcomb	1864	3.1	5.0	0.2		
Discus macclintockii	F. C. Baker	1928	3.6	6.2	0.2		
Discus marmorensis	H. B. Baker	1932	4.6	7.7	0.2		
Discus nigrimontanus	Pilsbry	1924	2.4	7.4	1.0		
Discus patulus edentulus	Pilsbry	1948	3.7	8.3	0.2		
Discus patulus patulus	Deshayes	1830	3.7	8.3	0.2		
Discus rotundatus	Müller	1774	2.8	6.5	0.3		*
Discus selenitoides	Pilsbry	1890	1.7	3.0	0.5		
Discus shimekii	Pilsbry	1890	4.0	6.5	0.2		
Speleodiscoides spirellum	A. G. Smith	1957	1.6	6.4	1.0		
Ellobiidae							
Carychium arboreum	Dourson	2012	2.0	0.7	0.6		
Carychium clappi	Hubricht	1959	1.9	0.7	0.5		
Carychium exiguum	Say	1822	1.8	0.7	0.5		
Carychium exile	I. Lea	1842	2.0	0.6	0.5		
Carychium mexicanum	Pilsbry	1891	1.7	0.7	0.5		
Carychium minimum	Müller	1774	1.8	0.9	0.3		*

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Carychium nannodes	G. H. Clapp	1905	1.4	0.5	0.5		
Carychium occidentale	Pilsbry	1891	2.2	1.2	0.3		
Carychium riparium	Hubricht	1978	1.9	0.6	0.5		
Carychium stygium	Call	1897	1.7	1.0	0.4		
Carychium tridentatum	Risso	1826	1.9	0.8	0.3		*
Euconulidae							
Dryachloa dauca	Thompson and Lee	1980	1.2	2.0	0.6		
Euconulus alderi	Gray	1840	2.0	2.6	0		
Euconulus chersinus	Say	1821	2.5	2.9	0		
Euconulus dentatus	Sterki	1893	2.5	2.9	0		
Euconulus fulvus	Müller	1774	2.4	3.4	0		
Euconulus fulvus alaskensis	Pilsbry	1899	2.6	3.3	0.4		
Euconulus polygyratus	Pilsbry	1899	2.8	3.3	0		
Euconulus trochulus	Reinhardt	1883	2.5	2.9	0		
Guppya gundlachi	Pfeiffer	1839	1.8	3.0	0.6		
Guppya miamiensis	Pilsbry	1903	1.5	2.4	0.4		
Guppya sterkii	Dall	1888	0.7	1.2	0.6		
Ferrussaciidae							
Cecilioides acicula	Müller	1774	4.5	1.2	0.3		*
Cecilioides aperta	Swainson	1840	4.5	1.0	0.2		
Gastrodontidae							
Gastrodonta fonticula	Wurtz	1948	3.4	6.3	0.4		
Gastrodonta interna	Say	1822	5.0	7.4	0.2		
Striatura exigua	Stimpson	1850	1.3	2.3	0.6		
Striatura ferrea	E. S. Morse	1864	1.4	2.9	0.8		
Striatura meridionalis	Pilsbry and Ferriss	1906	0.8	1.5	0.6		
Striatura milium	E. S. Morse	1859	0.7	1.4	0.6		
Striatura pugetensis	Dall	1895	0.7	1.4	0.6		
Ventridens acerra	J. Lewis	1870	11.5	16.3	0.3		
Ventridens arcellus	Hubricht	1976	10.2	13.4	0.4		
Ventridens brittsi	Pilsbry	1892	5.2	9.5	0.3		
Ventridens cerinoideus	Anthony	1865	5.2	8.0	0.3		
Ventridens coelaxis	Pilsbry	1899	3.0	6.6	0.4		
Ventridens collisella	Pilsbry	1896	7.1	9.0	0.4		
Ventridens decussatus	Walker and Pilsbry	1902	5.2	8.0	0.3		
Ventridens demissus	A. Binney	1843	5.4	9.0	0.3		
Ventridens eutropis	Pilsbry	1946	7.7	14.7	0.5		
Ventridens gularis	Say	1822	5.5	8.2	0.3		
Ventridens intertextus	A. Binney	1841	12.0	15.5	0.3		
Ventridens lasmodon	Phillips	1841	3.7	7.6	0.4		
Ventridens lawae	W. G. Binney	1892	4.0	7.0	0.4		
Ventridens ligera	Say	1821	10.0	12.5	0.3		
Ventridens monodon	Hubricht	1964	5.0	8.0	0.3		
Ventridens percallosus	Pilsbry	1898	7.5	9.2	0.4		
Ventridens pilsbryi	Hubricht	1964	5.0	8.0	0.3		
Ventridens suppressus	Say	1829	3.7	6.3	0.3		
Ventridens theloides	Walker and Pilsbry	1902	4.8	7.8	0.3		
Ventridens virginicus	Vanatta	1936	3.8	5.7	0.3		
Ventridens volusiae	Pilsbry	1900	5.3	8.3	0.3		
Zonitoides arboreus	Say	1816	2.6	5.6	0.6		
Zonitoides elliotti	Redfield	1856	4.0	8.0	0.5		
Zonitoides kirbyi	R. W. Fullington	1974	3.4	6.3	0.3		
Zonitoides lateumbilicatus	Pilsbry	1895	2.0	4.7	0.6		
Zonitoides limatulus	A. Binney	1840	2.4	4.8	0.6		

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Zonitoides nitidus	Müller	1774	3.8	6.5	0.5		
Zonitoides patuloides	Pilsbry	1895	3.1	5.4	0.5		
Haplotrematidae							
Haplotrema alameda	Pilsbry	1930	4.7	13.6	0.8		
Haplotrema caelatum	Mazyck	1886	3.4	7.4	0.8		
Haplotrema catalinense	Hemphill	1890	4.3	6.0	0.5		
Haplotrema concavum	Say	1821	7.7	16.0	0.8		
Haplotrema costatum	A. G. Smith	1957	2.9	6.2	0.6		
Haplotrema duranti	Newcomb	1864	1.8	5.2	0.7		
Haplotrema hybridum	Ancey	1888	9.2	20.1	0.5		
Haplotrema keepi	Hemphill	1890	4.4	11.2	0.5		
Haplotrema kendeighi	Webb	1951	6.8	15.4	0.8		
Haplotrema minimum	Ancey	1888	8.0	18.0	0.8		
Haplotrema mokelumnense	Roth	1990	3.3	9.3	0.6		
Haplotrema sportella	Gould	1846	7.9	16.3	0.5		
Haplotrema transfuga	Hemphill	1892	5.5	16.0	1.0		
Haplotrema vancouverense	I. Lea	1839	10.5	26.2	0.5		
Haplotrema voyanum	Newcomb	1865	5.0	11.3	0.5		
Haplotrema zopherum	Roth	1990	5.0	12.7	0.5		
Helicarionidae							
Ovachlamys fulgens	Gude	1900	3.0	5.0	0.5		*
Helicidae							
Cepaea hortensis	Müller	1774	16.0	19.0	0.2		
Cepaea nemoralis	Linnaeus	1758	18.5	24.0	0.2		*
Eobania vermiculata	Müller	1774	18.5	28.0	0.5		*
Helix aperta	Born	1778	25.0	25.0	0.5		*
Helix aspersa	Müller	1774	31.0	35.0	0.3		*
Helix pomatia	Linnaeus	1758	36.0	35.0	0.5		*
Otala lactea	Müller	1774	17.5	27.5	0.5		*
Theba pisana	Müller	1774	13.0	18.0	0.4		*
Helicinidae							
Alcadia striata	Lamarck	1822	7.2	11.9	0.5		*
Helicina chrysocheila	Binney	1851	10.0	9.5	0.3		
Helicina clappi	Pilsbry	1909	7.0	8.0	0.3		
Helicina fragilis elata	Shuttleworth	1852	4.0	4.2	0.3		
Helicina orbiculata	Say	1818	6.0	6.7	0.3		
Helicina orbiculata tropica	Pfeiffer	1852	6.8	8.1	0.3		
Hendersonia occulta	Say	1831	5.5	6.9	0.3		
Lucidella lirata	Pfeiffer	1847	2.5	3.2	0.4		
Lucidella tantilla	Pilsbry	1902	1.4	2.5	0.5		
Helicodiscidae							
Helicodiscus FL 1			1.4	2.0	0.3		*
Helicodiscus aldrichianus	G. H. Clapp	1907	1.0	1.9	0.7		
Helicodiscus barri	Hubricht	1962	1.8	3.9	0.4		
Helicodiscus bonamicus	Hubricht	1978	1.4	4.2	1.0		
Helicodiscus diadema	Grimm	1967	1.3	4.0	1.0		
Helicodiscus eigenmanni	Pilsbry	1900	1.7	4.5	0.9		
Helicodiscus enneodon	Hubricht	1967	1.9	4.8	1.0		
Helicodiscus fimbriatus	Wetherby	1881	1.6	4.5	1.0		
Helicodiscus hadenoecus	Hubricht	1962	1.2	2.7	0.9		
Helicodiscus hexodon	Hubricht	1966	1.9	4.9	1.0		
Helicodiscus inermis	H. B. Baker	1929	1.3	2.0	0.7		
Helicodiscus lirellus	Hubricht	1975	1.8	4.4	1.0		

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Helicodiscus multidens	Hubricht	1962	1.9	4.8	1.0		
Helicodiscus notius	Hubricht	1962	1.7	3.5	1.0		
Helicodiscus nummus	Vanatta	1899	0.5	1.5	1.0		
Helicodiscus parallelus	Say	1817	1.5	3.4	1.0		
Helicodiscus punctatellus	Morrison	1942	1.8	3.0	0.7		
Helicodiscus roundyi	Morrison	1935	0.7	1.5	0.8		
Helicodiscus salmonaceus	Hemphill	1890	1.4	4.7	1.0		
Helicodiscus saludensis	Morrison	1937	1.5	3.2	1.0		
Helicodiscus shimeki	Hubricht	1962	1.7	4.2	1.0		
Helicodiscus singleyanus	Pilsbry	1889	0.9	2.4	0.7		
Helicodiscus tridens	Morrison	1935	0.7	1.5	1.0		
Helicodiscus triodus	Hubricht	1958	1.5	4.0	1.0		
Polygyriscus virginianus	P. R. Burch	1947	1.3	4.1	1.0		
Helminthoglyptidae							
Cahuillus greggi	W. B. Miller	1981	6.5	12.4	0.5		
Cahuillus indioensis	Yates	1890	10.5	17.2	0.5		
Chamaearionta aquaealbae	S. S. Berry	1922	4.0	6.0	0.5		
Eremarionta brunnea	Willett	1935	7.9	13.5	0.5		
Eremarionta immaculata	Willett	1937	7.2	12.6	0.5		
Eremarionta millepalmarum	S. S. Berry	1930	7.3	12.1	0.5		
Eremarionta morongoana	S. S. Berry	1929	11.1	20.1	0.6		
Eremarionta newcombi	Pilsbry and Ferriss	1923	8.0	15.5	0.6		
Eremarionta orocopia	Willett	1939	8.2	11.9	0.5		
Eremarionta rowelli	Newcomb	1865	8.5	15.5	0.6		
Eremariontoides argus	Edson	1912	6.6	12.8	0.5		
Helminthoglypta allyniana	S. S. Berry	1920	18.8	32.2	0.5		
Helminthoglypta allynsmithi	Pilsbry	1939	15.6	26.0	0.6		
Helminthoglypta arrosa	W. G. Binney	1858	23.6	33.2	0.6		
Helminthoglypta avus	Bartsch	1916	14.6	25.0	0.5		
Helminthoglypta ayresiana	Newcomb	1861	14.5	20.8	0.6		
Helminthoglypta benitoensis	Lowe	1930	12.9	19.8	0.5		
Helminthoglypta berryi	Hanna	1929	21.0	22.7	0.6		
Helminthoglypta californiensis	I. Lea	1838	17.0	17.0	0.2		
Helminthoglypta callistoderma	Pilsbry	1917	15.6	23.0	0.5		
Helminthoglypta carpenteri	Newcomb	1861	16.5	23.0	0.5		
Helminthoglypta caruthersi	Willett	1934	13.4	27.5	0.6		
Helminthoglypta coelata	Bartsch	1916	13.6	21.3	0.5		
Helminthoglypta concolor	Roth and Hochberg	1988	10.9	20.5	0.5		
Helminthoglypta contracostae	Pilsbry	1895	12.8	19.1	0.6		
Helminthoglypta crotalina	S. S. Berry	1928	8.7	15.0	0.6		
Helminthoglypta cuyama	Hanna and A. G. Smith	1937	13.5	19.8	0.5		
Helminthoglypta cypreophila	W. G. Binney and Bland	1869	16.8	27.0	0.6		
Helminthoglypta diabloensis	J. G. Cooper	1869	14.0	22.0	0.4		
Helminthoglypta dupetithouarsii	Deshayes	1840	19.2	25.5	0.4		
Helminthoglypta edwardsi	Gregg and W. B. Miller	1976	11.1	17.7	0.5		
Helminthoglypta euomphalodes	S. S. Berry	1938	12.5	20.7	0.6		
Helminthoglypta exarata	Pfeiffer	1857	18.0	28.0	0.4		
Helminthoglypta expansilabris	Pilsbry	1898	19.8	23.8	0.4		
Helminthoglypta fairbanksi	Reeder and W. B. Miller	1986	12.3	34.3	0.4		
Helminthoglypta ferrissi	Pilsbry	1924	14.4	25.6	0.5		
Helminthoglypta fieldi	Pilsbry	1930	19.1	23.8	0.5		
Helminthoglypta fisheri	Bartsch	1904	9.1	16.4	0.6		
Helminthoglypta fontiphila	Gregg	1931	8.7	13.5	0.5		

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Helminthoglypta graniticola	S. S. Berry	1926	8.6	12.8	0.4		
Helminthoglypta greggi	Willett	1931	6.8	12.0	0.6		
Helminthoglypta hertleini	Hanna and A. G. Smith	1937	12.5	15.3	0.5		
Helminthoglypta inglesi	S. S. Berry	1938	12.9	19.9	0.5		
Helminthoglypta isabella	S. S. Berry	1938	12.3	17.4	0.5		
Helminthoglypta jaegeri	S. S. Berry	1928	8.0	13.8	0.6		
Helminthoglypta liodoma	S. S. Berry	1938	16.5	22.7	0.5		
Helminthoglypta mailliardi	Pilsbry	1927	14.3	18.3	0.3		
Helminthoglypta micrometalleoides	W. B. Miller	1970	5.6	10.9	0.7		
Helminthoglypta milleri	Reeder	1986	12.3	26.6	0.5		
Helminthoglypta mohaveana	S. S. Berry	1927	11.4	15.8	0.5		
Helminthoglypta montezuma	Reeder and W. B. Miller	1986	9.6	16.9	0.6		
Helminthoglypta napaea	S. S. Berry	1938	13.3	17.4	0.4		
Helminthoglypta nickliniana	I. Lea	1838	18.0	24.0	0.6		
Helminthoglypta orina	S. S. Berry	1938	11.9	15.9	0.6		
Helminthoglypta petricola	S. S. Berry	1916	13.0	23.0	0.5		
Helminthoglypta phlyctaena	Bartsch	1916	17.1	28.2	0.5		
Helminthoglypta piutensis	Willett	1938	8.2	19.8	0.7		
Helminthoglypta proles	Hemphill	1892	10.2	20.0	0.6		
Helminthoglypta reediana	Willett	1932	10.5	14.8	0.5		
Helminthoglypta salviae mina	Roth	1987	8.2	15.4	0.5		
Helminthoglypta salviae salvae	Roth	1987	9.2	15.8	0.5		
Helminthoglypta sanctaecrucis	Pilsbry	1927	15.0	22.3	0.5		
Helminthoglypta sequoicola	J. G. Cooper	1866	7.8	13.7	0.6		
Helminthoglypta similans	Hanna and A. G. Smith	1937	9.6	13.7	0.5		
Helminthoglypta sonoma	Pilsbry	1937	13.6	23.1	0.5		
Helminthoglypta stageri	Willett	1938	12.3	24.8	0.6		
Helminthoglypta stiversiana	J. G. Cooper	1876	18.8	26.3	0.5		
Helminthoglypta talmadgei	Roth	1988	15.1	21.9	0.6		
Helminthoglypta taylori	Reeder and Roth	1988	11.5	19.4	0.5		
Helminthoglypta tejonis	S. S. Berry	1930	17.3	25.5	0.5		
Helminthoglypta thermimontis	S. S. Berry	1953	13.6	20.0	0.5		
Helminthoglypta traskii	Newcomb	1861	16.3	24.6	0.5		
Helminthoglypta tudiculata	A. Binney	1843	22.5	29.9	0.4		
Helminthoglypta tularensis	Hemphill	1892	14.5	22.0	0.4		
Helminthoglypta umbilicata	Pilsbry	1898	15.0	25.0	0.4		
Helminthoglypta uvasana	Roth and Hochberg	1992	11.5	19.8	0.6		
Helminthoglypta vasquezi	Roth and Hochberg	1992	9.4	16.4	0.6		
Helminthoglypta venturensis	Bartsch	1916	12.0	20.3	0.6		
Helminthoglypta walkeriana	Hemphill	1911	17.0	22.0	0.6		
Helminthoglypta waltoni	Gregg and W. B. Miller	1976	15.3	23.2	0.5		
Helminthoglypta willetti	S. S. Berry	1920	18.4	24.8	0.5		
Herpeteros angelus	Gregg	1949	13.7	16.8	0.6		
Maricopella allynsmithi	Gregg and W. B. Miller	1969	7.8	13.4	0.6		
Micrarionta beatula	Cockerell	1929	10.2	17.3	0.4		
Micrarionta facta	Newcomb	1864	3.8	6.0	0.3		
Micrarionta feralis	Hemphill	1901	10.5	14.0	0.5		
Micrarionta gabbii	Newcomb	1864	4.6	7.7	0.6		
Micrarionta opuntia	Roth	1975	6.5	10.5	0.5		
Micrarionta rufocincta	Newcomb	1864	8.0	12.0	0.5		
Mohavelix micrometalleus	S. S. Berry	1930	4.6	8.2	0.7		
Myotophallus rooseveltianus	S. S. Berry	1917	8.0	14.0	0.5		

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Noyo intersessa	Roth	1987	16.8	22.6	0.5		
Rothelix cuyamacensis	Pilsbry	1895	10.9	18.9	0.5		
Rothelix lowei	Bartsch	1918	15.9	21.2	0.5		
Rothelix rhodophila	Reeder and W. B. Miller	1987	14.4	24.6	0.5		
Rothelix warnerfontis	Reeder and W. B. Miller	1987	11.4	19.0	0.5		
Sonorelix avawatzica	S. S. Berry	1930	8.5	13.0	0.5		
Sonorelix baileyi	Bartsch	1904	7.5	13.2	0.6		
Sonorelix borregoensis	S. S. Berry	1929	11.8	22.0	0.5		
Sonorelix harperi	Bryant	1900	8.5	15.5	0.5		
Sonorelix melanopylon	S. S. Berry	1930	8.0	12.3	0.5		
Sonorelix rixfordi	Pilsbry	1919	9.5	16.7	0.5		
Sonorella ambigua	Pilsbry and Ferriss	1915	13.0	22.7	0.5		
Sonorella anchana	S. S. Berry	1948	10.0	14.4	0.5		
Sonorella animasensis	Pilsbry	1939	11.0	18.9	0.5		
Sonorella apache	Pilsbry and Ferriss	1915	10.5	17.0	0.5		
Sonorella ashmuni	Bartsch	1904	16.9	23.2	0.5		
Sonorella baboquivariensis	Pilsbry and Ferriss	1915	13.3	21.3	0.5		
Sonorella bagnarai	W. B. Miller	1967	11.0	20.8	0.5		
Sonorella bartschi	Pilsbry and Ferriss	1915	11.4	20.0	0.6		
Sonorella bequaerti	W. B. Miller	1967	15.3	26.2	0.5		
Sonorella bicipitis	Pilsbry and Ferriss	1910	14.0	23.0	0.5		
Sonorella binneyi	Pilsbry and Ferriss	1910	10.9	16.7	0.5		
Sonorella bowiensis	Pilsbry	1905	9.7	17.8	0.5		
Sonorella bradshaveana	W. B. Miller	1984	9.3	14.7	0.5		
Sonorella caeruliflumininis	Pilsbry and Ferriss	1919	14.6	25.0	0.5		
Sonorella christenseni	Fairbanks and Reeder	1980	11.0	20.6	0.5		
Sonorella clappi	Pilsbry and Ferriss	1915	9.6	18.4	0.5		
Sonorella coloradoensis	Stearns	1890	10.0	13.8	0.5		
Sonorella coltoniana	Pilsbry	1939	11.8	21.6	0.5		
Sonorella compare	Pilsbry	1919	13.0	23.4	0.5		
Sonorella dalli	Bartsch	1904	12.0	21.1	0.5		
Sonorella danielsi	Pilsbry and Ferriss	1910	10.3	19.3	0.5		
Sonorella delicata	Pilsbry and Ferriss	1919	10.5	18.3	0.5		
Sonorella dragoonensis	Pilsbry and Ferriss	1915	11.2	19.7	0.5		
Sonorella eremita	Pilsbry and Ferriss	1915	10.9	19.0	0.5		
Sonorella ferrissi	Pilsbry	1915	7.0	14.5	0.5		
Sonorella flora	Pilsbry and Ferriss	1915	16.0	27.0	0.6		
Sonorella franciscana	Pilsbry and Ferriss	1919	11.0	18.3	0.5		
Sonorella galiurensis	Pilsbry and Ferriss	1919	16.5	26.3	0.5		
Sonorella grahamensis	Pilsbry and Ferriss	1919	10.3	19.0	0.5		
Sonorella granulatissima	Pilsbry	1902	10.2	18.9	0.5		
Sonorella hachitana hachitana	Dall	1896	13.4	21.5	0.5		
Sonorella huachucana	Pilsbry	1905	12.7	20.8	0.5		
Sonorella huecoensis	Gilbertson and Metcalf	2005	7.3	13.9	0.5		
Sonorella imitator	Gregg and W. B. Miller	1974	12.1	21.8	0.5		
Sonorella imperatrix	Pilsbry	1939	9.3	15.9	0.5		
Sonorella imperialis	Pilsbry and Ferriss	1923	11.3	19.5	0.5		
Sonorella insignis	Pilsbry and Ferriss	1919	9.5	20.3	0.5		
Sonorella macrophallus	Fairbanks and Reeder	1980	10.6	17.7	0.5		
Sonorella magdalenensis	Stearns	1890	12.7	21.7	0.6		
Sonorella meadi	W. B. Miller	1966	9.7	20.2	0.6		
Sonorella metcalfi	W. B. Miller	1976	12.0	19.8	0.5		
Sonorella micra	Pilsbry and Ferriss	1910	7.8	14.5	0.5		

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Sonorella micromphala	Pilsbry	1939	13.0	19.3	0.5		
Sonorella milleri	Christensen and Reeder	1981	9.8	16.7	0.5		
Sonorella mustang	Pilsbry and Ferriss	1919	14.2	25.7	0.5		
Sonorella neglecta	Gregg	1951	9.2	13.0	0.5		
Sonorella odorata	Pilsbry and Ferriss	1919	12.4	21.5	0.4		
Sonorella optata	Pilsbry and Ferriss	1910	15.2	25.0	0.6		
Sonorella orientis	Pilsbry	1936	12.7	22.6	0.4		
Sonorella painteri	Lang and Gilbertson	2010	14.0	22.8	0.5		
Sonorella papagorum	Pilsbry and Ferriss	1915	13.8	23.2	0.4		
Sonorella parva	Pilsbry	1905	9.7	17.2	0.5		
Sonorella pedregosensis	Gilbertson and Radke	2006	11.0	17.5	0.5		
Sonorella peloncillensis	Pilsbry and Ferriss	1915	12.5	22.5	0.5		
Sonorella reederi	W. B. Miller	1984	11.0	19.4	0.5		
Sonorella rinconensis	Pilsbry and Ferriss	1910	16.0	26.5	0.5		
Sonorella rosemontensis	Pilsbry	1939	12.7	21.7	0.5		
Sonorella russelli	W. B. Miller	1984	10.2	15.8	0.6		
Sonorella sabinoensis	Pilsbry and Ferriss	1919	12.7	21.3	0.5		
Sonorella santaritana	Pilsbry and Ferriss	1915	13.3	23.0	0.5		
Sonorella simmonsi	W. B. Miller	1966	12.0	20.6	0.5		
Sonorella sitiens	Pilsbry and Ferriss	1915	11.8	19.4	0.6		
Sonorella superstitionis	Pilsbry	1939	11.0	19.3	0.6		
Sonorella todseni	W. B. Miller	1976	9.6	17.9	0.5		
Sonorella tortillita	Pilsbry and Ferriss	1919	15.3	27.3	0.5		
Sonorella tryoniana	Pilsbry and Ferriss	1923	9.1	15.9	0.5		
Sonorella vespertina	Pilsbry and Ferriss	1915	11.0	19.8	0.5		
Sonorella virilis	Pilsbry	1905	10.3	19.7	0.5		
Sonorella walkeri	Pilsbry and Ferriss	1915	14.0	23.0	0.5		
Sonorella waltoni	W. B. Miller	1968	11.2	19.8	0.5		
Sonorella xanthenes	Pilsbry and Ferriss	1923	8.5	13.6	0.4		
Xerarionta intercisa	W. G. Binney	1857	13.9	23.4	0.4		
Xerarionta kellettii	Forbes	1850	18.3	25.3	0.4		
Xerarionta redimita	W. G. Binney	1858	12.0	17.0	0.4		
Xerarionta stearnsiana	Gabb	1868	20.0	25.7	0.4		
Xerarionta tryoni	Newcomb	1864	11.8	13.7	0.4		
Humboldtianidae							
Humboldtiana agavophila	Pratt	1971	30.0	34.5	0.4		
Humboldtiana cheatumi	Pilsbry	1935	29.0	33.5	0.4		
Humboldtiana chisosensis	Pilsbry	1927	22.0	29.0	0.4		
Humboldtiana edithae	Parodiz	1954	32.7	31.5	0.4		
Humboldtiana ferrissiana	Pilsbry	1928	24.0	30.6	0.4		
Humboldtiana fullingtoni	Cheatum	1972	31.2	38.6	0.4		
Humboldtiana palmeri	Clench and Rehder	1930	21.7	24.9	0.4		
Humboldtiana praesidii	Pilsbry	1939	22.7	27.6	0.4		
Humboldtiana texana	Pilsbry	1927	20.5	22.5	0.4		
Humboldtiana ultima	Pilsbry	1927	23.0	25.5	0.3		
Hygromiidae							
Candidula intersecta	Poiret	1801	6.5	10.0	0.5		*
Cernuella cisalpina	Rossmassler	1837	5.0	8.0	0.2		*
Cernuella virgata	Müller	1774	12.5	16.5	0.5		*
Helicella obvia	Menke	1828	8.5	17.0	0.5		*
Monacha cantiana	Montagu	1803	12.5	18.0	0.5		*
Trichia hispida	Linnaeus	1758	5.3	8.1	0.5		*
Trichia striolata	Pfeiffer	1828	6.0	10.5	0.5		*
Trochoidea elegans	Gmelin	1791	6.5	8.5	0.0		*

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Limacidae							
Lehmannia valentiana	Férussac	1821	60.0	10.0	1.0	*	*
Limax flavus	Linnaeus	1758	88.0	14.7	1.0	*	*
Limax marginatus	Müller	1774	75.0	12.5	1.0	*	*
Limax maximus	Linnaeus	1758	150.0	25.0	1.0	*	*
Limax nyctelius	Bourguignat	1861	50.0	8.3	1.0	*	*
Megomphicidae							
Ammonitella yatesii	J. G. Cooper	1869	3.6	8.1	0.5		
Glyptostoma gabrielense	Pilsbry	1938	14.0	30.0	0.4		
Glyptostoma newberryanum	W. G. Binney	1858	16.7	38.2	0.4		
Megomphix californicus	A. G. Smith	1960	5.9	12.6	0.9		
Megomphix hemphilli	W. G. Binney	1879	7.6	16.8	0.9		
Megomphix lutarius	H. B. Baker	1932	4.6	7.9	0.5		
Polygyrella polygyrella	Bland and J. G. Cooper	1861	4.7	10.9	0.5		
Polygyroidea harfordiana	J. G. Cooper	1870	3.9	9.9	0.5		
Milacidae							
Milax gagates	Draparnaud	1801	55	9.2	1.0	*	*
Monadeniidae							
Monadenia callipeplus	S. S. Berry	1940	13.4	21.0	0.5		
Monadenia chaceana	S. S. Berry	1940	18.0	20.0	0.4		
Monadenia churchi	Hanna and A. G. Smith	1933	11.3	20.0	0.5		
Monadenia circumcarinata	Stearns	1879	11.0	26.8	0.5		
Monadenia cristulata	S. S. Berry	1940	13.3	21.3	0.5		
Monadenia fidelis	J. E. Gray	1834	23.3	34.5	0.4		
Monadenia hillebrandi	Newcomb	1864	12.2	25.1	0.5		
Monadenia infumata	Gould	1855	21.7	38.8	0.3		
Monadenia marmarotis	S. S. Berry	1940	10.8	18.5	0.5		
Monadenia mormonum	Pfeiffer	1857	15.5	30.3	0.5		
Monadenia rotifer	S. S. Berry	1940	11.0	18.3	0.6		
Monadenia scottiana	S. S. Berry	1940	14.3	21.9	0.4		
Monadenia setosa	Talmadge	1952	18.0	28.0	0.5		
Monadenia troglodytes	Hanna and A. G. Smith	1933	10.8	24.2	0.5		
Monadenia tuolumneana	S. S. Berry	1955	9.0	22.7	0.5		
Monadenia yosemitensis	Lowe	1916	11.0	26.0	0.5		
Oleacinidae							
Varicella gracillima	Pfeiffer	1839	6.8	1.5	0.2		
Oreohelicidae							
Oreohelix alpina	Elrod	1901	5.4	9.4	0.4		
Oreohelix amariradix	Pilsbry	1934	8.5	14.5	0.4		
Oreohelix anchana	Gregg	1953	13.3	20.4	0.4		
Oreohelix barbata	Pilsbry	1905	6.0	13.1	0.7		
Oreohelix californica	S. S. Berry	1931	5.6	10.0	0.5		
Oreohelix carinifera	Pilsbry	1912	6.0	10.6	0.5		
Oreohelix concentrata	Dall	1896	7.9	15.5	0.3		
Oreohelix concentrata grahamensis	Gregg and W. B. Miller	1974	7.9	15.5	0.5		
Oreohelix confragosa	Metcalf	1974	10.3	17.7	0.4		
Oreohelix elrodi	Pilsbry	1900	11.1	24.5	0.4		
Oreohelix eurekensis	J. Henderson and Daniels	1916	5.2	9.3	0.4		
Oreohelix florida	Pilsbry	1939	11.0	17.0	0.5		
Oreohelix hammeri	Fairbanks	1984	8.4	20.2	0.7		
Oreohelix handi	Pilsbry and Ferriss	1918	5.7	10.3	0.5		
Oreohelix haydeni alta	Pilsbry and Cockerell	1913	11.4	17.6	0.4		
Oreohelix haydeni betheli	Pilsbry and Cockerell	1913	11.0	21.4	0.5		

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Oreohelix haydeni bruneri	Ancey	1881	7.0	14.0	0.5		
Oreohelix haydeni corrugata	Henderson and Daniels	1916	14.0	18.8	0.5		
Oreohelix haydeni haydeni	Gabb	1869	12.2	20.7	0.5		
Oreohelix haydeni hesperia	Pilsbry	1939	12.0	21.9	0.4		
Oreohelix haydeni hybrida	Hemphill	1900	10.5	16.5	0.4		
Oreohelix haydeni mixta	Pilsbry	1916	11.6	19.7	0.4		
Oreohelix haydeni oquirrhensis	Hemphill	1886	11.0	16.0	0.4		
Oreohelix haydeni perplexa	Pilsbry	1939	11.1	14.3	0.4		
Oreohelix hemphilli	Newcomb	1869	5.1	9.2	0.4		
Oreohelix hendersoni	Pilsbry	1912	8.7	16.4	0.6		
Oreohelix houghi	W. B. Marshall	1929	9.5	17.5	0.4		
Oreohelix howardi	Jones	1944	13.0	26.0	0.5		
Oreohelix idahoensis	Newcomb	1866	10.9	12.8	0.5		
Oreohelix idahoensis baileyi	Bartsch	1916	8.3	12.6	0.4		
Oreohelix intersum	Hemphill	1890	7.9	11.1	0.4		
Oreohelix jaegeri	S. S. Berry	1931	7.0	14.4	0.5		
Oreohelix jugalis	Hemphill	1890	11.2	21.0	0.4		
Oreohelix junii	Pilsbry	1934	11.0	20.0	0.5		
Oreohelix litoralis	Crews and Metcalf	1982	11.5	18.2	0.4		
Oreohelix loisae	Potts	2004	12.2	19.0	0.5		
Oreohelix magdalenae	Pilsbry	1939	8.5	14.0	0.5		
Oreohelix metcalfei acutidiscus	Pilsbry and Ferriss	1917	10.5	22.7	0.5		
Oreohelix metcalfei concentrica	Pilsbry and Ferriss	1917	9.3	21.5	0.5		
Oreohelix metcalfei cuchillensis	Pilsbry and Ferriss	1917	9.0	18.2	0.5		
Oreohelix metcalfei hermosensis	Pilsbry and Ferriss	1917	12.0	21.7	0.5		
Oreohelix metcalfei metcalfei	Cockerell	1905	10.8	20.4	0.4		
Oreohelix metcalfei radiata	Pilsbry and Ferriss	1917	9.5	20.5	0.5		
Oreohelix neomexicana	Pilsbry	1905	7.5	14.6	0.4		
Oreohelix nevadensis	S. S. Berry	1932	10.8	18.0	0.5		
Oreohelix nogalensis	Pilsbry	1948	13.3	18.6	0.2		
Oreohelix parawanensis	Gregg	1941	5.4	10.5	0.5		
Oreohelix peripherica newcombi	W. G. Binney	1885	9.5	20.0	0.3		
Oreohelix peripherica peripherica	Ancey	1881	9.5	20.0	0.3		
Oreohelix peripherica wasatchensis	W. G. Binney	1886	16.7	20.6	0.4		
Oreohelix peripherica weberiana	Pilsbry	1948	10.8	17.5	0.5		
Oreohelix pilsbryi	Ferriss	1917	10.3	17.8	0.5		
Oreohelix pygmaea	Pilsbry	1913	8.7	11.0	0.6		
Oreohelix pygmaea maculata	Henderson	1921	11.5	14.0	0.4		
Oreohelix socorroensis	Pilsbry	1905	8.7	15.2	0.5		
Oreohelix strigosa berryi	Pilsbry	1915	6.2	9.2	0.4		
Oreohelix strigosa buttoni	Hemphill	1890	9.0	13.0	0.5		
Oreohelix strigosa cooperi	W. G. Binney	1858	9.0	13.0	0.4		
Oreohelix strigosa depressa	Gould	1846	13.9	20.5	0.3		
Oreohelix strigosa fragilis	Hemphill	1890	22.9	19.1	0.5		
Oreohelix strigosa goniogyra	Pilsbry	1933	12.0	18.7	0.4		
Oreohelix strigosa meridionalis	Pilsbry and Ferriss	1919	14.4	24.7	0.5		
Oreohelix strigosa montrosensis	Pilsbry	1948	16.5	21.8	0.5		
Oreohelix strigosa strigosa	Gould	1848	14.0	18.0	0.3		
Oreohelix strigosa variabilis	Henderson	1929	16.0	22.0	0.5		
Oreohelix subrudis	Reeve	1854	14.0	20.0	0.4		
Oreohelix swopei	Pilsbry and Ferriss	1917	12.0	21.0	0.4		
Oreohelix tenuistriata	J. Henderson and Daniels	1916	7.9	11.7	0.5		

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Oreohelix variabilis	J. Henderson	1929	13.5	18.5	0.4		
Oreohelix vortex	S. S. Berry	1932	7.8	13.4	0.5		
Oreohelix waltoni	Solem	1975	5.8	9.4	0.5		
Oreohelix yavapai clutei	Pilsbry	1920	8.9	13.2	0.4		
Oreohelix yavapai cummingsi	Pilsbry	1920	6.0	12.0	0.4		
Oreohelix yavapai extremitatis	Pilsbry and Ferriss	1911	8.5	16.2	0.5		
Oreohelix yavapai fortis	Cockerell	1927	10.8	23.0	0.5		
Oreohelix yavapai magnicornu	Pilsbry	1916	11.1	19.3	0.4		
Oreohelix yavapai mariae	Bartsch	1916	10.0	20.7	0.4		
Oreohelix yavapai profundorum	Pilsbry and Ferriss	1911	11.9	16.2	0.5		
Oreohelix yavapai yavapai	Pilsbry	1905	9.2	16.8	0.4		
Radiocentrum avalonense	Hemphill	1905	7.0	12.6	0.4		
Radiocentrum chiricahuanum	Pilsbry	1905	6.6	11.0	0.5		
Radiocentrum clappi	Ferriss	1904	6.5	14.8	0.4		
Radiocentrum ferrissi	Pilsbry	1915	6.3	14.8	0.5		
Radiocentrum hachetanum	Pilsbry	1915	8.7	15.4	0.3		
Orthalicidae							
Bulimulus guadalupensis	Bruguire	1789	17.0	8.0	0.4		*
Drymaeus dominicus	Reeve	1850	21.0	10.0	0.3		
Drymaeus dormani	W. G. Binney	1857	30.0	16.0	0.3		
Drymaeus multilineatus	Say	1825	22.3	11.0	0.3		
Liguus fasciatus	Müller	1774	50.0	25.0	0.3		
Naesiotus christenseni	W. B. Miller and Reeder	1984	17.7	8.4	0.5		
Naesiotus nigromontanus	Dall	1897	18.5	10.8	0.4		
Orthalicus floridensis	Pilsbry	1899	61.0	34.0	0.4		
Orthalicus reses	Pilsbry	1946	58.0	34.0	0.4		
Rabdotus alternatus	Say	1830	27.8	14.3	0.4		
Rabdotus dealbatus	Say	1821	19.4	12.6	0.5		
Rabdotus dealbatus neomexicanus	Pilsbry	1946	29.0	17.0	0.3		
Rabdotus dealbatus ragsdalei	Pilsbry	1890	21.5	10.8	0.4		
Rabdotus durangoanus	von Martens	1893	15.4	7.4	0.3		
Rabdotus mooreanus	Pfeiffer	1868	25.0	13.3	0.5		
Rabdotus pilsbryi	Ferriss	1925	27.9	12.3	0.6		
Oxychilidae							
Glyphyalinia NC 1			1.0	2.3	0.9		
Glyphyalinia carolinensis	Cockerell	1890	5.0	11.0	0.8		
Glyphyalinia clingmani	Dall	1890	2.9	6.0	0.9		
Glyphyalinia cryptomphala	G. H. Clapp	1915	2.5	5.5	0.9		
Glyphyalinia cumberlandiana	G. H. Clapp	1919	1.3	2.8	0.9		
Glyphyalinia floridana	Morrison	1937	2.6	4.5	0.3		
Glyphyalinia indentata	Say	1823	3.0	5.7	0.9		
Glyphyalinia junaluskana	Clench and Banks	1932	4.0	6.7	0.9		
Glyphyalinia latebricola	Hubricht	1968	3.1	6.3	0.8		
Glyphyalinia lewisiana	G. H. Clapp	1908	1.5	3.5	0.9		
Glyphyalinia luticola	Hubricht	1966	2.6	5.7	0.9		
Glyphyalinia ocoae	Hubricht	1978	1.9	4.8	0.6		
Glyphyalinia pecki	Hubricht	1966	2.7	5.7	0.7		
Glyphyalinia pentadelphia	Pilsbry	1900	2.5	5.0	0.8		
Glyphyalinia picea	Hubricht	1976	3.0	7.1	0.7		
Glyphyalinia praecox	H. B. Baker	1930	2.8	6.2	0.9		
Glyphyalinia raderi	Dall	1898	1.7	3.7	0.7		
Glyphyalinia rhoadsi	Pilsbry	1899	2.5	4.7	0.9		
Glyphyalinia rimula	Hubricht	1968	3.4	7.7	0.7		

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Glyphyalinia roemeri	Pilsbry and Ferriss	1906	2.0	4.0	0.7		
Glyphyalinia sculptilis	Bland	1858	5.0	12.5	0.9		
Glyphyalinia solida	H. B. Baker	1930	4.0	7.0	0.9		
Glyphyalinia specus	Hubricht	1965	2.3	4.8	0.4		
Glyphyalinia umbilicata	Cockerell	1893	2.3	5.0	0.9		
Glyphyalinia virginica	Morrison	1937	1.5	3.2	0.7		
Glyphyalinia wheatleyi	Bland	1883	2.3	5.0	0.9		
Mesomphix andrewsae	Pilsbry	1895	9.2	17.8	0.8		
Mesomphix anurus	Hubricht	1962	11.8	20.3	0.4		
Mesomphix capnodes	W. G. Binney	1857	20.0	31.0	0.3		
Mesomphix cupreus	Rafinesque	1831	15.0	26.0	0.3		
Mesomphix friabilis	W. G. Binney	1857	19.0	25.0	0.4		
Mesomphix globosus	MacMillan	1940	13.0	18.5	0.3		
Mesomphix inornatus	Say	1821	8.8	16.6	0.9		
Mesomphix latior	Pilsbry	1900	13.1	25.2	0.7		
Mesomphix perlaevis	Pilsbry	1900	11.5	19.0	0.3		
Mesomphix pilsbryi	G. H. Clapp	1904	15.0	25.0	0.3		
Mesomphix rugeli	W. G. Binney	1879	10.8	12.4	0.4		
Mesomphix subplanus	A. Binney	1842	9.9	21.2	1.0		
Mesomphix vulgatus	H. B. Baker	1933	17.5	27.8	0.3		
Nesovitrea binneyana	E. S. Morse	1864	1.8	4.3	0.7		
Nesovitrea dalliana	Pilsbry and Simpson	1889	1.2	2.8	0.7		
Nesovitrea electrina	Gould	1841	2.5	4.8	0.7		
Nesovitrea suzannae	Pratt	1978	2.3	4.5	0.7		
Oxychilus alliarius	J. S. Miller	1822	2.5	5.0	0.9		*
Oxychilus cellarius	Müller	1774	4.2	9.0	0.9		*
Oxychilus draparnaudi	Beck	1837	7.0	15.0	0.9		*
Oxychilus helveticus	Blum	1881	4.5	7.5	0.6		*
Vitrinizonites latissimus	J. Lewis	1875	7.5	15.0	0.8		
Philomycidae							
Megapallifera mutabilis	Hubricht	1951	60.0	10.0	1.0	*	
Megapallifera ragsdalei	Webb	1950	50.0	8.3	1.0	*	
Megapallifera wetherbyi	W. G. Binney	1874	12.0	3.0	1.0	*	
Pallifera dorsalis	A. Binney	1842	18.0	4.5	1.0	*	
Pallifera fosteri	F. C. Baker	1939	20.0	3.3	1.0	*	
Pallifera hemphilli	W. G. Binney	1885	25.0	6.3	1.0	*	
Pallifera marmorea	Pilsbry	1948	24.0	6.0	1.0	*	
Pallifera megaphallica	Grimm	1961	16.0	4.0	1.0	*	
Pallifera ohioensis	Sterki	1908	30.0	5.0	1.0	*	
Pallifera pilsbryi	C. D. Miles and Mead	1960	19.0	2.5	1.0	*	
Pallifera secreta	Cockerell	1900	27.5	4.6	1.0	*	
Pallifera tournescalis	Branson	1968	18.0	2.5	1.0	*	
Pallifera varia	Hubricht	1953	65.0	10.8	1.0	*	
Philomycus batchi	Branson	1968	50.3	8.0	1.0	*	
Philomycus bisdosus	Branson	1968	85.5	8.5	1.0	*	
Philomycus carolinianus	Bosc	1802	87.5	14.6	1.0	*	
Philomycus flexuolaris	Rafinesque	1820	75.0	12.5	1.0	*	
Philomycus sellatus	Hubricht	1972	100.0	16.6	1.0	*	
Philomycus togatus	Gould	1841	75.0	12.5	1.0	*	
Philomycus venustus	Hubricht	1953	100.0	16.6	1.0	*	
Philomycus virginicus	Hubricht	1953	100.0	16.6	1.0	*	

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Pleurodontidae							
Caracolus marginella	Gmelin	1791	20.0	35.0	0.3		*
Caracolus rostratus	Pfeiffer	1847	20.0	35.0	0.3		*
Zachrysia auricoma	Férussac	1821	18.0	28.0	0.3		*
Zachrysia provisoria	Pfeiffer	1858	18.0	28.0	0.3		*
Polygyridae							
Allogona lombardii	A. G. Smith	1943	19.0	27.0	0.3		
Allogona profunda	Say	1821	16.0	28.0	0.2		
Allogona ptychophora	A. D. Brown	1870	10.0	15.5	0.6		
Allogona townsendiana	I. Lea	1838	16.2	25.8	0.3		
Appalachina chilhoweensis	J. Lewis	1870	21.5	35.7	0.4		
Appalachina sayanus	Pilsbry	1906	14.5	24.0	0.5		
Appalachina sayanus kentucki	Dourson	2011	11.3	20.0	0.5		
Ashmunella amblya amblya	Pilsbry	1940	7.0	19.4	0.6		
Ashmunella amblya cornudasensis	Pilsbry	1940	7.7	18.0	0.5		
Ashmunella angulata	Pilsbry	1905	6.3	13.3	0.4		
Ashmunella animasensis	Vagvolgyi	1974	5.7	12.0	0.6		
Ashmunella ashmuni	Dall	1897	6.8	13.2	0.6		
Ashmunella auriculata	Vagvolgyi	1974	4.7	12.2	0.5		
Ashmunella bequaerti	Clench and W. B. Miller	1966	3.5	11.4	0.5		
Ashmunella binneyi	Pilsbry and Ferriss	1917	7.0	15.5	0.6		
Ashmunella carlsbadensis	Pilsbry	1932	5.5	13.0	0.5		
Ashmunella chiricahuana	Dall	1896	8.4	17.3	0.4		
Ashmunella cockerelli argenticola	Pilsbry and Ferriss	1917	7.4	16.0	0.7		
Ashmunella cockerelli cockerelli	Pilsbry and Ferriss	1917	5.2	17.1	0.6		
Ashmunella cockerelli perobtusa	Pilsbry and Ferriss	1917	7.8	16.0	0.5		
Ashmunella danielsi	Pilsbry and Ferriss	1915	7.0	13.9	0.5		
Ashmunella danielsi dispar	Pilsbry and Ferriss	1915	5.7	10.5	0.5		
Ashmunella edithae	Pilsbry and Cheatum	1951	5.5	16.2	0.6		
Ashmunella esuritor	Pilsbry	1915	7.7	15.0	0.5		
Ashmunella ferrissi	Pilsbry	1905	5.3	11.1	0.3		
Ashmunella harrisi	Metcalf and Smartt	1977	5.3	15.7	0.6		
Ashmunella hebardi	Pilsbry and Vanatta	1923	5.0	14.7	0.6		
Ashmunella kochii	G. H. Clapp	1908	6.7	17.7	0.7		
Ashmunella kochii caballoensis	Vagvolgyi	1974	7.1	17.8	0.7		
Ashmunella kochii sanandresensis	Vagvolgyi	1974	6.0	16.5	0.4		
Ashmunella lenticula	Gregg	1953	5.0	12.4	0.5		
Ashmunella lepiderma	Pilsbry and Ferriss	1910	5.0	11.0	0.3		
Ashmunella levettei	Bland	1881	8.0	16.0	0.5		
Ashmunella macromphala	Vagvolgyi	1974	5.9	13.7	0.5		
Ashmunella mearnsii	Dall	1895	5.5	13.0	0.6		
Ashmunella mendax	Pilsbry and Ferriss	1917	9.3	20.0	0.5		
Ashmunella mogollonensis	Pilsbry	1905	9.5	19.0	0.5		
Ashmunella mudgei	Cheatum	1971	6.8	16.6	0.5		
Ashmunella organensis	Pilsbry	1936	6.6	13.0	0.6		
Ashmunella pasonis pasonis	Drake	1951	5.0	13.5	0.6		
Ashmunella pasonis polygyroidea	Vagvolgyi	1974	5.0	14.5	0.6		
Ashmunella pilsbryana	Ferriss	1914	6.2	14.6	0.4		
Ashmunella proxima	Pilsbry	1905	6.3	13.0	0.5		
Ashmunella pseudodonta	Dall	1897	6.2	14.2	0.6		
Ashmunella pseudodonta capitanensis	Ashmun and Cockerell	1899	9.0	17.8	0.5		
Ashmunella rhyssa	Dall	1897	10.0	16.5	0.5		

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Ashmunella rhyssa altissima	Cockerell	1898	5.4	11.2	0.7		
Ashmunella rileyensis	Metcalf and Hurley	1971	5.5	14.6	0.6		
Ashmunella salinasensis	Vagvolgyi	1974	6.6	13.7	0.0		
Ashmunella sprouli	Fullington and Fullington	1978	4.1	12.0	0.7		
Ashmunella tetrodon animorum	Pilsbry and Ferriss	1915	6.2	13.5	0.5		
Ashmunella tetrodon fragilis	Pilsbry and Ferriss	1917	6.5	14.0	0.6		
Ashmunella tetrodon inermis	Pilsbry and Ferriss	1915	7.7	16.3	0.4		
Ashmunella tetrodon mutator	Pilsbry and Ferriss	1915	7.0	14.0	0.5		
Ashmunella tetrodon tetrodon	Pilsbry and Ferriss	1915	6.7	15.0	0.5		
Ashmunella thomsoniana	Ancey	1887	6.5	12.0	0.6		
Ashmunella todseni	Metcalf and Smartt	1977	5.7	12.8	0.6		
Ashmunella townsendi	Bartsch	1904	7.7	13.4	0.4		
Ashmunella varicifera	Ancey	1901	9.3	17.5	0.5		
Ashmunella walkeri	Ferriss	1904	4.5	13.3	0.7		
Cryptomastix devia	Gould	1846	14.1	22.2	0.5		
Cryptomastix germana	Gould	1851	5.5	8.3	0.2		
Cryptomastix germana vancouverinsulae	Pilsbry and Cook	1922	4.8	7.1	0.3		
Cryptomastix harfordiana	W. G. Binney	1886	4.6	8.8	0.3		
Cryptomastix hendersoni	Pilsbry	1928	8.5	15.4	0.5		
Cryptomastix magnidentata	Pilsbry	1940	5.7	10.8	0.5		
Cryptomastix mullani	Bland and J. G. Cooper	1861	8.3	12.9	0.4		
Cryptomastix populi	Vanatta	1924	8.8	16.9	0.5		
Cryptomastix sanburni	W. G. Binney	1886	6.8	11.1	0.4		
Daedalochila FL 1			4.0	8.0	0.7		
Daedalochila ariadnae	Pfeiffer	1848	4.0	10.0	0.7		
Daedalochila auriculata	Say	1818	7.8	15.5	0.8		
Daedalochila auriformis	Bland	1859	4.6	7.8	0.7		
Daedalochila avara	Say	1818	3.6	6.2	0.9		
Daedalochila bicornuta	Pilsbry	1900	7.0	14.0	0.6		
Daedalochila bisontes	Coles and Walsh	2004	3.9	8.0	0.7		
Daedalochila chisosensis	Pilsbry	1936	5.0	11.8	0.5		
Daedalochila delecta	Hubricht	1976	4.5	7.5	0.7		
Daedalochila deltoidea	Simpson	1889	3.6	7.8	0.4		
Daedalochila dorfeuilliana	I. Lea	1838	3.8	8.0	0.8		
Daedalochila fatigiata	Say	1829	3.6	10.4	0.8		
Daedalochila gracilis	Hubricht	1961	3.9	8.3	0.4		
Daedalochila hausmani	Jackson	1948	5.0	9.5	0.7		
Daedalochila hippocrepis	Pfeiffer	1848	5.1	11.5	0.6		
Daedalochila implicata	von Martens	1865	3.0	7.0	0.7		
Daedalochila jacksoni	Bland	1866	3.8	7.6	0.4		
Daedalochila leporina	Gould	1848	3.2	5.7	0.6		
Daedalochila lithica	Hubricht	1961	4.0	8.5	0.7		
Daedalochila mooreana	W. G. Binney	1858	4.2	8.0	0.6		
Daedalochila oppilata	Morelet	1849	4.1	8.0	0.7		
Daedalochila peninsulae	Pilsbry	1940	4.0	7.6	0.7		
Daedalochila peregrina	Rehder	1932	3.3	7.5	0.8		
Daedalochila plicata	Say	1821	3.0	6.7	0.8		
Daedalochila polita	Pilsbry and Hinkley	1907	4.0	9.6	0.8		
Daedalochila postelliana	Bland	1859	5.0	9.5	0.7		
Daedalochila rhoadsii	Pilsbry	1899	4.0	10.0	0.7		
Daedalochila scintilla	Pilsbry and Hubricht	1956	3.9	8.8	0.7		
Daedalochila simpsoni	Pilsbry and Ferriss	1907	3.3	6.6	0.4		

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Daedalochila subclausa	Pilsbry	1899	5.9	9.5	0.7		
Daedalochila tholus	W. G. Binney	1857	5.4	10.2	0.5		
Daedalochila triodontoides	Bland	1861	5.0	9.5	0.7		
Daedalochila troostiana	I. Lea	1839	3.5	7.4	0.6		
Daedalochila uvulifera	Shuttleworth	1852	7.0	12.0	0.8		
Euchemotrema fasciatum	Pilsbry	1940	5.1	10.2	0.6		
Euchemotrema fraternum fraternum	Say	1824	6.3	9.5	0.5		
Euchemotrema fraternum imperforatum	Pilsbry	1900	7.1	10.2	0.3		
Euchemotrema fraternum montanum	Archer	1939	11.2	6.4	0.5		
Euchemotrema hubrichti	Pilsbry	1940	4.5	9.3	0.5		
Euchemotrema leai aliciae	Pilsbry	1893	5.5	7.6	0.5		
Euchemotrema leai cheatumi	Fullington	1974	4.6	8.2	0.6		
Euchemotrema leai leai	A. Binney	1841	5.7	8.6	0.5		
Euchemotrema wichitorum	Branson	1972	4.7	8.4	0.4		
Fumonelix archeri	Pilsbry	1940	9.2	14.2	0.4		
Fumonelix cherohalaensis	Dourson	2012	14.1	21.5	0.4		
Fumonelix christyi	Bland	1860	5.0	9.4	0.2		
Fumonelix clingmanicus	Pilsbry	1904	9.0	13.2	0.4		
Fumonelix jonesiana	Archer	1938	8.0	13.2	0.4		
Fumonelix langdoni	Dourson	2012	10.7	18.0	0.5		
Fumonelix orestes	Hubricht	1975	10.4	16.5	0.3		
Fumonelix roanensis	Pilsbry	1940	9.3	16.0	0.5		
Fumonelix wetherbyi	Bland	1873	11.0	17.9	0.4		
Fumonelix wheatleyi	Bland	1860	12.5	18.8	0.4		
Hochbergellus hirsutus	Roth and W. B. Miller	1992	10.5	15.4	0.6		
Inflectarius approximans	G. H. Clapp	1905	5.0	8.0	0.2		
Inflectarius downieanus	Bland	1861	10.0	13.5	0.2		
Inflectarius edentatus	Sampson	1889	7.0	12.0	0.5		
Inflectarius ferrissi	Pilsbry	1897	12.5	22.1	0.2		
Inflectarius inflectus	Say	1821	6.5	11.5	0.2		
Inflectarius kalmianus	Hubricht	1965	6.1	9.2	0.2		
Inflectarius magazinensis	Pilsbry and Ferriss	1907	7.4	14.0	0.4		
Inflectarius rugeli	Shuttleworth	1852	8.0	13.5	0.2		
Inflectarius smithi	G. H. Clapp	1905	8.8	14.1	0.4		
Inflectarius subpalliatus	Pilsbry	1893	8.0	15.0	0.5		
Inflectarius verus	Hubricht	1954	7.2	13.5	0.2		
Linisia tamaulipasensis	I. Lea	1857	5.3	13.2	0.6		
Linisia texasiana	Moricand	1833	5.1	10.5	0.8		
Lobosculum pustula	Férussac	1832	2.7	4.4	0.7		
Lobosculum pustuloides	Bland	1858	2.5	5.5	0.7		
Mesodon altivagus	Pilsbry	1900	20.5	26.3	0.4		
Mesodon andrewsae	W. G. Binney	1879	16.6	24.3	0.3		
Mesodon clausus clausus	Say	1821	12.0	16.0	0.2		
Mesodon clausus trossulus	Hubricht	1966	12.0	16.0	0.2		
Mesodon elevatus	Say	1821	18.0	22.0	0.2		
Mesodon mitchellianus	I. Lea	1839	12.4	16.3	0.3		
Mesodon normalis	Pilsbry	1900	26.3	33.0	0.4		
Mesodon sanus	Clench and Archer	1933	11.9	16.8	0.3		
Mesodon thyroidus	Say	1816	15.0	21.0	0.2		
Mesodon zaletus	A. Binney	1837	20.0	27.0	0.2		
Neohelix albolabris	Say	1817	18.0	28.0	0.5		
Neohelix alleni	Sampson	1883	16.0	26.0	0.5		
Neohelix dentifera	A. Binney	1837	12.3	21.5	0.5		

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Neohelix divesta	Gould	1848	10.5	17.0	0.7		
Neohelix lioderma	Pilsbry	1902	7.1	17.3	0.4		
Neohelix major	A. Binney	1837	39.5	32.0	0.5		
Neohelix solemi	Emberton	1988	15.0	22.0	0.5		
Patera appressa	Say	1821	8.0	17.5	0.6		
Patera binneyana	Pilsbry	1899	13.0	24.5	0.5		
Patera clarki	I. Lea	1858	10.2	15.1	0.3		
Patera clenchi	Rehder	1932	9.7	17.5	0.7		
Patera estillensis	Dourson	2011	7.8	17.5	0.7		
Patera indianorum	Pilsbry	1899	12.0	22.5	0.4		
Patera kiowaensis	Simpson	1888	8.3	14.5	0.4		
Patera laevior	Pilsbry	1940	7.5	16.0	0.2		
Patera leatherwoodi	Pratt	1971	8.5	17.6	0.7		
Patera panselenus	Hubricht	1976	8.3	19.9	0.5		
Patera pennsylvanica	Green	1827	13.0	18.0	0.2		
Patera perigrapta	Pilsbry	1894	10.0	19.0	0.2		
Patera roemeri	Pfeiffer	1848	11.6	21.0	0.5		
Patera sargentiana	C. W. Johnson and Pilsbry	1892	11.7	24.6	0.3		
Polygyra cereolus	Muhlfeld	1816	3.7	12.0	0.6		
Polygyra plana bahamensis	Vanatta	1919	3.1	8.3	0.6		
Polygyra septemvolva	Say	1818	3.7	11.0	0.6		
Praticolella bakeri	Vanatta	1915	7.8	10.8	0.5		
Praticolella berlandieriana	Moricand	1833	8.4	11.0	0.4		
Praticolella candida	Hubricht	1983	8.9	11.9	0.4		
Praticolella griseola	Pfeiffer	1841	9.0	11.7	0.5		
Praticolella jejuna	Say	1821	5.4	8.0	0.5		
Praticolella lawae	J. Lewis	1874	4.0	6.0	0.5		
Praticolella mexicana	Perez	2011	7.6	10.9	0.5		
Praticolella mobiliana	I. Lea	1841	6.0	8.5	0.5		
Praticolella pachyloma	Menke	1847	9.7	11.7	0.5		
Praticolella taeniata	Pilsbry	1940	8.6	11.8	0.4		
Praticolella trimatris	Hubricht	1983	7.7	9.5	0.4		
Stenotrema altispira	Pilsbry	1894	7.2	9.7	0.2		
Stenotrema angellum	Hubricht	1958	6.3	10.5	0.5		
Stenotrema barbatum	G. H. Clapp	1904	6.5	10.0	0.5		
Stenotrema barbigerum	Redfield	1856	5.0	9.3	0.5		
Stenotrema blandianum	Pilsbry	1903	4.4	8.0	0.6		
Stenotrema brevipila	G. H Clapp	1907	4.9	6.6	0.2		
Stenotrema burringtoni	Grimm	1971	5.5	8.4	0.5		
Stenotrema calvescens	Hubricht	1961	6.2	9.2	0.5		
Stenotrema cohuttense	G. H. Clapp	1914	6.5	4.5	0.5		
Stenotrema deceptum	G. H. Clapp	1905	4.7	6.6	0.3		
Stenotrema depilatum	Pilsbry	1895	8.4	10.6	0.3		
Stenotrema edgarianum	I. Lea	1841	5.0	9.0	0.5		
Stenotrema edvardsi	Bland	1856	5.1	7.5	0.4		
Stenotrema exodon	Pilsbry	1900	5.9	9.5	0.4		
Stenotrema florida	Pilsbry	1940	8.3	12.0	0.5		
Stenotrema hirsutum	Say	1817	5.0	7.5	0.5		
Stenotrema labrosum	Bland	1862	6.6	11.5	0.5		
Stenotrema macgregori	Dourson	2011	6.1	9.0	0.4		
Stenotrema magnifumosum	Pilsbry	1900	5.5	7.7	0.4		
Stenotrema maxillatum	Gould	1848	5.2	7.0	0.5		
Stenotrema morosum	Hubricht	1978	4.4	6.5	0.5		

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Stenotrema pilsbryi	Ferriss	1900	5.5	9.6	0.3		
Stenotrema pilula	Pilsbry	1900	4.3	5.8	0.4		
Stenotrema simile	Grimm	1971	6.7	9.3	0.5		
Stenotrema spinosum	I. Lea	1830	6.0	13.0	0.5		
Stenotrema stenotrema	Pfeiffer	1842	6.8	10.0	0.5		
Stenotrema turbinella	Clench and Archer	1933	6.0	8.6	0.4		
Stenotrema unciferum	Pilsbry	1900	5.0	7.5	0.5		
Stenotrema waldense	Archer	1938	6.0	7.8	0.4		
Trilobopsis loricata	Gould	1846	3.6	6.7	0.5		
Trilobopsis penitens	Hanna and Rixford	1923	3.4	7.9	0.9		
Trilobopsis roperi	Pilsbry	1889	3.3	8.2	0.9		
Trilobopsis tehamana	Pilsbry	1928	3.2	7.0	0.8		
Trilobopsis trachypepla	S. S. Berry	1933	4.3	7.4	0.5		
Triodopsis affinis	Hubricht	1954	8.0	12.0	0.7		
Triodopsis alabamensis	Pilsbry	1902	6.0	11.5	0.7		
Triodopsis anteridon	Pilsbry	1940	6.9	13.4	0.4		
Triodopsis burchi	Hubricht	1950	6.0	12.5	0.7		
Triodopsis claibornensis	Lutz	1950	6.2	11.2	0.7		
Triodopsis complanata	Pilsbry	1898	10.8	24.2	0.5		
Triodopsis cragini	Call	1886	4.5	8.3	0.7		
Triodopsis discoidea	Pilsbry	1904	10.0	19.5	0.7		
Triodopsis fallax	Say	1825	8.0	12.0	0.7		
Triodopsis fradulenta	Pilsbry	1894	8.4	15.7	0.6		
Triodopsis fulciden	Hubricht	1952	4.4	8.0	0.7		
Triodopsis henriettae	Mazyck	1877	6.0	11.3	0.7		
Triodopsis hopetonensis	Shuttleworth	1852	6.0	11.0	0.7		
Triodopsis juxtidens	Pilsbry	1894	9.0	17.6	0.7		
Triodopsis messana	Hubricht	1952	6.5	12.0	0.7		
Triodopsis neglecta	Pilsbry	1899	5.6	11.6	0.6		
Triodopsis obsoleta	Pilsbry	1894	6.0	11.0	0.7		
Triodopsis palustris	Hubricht	1958	8.0	15.0	0.7		
Triodopsis pendula	Hubricht	1952	5.9	11.7	0.7		
Triodopsis picea	Hubricht	1958	8.8	13.4	0.7		
Triodopsis platysayoides	Brooks	1933	8.0	18.0	0.9		
Triodopsis rugosa	Brooks and MacMillan	1940	9.2	5.6	0.7		
Triodopsis soelneri	J. B. Henderson	1907	7.2	10.8	0.6		
Triodopsis tennesseensis	Walker and Pilsbry	1902	10.4	22.4	0.5		
Triodopsis tridentata	Say	1816	7.0	12.8	0.7		
Triodopsis vannostrandi	Bland	1875	7.6	12.4	0.7		
Triodopsis vulgata	Pilsbry	1940	9.0	16.7	0.7		
Triodopsis vultuosa	Gould	1848	6.5	11.5	0.7		
Vespericola armigera	Ancey	1881	9.0	15.0	0.3		
Vespericola columbianus	I. Lea	1838	10.2	14.9	0.4		
Vespericola embertoni	Roth and W. B. Miller	2000	9.1	15.0	0.4		
Vespericola eritrichius	S. S. Berry	1939	10.2	12.2	0.4		
Vespericola haplus	S. S. Berry	1933	7.2	10.3	0.6		
Vespericola karokorum	Talmadge	1962	8.9	13.6	0.6		
Vespericola klamathicus	Roth and W. B. Miller	1995	10.1	15.2	0.5		
Vespericola marinensis	Roth and W. B. Miller	1993	8.7	12.2	0.4		
Vespericola megasoma	Pilsbry	1928	9.9	13.7	0.4		
Vespericola ohlone	Roth	2003	9.1	13.6	0.4		
Vespericola orius	S. S. Berry	1933	10.3	14.7	0.4		
Vespericola pilosus	J. Henderson	1928	9.7	13.7	0.4		

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Vespericola pinicola	S. S. Berry	1916	6.7	11.0	0.4		
Vespericola pressleyi	Roth	1985	9.3	14.3	0.5		
Vespericola rhodophila	Roth and W. B. Miller	2000	9.0	13.0	0.4		
Vespericola rothi	Cordero and W. B. Miller	1995	10.2	15.5	0.4		
Vespericola sasquatch	Roth and W. B. Miller	2000	9.3	16.0	0.5		
Vespericola scotti	Cordero and W. B. Miller	1995	7.0	12.2	0.5		
Vespericola shasta	S. S. Berry	1921	8.5	11.3	0.5		
Vespericola sierranus	S. S. Berry	1921	5.5	7.6	0.4		
Webbhelix multilineata	Say	1821	15.0	21.5	0.5		
Xolotrema caroliniense	I. Lea	1834	10.4	21.0	0.5		
Xolotrema denotatum	Férussac	1821	13.0	23.4	0.5		
Xolotrema fosteri	F. C. Baker	1921	9.5	16.5	0.5		
Xolotrema obstrictum	Say	1821	8.8	17.3	0.5		
Xolotrema occidentale	Pilsbry and Ferriss	1907	8.1	17.4	0.8		
Pomatiidae							
Chondropoma dentatum	Say	1825	10.8	5.9	0.2		
Opisthosiphon bahamensis	Pfeiffer	1865	8.5	4.7	0.2		
Pomatiopsidae							
Pomatiopsis cincinnatiensis	I. Lea	1840	6.0	4.0	0.2		
Pomatiopsis lapidaria	Say	1817	6.8	3.5	0.2		
Pristilomatidae							
Hawaiia IA 1			1.2	2.5	0.7		
Hawaiia alachuana	Dall	1885	1.2	2.5	0.7		
Hawaiia minuscula	A. Binney	1841	1.2	2.5	0.7		
Paravitrea AR 1			2.6	4.8	0.7		
Paravitrea alethia	Hubricht	1978	3.4	5.9	0.4		
Paravitrea amicalola	Hubricht	1976	2.4	4.1	0.7		
Paravitrea andrewsae	W. G. Binney	1879	4.3	7.6	0.6		
Paravitrea aulacogyra	Pilsbry and Ferriss	1906	3.3	8.0	0.9		
Paravitrea bellona	Hubricht	1978	2.1	5.8	0.5		
Paravitrea bidens	Hubricht	1963	1.8	3.6	0.5		
Paravitrea blarina	Hubricht	1963	2.2	3.9	0.4		
Paravitrea calcicola	H. B. Baker	1931	3.6	5.9	0.7		
Paravitrea capsella	Gould	1851	3.0	5.5	0.7		
Paravitrea ceres	Hubricht	1978	2.0	4.3	0.7		
Paravitrea clappi	Pilsbry	1898	3.2	5.8	0.7		
Paravitrea conecuhensis	G. H. Clapp	1917	2.5	4.5	0.7		
Paravitrea dentilla	Hubricht	1978	3.5	6.8	0.5		
Paravitrea diana	Hubricht	1983	2.5	6.1	0.5		
Paravitrea grimmi	Hubricht	1968	2.4	5.2	0.7		
Paravitrea hera	Hubricht	1983	5.0	7.5	0.4		
Paravitrea lacteodens	Pilsbry	1903	2.4	4.8	0.7		
Paravitrea lamellidens	Pilsbry	1898	1.8	3.6	0.8		
Paravitrea lapilla	Hubricht	1965	2.2	4.8	0.5		
Paravitrea metallacta	Hubricht	1963	1.9	3.9	0.5		
Paravitrea mira	Hubricht	1975	3.9	6.3	0.4		
Paravitrea multidentata	A. Binney	1840	1.3	2.5	0.7		
Paravitrea petrophila	Bland	1883	3.0	5.4	0.6		
Paravitrea pilsbryana	G. H. Clapp	1919	2.0	4.5	0.7		
Paravitrea placentula	Shuttleworth	1852	3.6	7.2	0.6		
Paravitrea pontis	H. B. Baker	1931	2.8	5.1	0.6		
Paravitrea reesei	Morrison	1937	1.6	3.0	0.7		
Paravitrea septadens	Hubricht	1978	1.6	3.4	0.7		

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Paravitrea seradens	Hubricht	1972	2.8	5.5	0.7		
Paravitrea significans	Bland	1866	2.0	4.5	0.7		
Paravitrea simpsoni	Pilsbry	1889	2.2	5.1	0.8		
Paravitrea smithi	Walker	1928	2.2	4.5	0.8		
Paravitrea subtilis	Hubricht	1978	1.4	2.9	0.7		
Paravitrea tantilla	Hubricht	1963	2.0	3.7	0.6		
Paravitrea ternaria	Hubricht	1978	3.4	6.8	0.5		
Paravitrea tiara	Hubricht	1978	3.4	6.0	0.5		
Paravitrea toma	Hubricht	1975	2.6	4.8	0.5		
Paravitrea tridens	Pilsbry	1946	3.0	5.9	0.5		
Paravitrea umbilicaris	Ancey	1887	1.4	2.9	0.8		
Paravitrea variabilis	H. B. Baker	1929	1.8	3.8	0.6		
Paravitrea varidens	Hubricht	1978	4.6	7.6	0.5		
Pilsbryna aurea	H. B. Baker	1929	3.2	5.1	0.4		
Pilsbryna castanea	H. B. Baker	1931	2.0	3.7	0.5		
Pilsbryna nodopalma	Slapcinsky and Coles	2004	1.5	3.0	0.5		
Pilsbryna quadrilamellata	Slapcinsky and Coles	2004	1.7	3.2	0.8		
Pilsbryna vanattai	Pilsbry and Walker	1902	4.8	4.0	0.5		
Pristiloma arcticum	Lehnert	1884	1.6	2.7	0.4		
Pristiloma cavator	Roth	1998	3.1	4.9	0.6		
Pristiloma chersinella	Dall	1886	1.9	3.4	0.4		
Pristiloma gabrielinum	S. S. Berry	1924	2.2	4.3	0.7		
Pristiloma idahoense	Pilsbry	1902	1.6	3.2	0.6		
Pristiloma johnsoni	Dall	1895	1.1	2.3	0.9		
Pristiloma lansingi	Bland	1875	1.5	2.5	0.7		
Pristiloma nicholsoni	H. B. Baker	1930	1.1	1.8	0.8		
Pristiloma orotis	S. S. Berry	1930	1.3	2.2	0.7		
Pristiloma pilsbryi	Vanatta	1899	1.7	2.4	0.7		
Pristiloma shepardae	Hemphill	1892	1.0	2.4	0.6		
Pristiloma stearnsi	Bland	1875	2.5	3.6	0.6		
Pristiloma subrupicola	Dall	1877	1.4	2.9	0.5		
Pristiloma subrupicola spelaeum	Dall	1895	1.8	4.0	0.5		
Pristiloma wascoense	Hemphill	1911	1.0	2.0	0.4		
Vitrea crystallina	Westerlund	1871	2.2	4.3	0.7		*
Punctidae							
Punctum IA 1			0.7	1.5	0.5		
Punctum blandianum	Pilsbry	1900	0.7	1.2	0.5		
Punctum californicum	Pilsbry	1898	1.1	1.8	0.5		
Punctum conspectum	Reeve	1852	1.3	2.1	0.3		
Punctum hannai	Roth	1985	0.8	1.3	0.5		
Punctum minutissimum	I. Lea	1841	0.6	1.1	0.5		
Punctum randolphi	Dall	1895	0.9	1.2	0.5		
Punctum smithi	Morrison	1935	0.6	1.2	0.5		
Punctum vitreum	H. B. Baker	1930	0.7	1.2	0.5		
?Zonites? diegoensis	Hemphill	1892	1.8	1.5	0.5		
Pupillidae							
Pupilla blandi blandi	E. S. Morse	1865	3.3	1.5	0.8		
Pupilla blandi charlestonensis	Pilsbry	1948	3.0	1.4	0.8		
Pupilla blandi pithodes	Pilsbry and Ferriss	1917	3.4	1.7	0.6		
Pupilla hebes hebes	Ancey	1881	3.3	1.5	0.8		
Pupilla hebes kaibabensis	Pilsbry and Ferriss	1921	2.7	1.5	0.8		
Pupilla hebes nefas	Pilsbry and Ferriss	1910	3.7	1.8	0.7		
Pupilla muscorum muscorum	Linnaeus	1758	3.6	1.7	0.8		*

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Pupilla muscorum xerobia	Pilsbry	1948	2.5	1.5	0.8		
Pupilla sonorana	Sterki	1899	2.8	1.4	0.6		
Pupilla syngenes	Pilsbry	1890	3.7	1.7	0.8		
Pupoides albilabris	C. B. Adams	1841	4.8	2.0	0.3		
Pupoides hordaceus	Gabb	1866	3.8	1.6	0.5		
Pupoides inornatus	Vanatta	1915	3.5	1.6	0.6		
Pupoides modicus	Gould	1848	3.9	2.2	0.3		
Sagdidae							
Lacteoluna selenina	Gould	1848	2.7	5.0	0.7		
Spiraxidae							
Euglandina rosea	Férussac	1818	50.0	21.0	0.3		
Euglandina singleyana	W. G. Binney	1892	45.0	16.5	0.5		
Euglandina texasiana	Pfeiffer	1857	31.1	11.2	0.5		
Pseudosubulina cheatumi	Pilsbry	1950	5.7	1.4	0.2		
Streptaxidae							
Gulella bicolor	Hutton	1834	6.5	1.5	0.2		*
Strobilopsidae							
Strobilops aenea	Pilsbry	1926	1.9	2.2	0.0		
Strobilops affinis	Pilsbry	1893	2.5	2.8	0.0		
Strobilops hubbardi	A. D. Brown	1861	1.2	2.6	0.5		
Strobilops labyrinthica	Say	1817	1.8	2.3	0.0		
Strobilops texasiana	Pilsbry and Ferriss	1906	1.9	2.3	0.0		
Subulinidae							
Lamellaxis clavulinus	Potiez and Michaud	1838	7.0	2.4	0.2		*
Lamellaxis gracilis	Hutton	1834	10.0	3.0	0.2		*
Lamellaxis mauritianum	Pfeiffer	1852	11.5	3.4	0.2		*
Lamellaxis micra	d'Orbigny	1835	7.0	2.3	0.2		*
Opeas pumilum	Pfeiffer	1840	5.7	1.9	0.2		*
Opeas pyrgula	Schmacker and Boettger	1891	8.0	2.2	0.2		*
Rumina decollata	Linnaeus	1758	260	11.0	0.2		*
Subulina octona	Bruguire	1792	17.0	4.3	0.2		*
Succineidae							
Catinella aprica	Hubricht	1968	7.0	4.0	0.3		
Catinella avara	Say	1824	9.0	5.5	0.3		
Catinella exile	Leonard	1972	6.5	3.5	0.3		
Catinella gabbii	Tryon	1866	9.5	5.9	0.3		
Catinella gelida	F. C. Baker	1927	7.3	4.0	0.3		
Catinella hubrichti	Grimm	1960	7.0	4.0	0.3		
Catinella oklahomarum	Webb	1953	7.0	4.0	0.3		
Catinella pugilator	Hubricht	1961	7.0	4.0	0.3		
Catinella rehderi	Pilsbry	1948	9.0	5.8	0.3		
Catinella stretchiana	Bland	1865	6.3	5.0	0.4		
Catinella vagans	Pilsbry	1900	7.0	4.0	0.3		
Catinella vermeta	Say	1829	7.0	3.9	0.3		
Catinella wandae	Webb	1953	7.3	4.0	0.3		
Oxyloma effusum	Pfeiffer	1853	18.0	8.5	0.3		
Oxyloma groenlandicum	Müller	1842	11.0	4.0	0.3		
Oxyloma hawkinsi	Baird	1863	19.0	8.0	0.5		
Oxyloma haydeni	W. G. Binney	1858	21.0	9.0	0.4		
Oxyloma kanabense	Pilsbry	1948	16.6	8.1	0.3		
Oxyloma missoula	Hubricht	1982	14.5	7.5	0.3		
Oxyloma nuttallianum	I. Lea	1841	12.7	6.4	0.3		
Oxyloma peoriense	Wolf	1894	10.0	6.0	0.3		

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Oxyloma retusa	I. Lea	1834	15.5	8.0	0.3		
Oxyloma salleanum	Pfeiffer	1849	19.0	10.0	0.3		
Oxyloma sillimani	Bland	1865	16.4	8.6	0.4		
Oxyloma subeffusum	Pilsbry	1948	13.2	8.2	0.3		
Oxyloma verrilli	Bland	1865	7.0	4.0	0.3		
Succinea MN 1			13.0	7.0	0.5		
Succinea bakeri	Hubricht	1963	16.0	12.0	0.5		
Succinea barberi	W. B. Marshall	1926	17.5	7.5	0.5		
Succinea californica	P. Fischer and Crosse	1878	7.0	4.0	0.5		
Succinea campestris	Say	1817	15.0	10.0	0.5		
Succinea chittenangoensis	Pilsbry	1908	21.2	10.9	0.3		
Succinea floridana	Pilsbry	1905	13.7	8.8	0.5		
Succinea forsheyi	I. Lea	1864	13.0	9.0	0.5		
Succinea greerii	Tryon	1866	12.2	7.4	0.5		
Succinea grosvenori	I. Lea	1864	12.2	7.4	0.5		
Succinea indiana	Pilsbry	1905	14.0	7.0	0.5		
Succinea luteola	Gould	1848	19.0	10.0	0.5		
Succinea oregonensis	I. Lea	1841	6.5	4.0	0.5		
Succinea ovalis	Say	1817	20.0	14.0	0.5		
Succinea paralia	Hubricht	1983	14.0	9.0	0.5		
Succinea pleistocenica	F. C. Baker	1948	21.0	13.0	0.5		
Succinea putris	Linnaeus	1758	21.0	13.0	0.5		*
Succinea rusticana	Gould	1846	11.8	6.2	0.5		
Succinea solastra	Hubricht	1961	15.3	7.3	0.4		
Succinea strigata	Pfeiffer	1855	14.0	8.0	0.5		
Succinea unicolor	Tryon	1866	9.0	6.0	0.5		
Succinea urbana	Hubricht	1961	14.0	7.0	0.5		
Succinea wilsonii	I. Lea	1864	13.7	7.5	0.5		
Testacellidae							
Testacella haliotidea	Draparnaud	1801	100.0	16.7	1.0	*	*
Thysanophoridae							
Hojeda inaguensis	Weinland	1880	2.1	3.3	0.5		
Microphysula cookei	Pilsbry	1922	1.9	4.0	1.0		
Microphysula ingersolli	Bland	1875	2.5	4.0	1.0		
Thysanophora hornii	Gabb	1866	2.8	4.2	0.5		
Thysanophora plagioptycha	Shuttleworth	1854	3.0	3.0	0.4		
Truncatellidae							
Truncatella californica	Pfeiffer	1857	4.6	1.6	0.2		
Truncatella caribaensis	Reeve	1842	7.5	2.8	0.2		
Truncatella clathrus	Lowe	1932	4.5	1.8	0.2		
Truncatella pulchella	Pfeiffer	1839	4.5	1.7	0.2		
Truncatella stimpsonii	Stearns	1872	4.8	1.8	0.2		
Urocoptidae							
Cerion incanum	A. Binney	1851	27.0	10.0	0.5		
Cochlodinella poeyana	d'Orbigny	1841	12.5	2.8	0.5		
Coelostemma pyrgonasta	F. G. Thompson	1988	16.6	4.9	0.5		
Holospira animasensis	Gilbertson and Worthington	2003	11.0	3.7	0.6		
Holospira arizonensis	Stearns	1890	12.8	4.2	0.8		
Holospira bilamellata	Dall	1895	20.5	5.0	0.8		
Holospira campestris	Pilsbry and Ferriss	1915	11.5	3.7	0.7		
Holospira chiricahuana	Pilsbry	1905	9.0	2.8	0.7		
Holospira cionella	Pilsbry	1905	10.0	3.1	0.7		
Holospira cockerelli	Dall	1897	12.1	3.5	0.5		

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Holospira crossei	Dall	1895	17.0	4.0	0.6		
Holospira danielsi	Pilsbry and Ferriss	1915	11.5	3.5	0.7		
Holospira ferrissi	Pilsbry	1905	8.2	3.0	0.7		
Holospira goldfussi	Menke	1847	13.0	3.7	0.7		
Holospira hamiltoni	Dall	1897	20.5	4.9	0.7		
Holospira mesolia	Pilsbry	1912	21.7	6.1	0.8		
Holospira metcalfi	F. G. Thompson	1974	16.0	3.7	0.7		
Holospira millestriata	Pilsbry and Ferriss	1915	8.8	3.3	0.8		
Holospira montivaga	Pilsbry	1946	15.0	4.6	0.4		
Holospira oritis	Pilsbry and Cheatum	1951	14.6	4.8	0.9		
Holospira pasonis	Dall	1895	22.5	6.5	0.8		
Holospira pityis	Pilsbry and Cheatum	1951	8.5	4.0	0.6		
Holospira regis	Pilsbry and Cockerell	1905	10.8	3.3	0.5		
Holospira riograndensis	Pilsbry	1946	18.2	5.1	0.7		
Holospira sherbrookei	Gilbertson	1989	14.0	3.8	0.7		
Holospira tantalus	Bartsch	1906	10.2	3.3	0.6		
Holospira whetstonensis	Pilsbry and Ferriss	1923	12.8	3.6	0.7		
Holospira yucatanensis	Bartsch	1906	18.1	5.9	0.8		
Metastoma roemeri	Pfeiffer	1848	14.0	4.0	0.5		
Microceramus pontificus	Gould	1848	10.0	3.7	0.5		
Microceramus texanus	Pilsbry	1898	9.5	3.3	0.6		
Valloniidae							
Planogyra asteriscus	E. S. Morse	1857	0.9	1.8	1.0		
Planogyra clappi	Pilsbry	1898	1.1	2.0	0.9		
Pupisoma dioscoricola	C. B. Adams	1845	1.9	1.8	0.3		
Pupisoma macneilli	G. H. Clapp	1918	1.3	1.2	0.3		
Vallonia costata	Müller	1774	1.0	2.5	0.7		*
Vallonia cyclophorella	Sterki	1892	1.2	2.7	0.7		
Vallonia excentrica	Sterki	1893	1.1	2.3	0.7		*
Vallonia gracilicosta	Reinhardt	1883	1.1	2.6	0.7		
Vallonia parvula	Sterki	1893	0.8	2.0	0.7		
Vallonia perspectiva	Sterki	1893	0.7	2.0	0.7		
Vallonia pulchella	Müller	1774	1.2	2.4	0.7		*
Vallonia terraenovae	Gerber	1996	1.4	2.6	0.7		
Zoogenetes harpa	Say	1824	3.3	2.5	0.3		
Veronicellidae							
Angustipes ameghini	Gambetta	1923	45.0	11.0	1.0	*	*
Diplosolenodes occidentale	Guilding	1825	50.0	15.0	1.0	*	*
Laevicaulis alte	Férussac	1821	70.0	18.0	1.0	*	*
Leidyula kraussi	Férussac	1823	36.0	12.0	1.0	*	*
Leidyula moreleti	Crosse and P. Fischer	1872	80.0	14.0	1.0	*	*
Sarasinula plebeia	P. Fischer	1868	60.0	14.0	1.0	*	*
Veronicella floridana	Leidy	1851	50.0	20.0	1.0	*	
Veronicella sloanii	Cuvier	1817	80.0	14.0	1.0	*	*
Vertiginidae							
Bothriopupa variolosa	Gould	1848	1.8	1.3	0.3		
Chaenaxis intuscostata	Pilsbry and Ferriss	1906	3.8	1.8	0.7		
Chaenaxis tuba	Pilsbry and Ferriss	1906	3.2	1.6	0.6		
Columella ID 1			2.1	1.1	0.5		
Columella columella alticola	Martens	1830	2.7	1.0	0.8		
Columella simplex	Gould	1840	2.1	1.1	0.5		
Gastrocopta abbreviata	Sterki	1909	3.7	2.0	0.5		
Gastrocopta armifera	Say	1821	4.7	2.5	0.5		

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Gastrocopta ashmuni	Sterki	1898	2.0	1.0	0.6		
Gastrocopta ashmuni minor	Sterki	1898	1.7	0.8	0.5		
Gastrocopta bilamellata	Sterki and Clapp	1909	2.1	0.9	0.7		
Gastrocopta clappi	Sterki	1909	3.7	1.9	0.5		
Gastrocopta cochisensis	Pilsbry and Ferriss	1910	2.3	1.1	0.5		
Gastrocopta contracta	Say	1822	2.3	1.2	0.2		
Gastrocopta corticaria	Say	1816	2.5	1.0	0.6		
Gastrocopta cristata	Pilsbry and Vanatta	1900	2.8	1.2	0.6		
Gastrocopta dalliana	Sterki	1898	1.8	0.8	0.7		
Gastrocopta holzingeri	Sterki	1889	1.6	0.7	0.7		
Gastrocopta oligobasidon	Pilsbry and Ferriss	1910	2.5	1.1	0.7		
Gastrocopta pellucida	Pfeiffer	1841	2.1	0.9	0.8		
Gastrocopta pentodon	Say	1822	1.8	0.9	0.3		
Gastrocopta peversa	Sterki	1898	2.4	1.1	0.6		
Gastrocopta pilsbryana	Sterki	1890	1.8	0.8	0.6		
Gastrocopta procera	Gould	1840	2.5	1.1	0.3		
Gastrocopta quadridens	Pilsbry	1916	2.9	1.3	0.6		
Gastrocopta riograndensis	Pilsbry	1916	2.5	1.1	0.4		
Gastrocopta riparia	Pilsbry	1916	2.5	1.1	0.5		
Gastrocopta rogersensis	Nekola and Coles	2002	2.1	0.9	0.5		
Gastrocopta ruidosensis	Cockerell	1899	3.9	1.9	0.6		
Gastrocopta rupicola	Say	1821	2.5	1.1	0.5		
Gastrocopta servilis	Gould	1843	2.5	1.1	0.5		
Gastrocopta similis	Sterki	1909	3.8	1.8	0.6		*
Gastrocopta sterkiana	Pilsbry	1917	2.5	1.1	0.5		
Gastrocopta tappaniana	C. B. Adams	1842	2.1	1.3	0.3		
Sterkia calamitosa	Pilsbry	1889	1.5	0.8	0.8		
Sterkia clementina	Sterki	1890	1.8	0.8	0.3		
Sterkia eyriesi rhoadsi	Pilsbry	1899	1.9	1.0	0.8		
Sterkia hemphilli	Sterki	1890	1.8	0.8	0.2		
Vertigo AK 1			2.0	1.1	0.6		
Vertigo AK 2			2.0	1.1	0.8		
Vertigo AK 3			2.0	1.1	0.6		
Vertigo AK 4			1.8	1.2	0.5		
Vertigo AK 5			2.2	1.2	0.8		
Vertigo AZ 1			1.2	1.9	0.6		
Vertigo UT 1			1.7	1.1	0.3		
Vertigo UT 2			2.0	1.1	0.7		
Vertigo aff. genesii			1.9	1.2	0.3		
Vertigo alabamensis	G. H. Clapp	1915	1.8	0.9	0.5		
Vertigo allyniana	S. S. Berry	1919	2.1	1.3	0.4		
Vertigo andrusiana	Pilsbry	1899	2.4	1.3	0.4		
Vertigo andrusiana sanbernardensis	Pilsbry	1919	2.1	1.2	0.6		
Vertigo arizonensis	Pilsbry and Vanatta	1900	1.8	0.9	0.7		
Vertigo arthuri	von Martens	1882	1.8	0.9	0.5		
Vertigo berryi	Pilsbry	1919	2.5	1.4	0.2		
Vertigo binneyana	Sterki	1890	2.1	1.1	0.5		
Vertigo bollesiana	E. S. Morse	1865	1.7	0.9	0.5		
Vertigo californica	Rowell	1861	2.4	1.3	0.5		
Vertigo catalinaria	Sterki	1890	1.8	1.1	0.5		
Vertigo clappi	Brooks and Hunt	1936	1.5	0.8	0.5		
Vertigo coloradensis	Cockerell	1891	1.9	1.1	0.7		
Vertigo columbiana	Pilsbry and Vanatta	1900	2.0	1.2	0.5		

Appendix 1. (Continued)

Family/Species	Author	Year	Shell Dimensions (mm)			Slug	Exotic
			Height	Width	Taper		
Vertigo concinnula	Cockerell	1897	2.2	1.2	0.7		
Vertigo conecuhensis	G. H. Clapp	1915	1.6	0.8	0.5		
Vertigo cristata	Sterki	1919	1.9	0.9	0.5		
Vertigo cupressicola	Sterki	1919	1.8	1.1	0.5		
Vertigo cyclops	Sterki	1890	2.7	1.5	0.7		
Vertigo dalliana	Sterki	1890	2.1	1.4	0.4		
Vertigo diegoensis	Sterki	1890	2.5	1.3	0.5		
Vertigo elatior	Sterki	1894	2.1	1.1	0.5		
Vertigo gouldii	A. Binney	1843	1.9	1.0	0.5		
Vertigo hannai	Pilsbry	1919	1.8	0.9	0.7		
Vertigo hebardi	Vanatta	1912	1.3	0.8	0.4		
Vertigo hinkleyi	Pilsbry	1921	1.7	0.8	0.7		
Vertigo idahoensis	Pilsbry	1934	2.0	1.2	0.4		
Vertigo inserta	Pilsbry	1919	1.8	0.9	0.8		
Vertigo longa	Pilsbry	1919	2.3	1.1	0.8		
Vertigo malleata	Coles and Nekola	2007	1.9	1.0	0.5		
Vertigo meramecensis	Van Devender	1979	2.0	1.1	0.3		
Vertigo milium	Gould	1840	1.6	0.7	0.7		
Vertigo modesta castanea	Pilsbry and Vanatta	1892	2.5	1.4	0.6		
Vertigo modesta corpulenta	Morse	1865	2.5	1.3	0.6		
Vertigo modesta hoppii	Moller	1842	2.4	1.6	0.6		
Vertigo modesta insculpta	Pilsbry	1919	2.6	1.4	0.7		
Vertigo modesta modesta	Say	1824	2.5	1.4	0.6		
Vertigo modesta parietalis	Ancey	1887	2.5	1.4	0.6		
Vertigo modesta sculptilis	Pilsbry	1934	2.5	1.3	0.6		
Vertigo modesta ultima	Pilsbry	1948	2.5	1.5	0.6		
Vertigo morsei	Sterki	1894	2.9	1.5	0.6		
Vertigo nylanderi	Sterki	1909	1.8	0.9	0.7		
Vertigo occidentalis	Sterki	1907	2.1	1.3	0.3		
Vertigo oralis	Sterki	1898	2.0	1.2	0.4		
Vertigo oscariana	Sterki	1890	1.8	0.8	0.6		
Vertigo oughtoni	Pilsbry	1948	2.1	1.1	0.7		
Vertigo ovata	Say	1822	2.3	1.4	0.4		
Vertigo parvula	Sterki	1890	1.5	0.8	0.6		
Vertigo perryi	Sterki	1905	1.8	0.9	0.5		
Vertigo pygmaea	Draparnaud	1801	2.0	1.1	0.4		*
Vertigo rowellii	Newcomb	1860	2.6	1.3	0.4		
Vertigo rugosula	Sterki	1890	2.0	1.2	0.5		
Vertigo sterkii	Pilsbry	1919	1.9	1.2	0.4		
Vertigo teskeyae	Hubricht	1961	3.0	2.0	0.4		
Vertigo tridentata	Wolf	1870	2.0	1.1	0.5		
Vertigo trinotata	Sterki	1890	2.3	1.2	0.4		
Vertigo ventricosa	E. S. Morse	1865	1.9	1.1	0.5		
Vitrinidae							
Vitrina alaskana	Beck	1837	4.5	6.0	0.7		
Vitrina limpida	Müller	1774	4.5	6.0	0.7		