Supplementary Appendix

Data

We excluded samples from reefs and their associated facies, both hyper- and hypo-saline shallow shelf environments, and samples that are strongly dominated by single taxa, which potentially indicate an atypical marine setting (it should be noted that all of these conditions are rare within the macrofossiliferous strata of the early Paleogene GCP). Thus, there is strong habitat consistency amongst samples within each of the two settings studied, notwithstanding subtle environmental variation not resolvable from bulk lithologic composition and stratigraphic architecture. Monographic works are excluded because they typically result from a higher collection intensity and finer level of taxonomic resolution than paleoecologic studies.

Age and correlation of units

The ages of collections were refined using the ammonite data of Cobban and Kennedy (1993, 1995), Kennedy and Cobban (2000), Kennedy et al. (2001), the sequence stratigraphic and foraminiferal studies of Mancini et al. (1996), the sequence stratigraphic data of King and Skotnicki (1992), the nannofossil biostratigraphic data of Self-Trail (2002), and Burleigh and Self-Trail (2006), and the ammonite and dinoflagellate data of Landman et al. (2004, 2007). Correlation of units across the GCP was based mainly on Mancini and Tew (1995), Mancini et al. (1996), and Crabaugh and Elsik (2000) (see also details in Sessa et al. 2009).

Subsampling Routine

The method for standardizing diversity metrics and the richness and abundance of ecological categories uses richness at a specific quota (100 individuals) as an exemplar, but it also applies to any population measurement, including evenness (PIE), and other samples sizes, including those used in this study (70, 200, and 500 individuals).

From a sample $\mathbf{S}$ of individuals, we draw a random subsample, S_i, of size 100; subsampling is performed with replacement. The subsample has x_i unique taxa (richness), with a theoretical range from 1 to 100. The subsampling process is repeated 1000 times to produce a bootstrapped sample of 1000 richness observations,

$$X = \{x_1, ..., x_{1000})\ .$$

Let $n_j = \#\{i \mid x_i = j\}$, $j = 1,...,100$;

that is, the number of times richness is equal to j. The empirical probability of observing n_j is

$$p_j = n_j / 1000,\ j = 1, \ldots, 100\ .$$

The entire distribution of the bootstrapped sample is written as a vector, $\mathbf{p} = (p_1, \ldots, p_{100})$.

In most cases, a time bin is composed of several samples. These produce 1 to m subsamples, $\mathbf{S}_l$, $l = 1, \ldots, m$. Bootstrapped richness distributions are estimated from each subsample by the procedure described above: $\mathbf{p}^l$, $l = 1, \ldots, m$.

The bootstrapped richness vector for the entire time bin is estimated by the average,

$$\mathbf{p} = \sum_{l=1}^{m} \mathbf{p}^l / m\ .$$

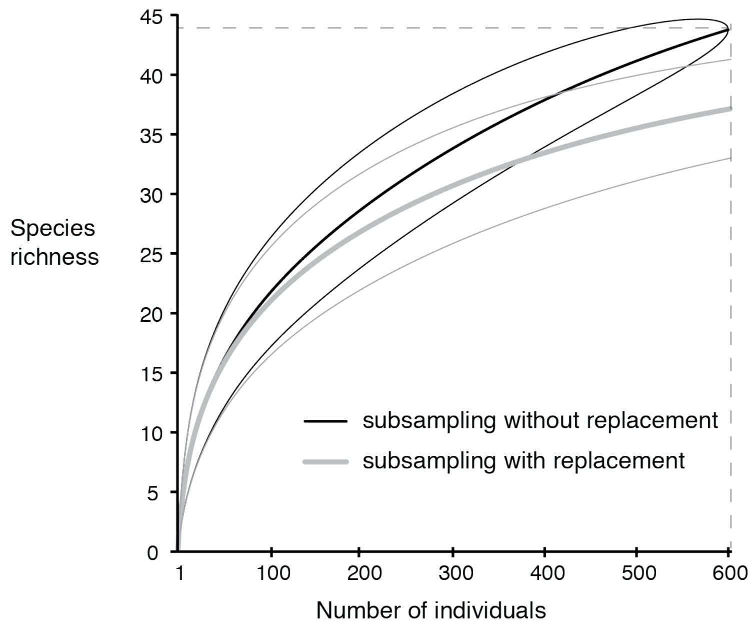
The bootstrapping subsampling procedure is commonly used in paleontological analysis - see Kowalewski and Novack-Gottshall (2010) for a summary of studies. In bootstrapping, individuals are subsampled with replacement, as opposed to subsampling without replacement (i.e. rarefaction), which does not replace an individual once it has been drawn. Although subsampling without replacement is unbiased with respect to a finite sample, subsampling with replacement is valid if the original sample is an accurate representation of the underlying population, because with replacement subsampling preserves the abundance structure present within the sample, and, by extension, within the underlying population. We realize this assumption of representativeness is difficult to assess, but this will be the case regardless of which subsampling method is chosen. There are several reasons why we have chosen to subsample with replacement, rather than without.

When subsampling without replacement, the variation around a diversity estimate is reduced as the number of individuals in a sample is approached, the extreme being that if the subsampling quota and the total number of specimens in a sample are the same number, the variation is zero (i.e., a sample of 100 individuals will have no variability around a richness estimate that has a subsampling quota of 100 individuals; Fig.1). This narrowing of confidence intervals as the quota of individuals is approached is a well-known issue that has been likened to a banana because of its shape (narrowing also occurs at low numbers of individuals). Because some of the samples in this dataset are at or close to the 100 individual quota, subsampling without replacement would result in unrealistically small variability around those diversity estimates. Although subsampling with replacement also suffers from narrowing confidence intervals (in this case, as the total number of species in the sample is approached), it is reduced relative to subsampling without at quotas near the total number of individuals in a sample

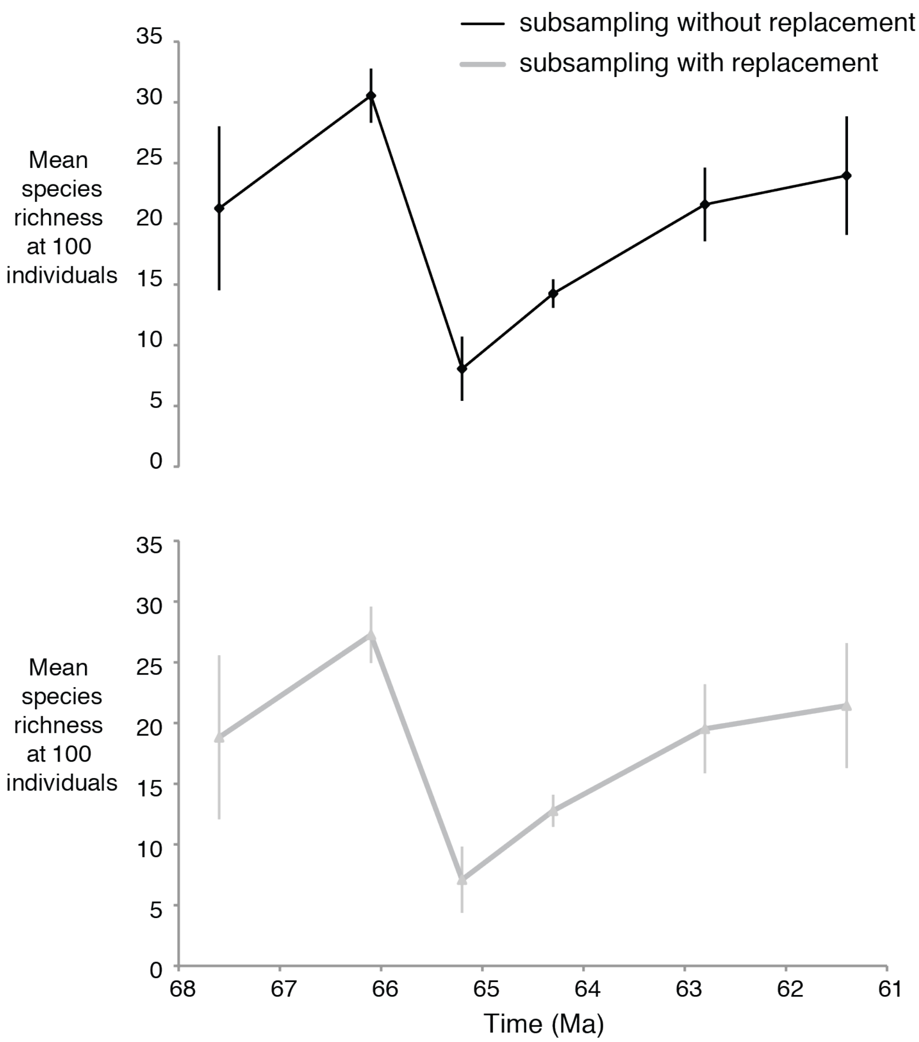
(Supplementary Fig. 1). Thus, we think that subsampling with replacement is more reasonable when the number of individuals in samples is close to the subsampling quota, and when the range of sample sizes in a matrix is high. Because samples that fall below the subsampling quota are excluded, the method does not extrapolate beyond the number of individuals within a sample (although one could make the case that this is a valid procedure in some instances). Subsampling with replacement does underestimate the number of taxa at a given quota when compared to subsampling without replacement (Supplementary Fig. 1).

Finally, because subsampling with replacement has a higher variability than subsampling without replacement (Supplementary Figs. 1,2), it is a more conservative method of detecting change between samples (or, in our case, time bins). Perhaps most comforting is that while these two subsampling methods give different absolute estimates of diversity, the trends through time are the same (Supplementary Fig. 2).

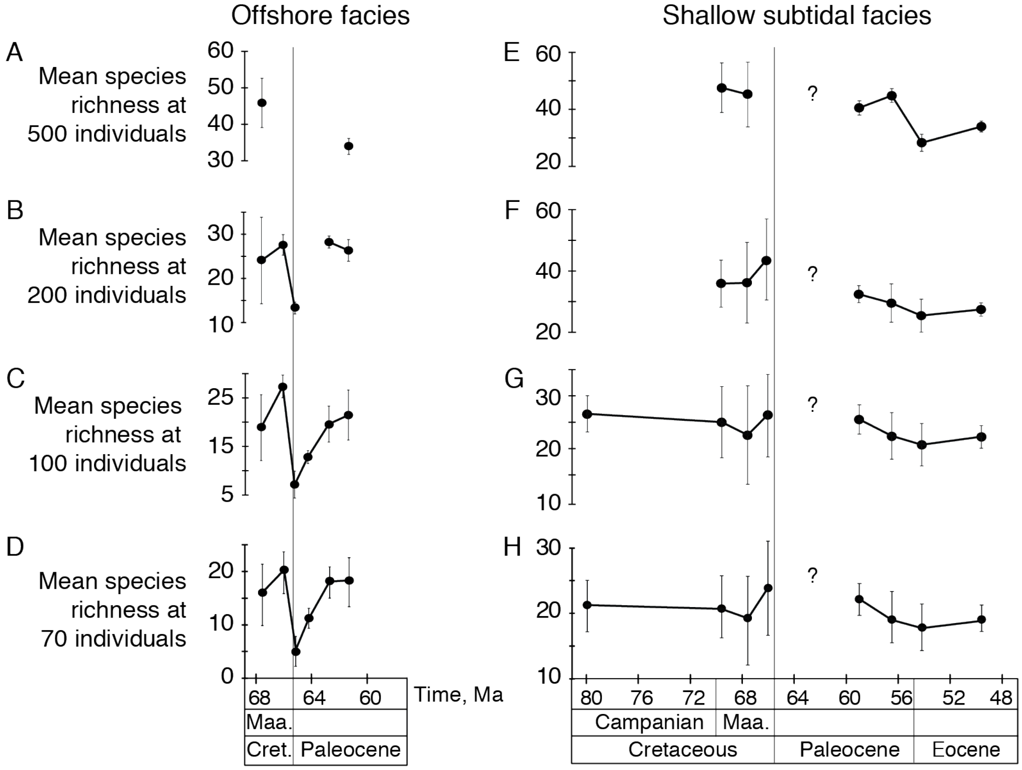
The trends are also fairly insensitive to the quota level chosen (Supplementary Fig. 3).



Supplementary Figure 1. Subsampling without replacement curve with 95% confidence intervals (in black) and subsampling with replacement curve with 95% confidence intervals (in grey) for a sample from the shallow subtidal setting at 59.0 Ma. This sample has 44 unique taxa (horizontal dotted line) and 603 individuals (vertical dotted line). The ‘banana’ shape of narrowing confidence intervals is particularly evident around the subsampling without replacement curve.



Supplementary Figure 2. Comparison of subsampling with and without replacement at a quota of 100 individuals. Mean and 95% confidence intervals are plotted. Although the estimated richness values differ between the two methods, the patterns recovered are the same.



Supplementary Figure 3. Comparison of the means of subsampled species richness at quotas of 70, 100, 200, and 500 individuals in offshore (A-D) and shallow subtidal (E-H) settings to assess the sensitivity to sample size. Despite varying sample size, all curves in each environment show essentially the same long-term trends. Error bars are 95% confidence intervals. Vertical line denotes the K/Pg boundary. Maa. = Maastrichtian, Cret. = Cretaceous.

Time-Series Analysis

The ages of time bins in the subdivided datasets were estimated by dividing the durations of a non-subdivided bin presented in Table 1 by the number of newly created time bins; e.g., offshore bin 3 in Table 1, which ranges from 68.6 to 66.6 Ma, was split into three bins, and each of those bins was assigned an equal portion of the two million year time span. Although the assignment of age to time bins can influence the results of model simulations (Hunt 2008), randomly assigning variable portions of the duration to subdivided bins does not appear to influence results.

The source code for *PaleoTS* provides a rich set of underlying numerical functions. Models incorporating punctuations were fit by splitting a time series into two segments and optimizing using the low-level log likelihood functions *logL.Stasis* and *logL.GRW* on each segment as appropriate. The unbiased random walk (URW) is a general (biased) random walk (GRW) with the mean value fixed at zero. Variances for each segment were modeled by a single common parameter for URWs and GRWs, whereas for models of stasis followed by a random walk, separate variance parameters were used for each segment.

Additional testing in *PaleoTS*, whereby models are assessed with respect to the position of the punctuation in a time series, place a shift at the K/Pg boundary for all the various traits evaluated for the offshore dataset except for the richness and abundance of the fastest mobility category (results not shown).

Ecological Classification

Taxa are classified into ecological categories based on extant members of the genus or family; in a few cases, higher taxonomic levels were used. The sources used to classify taxa and the basis of those classifications (i.e., genus, family, etc.) are provided in the "Source and Comments" field. For classifications from the Paleobiology Database (PaleoDB), the specific reference(s) from the PaleoDB are also listed. NMITA = Neogene Marine Biota of Tropical America, B= Bivalve, G = Gastropod, S = scaphopod. * = these taxa are from Hansen's (1988) and Hansen et al.'s (1993a,b) studies of faunas in the immediate aftermath of the K/Pg mass extinction. These recovery-interval taxa are clearly unique species in their designated groups (Hansen 1988; Hansen et al. 1993a,b) but there has been no taxonomic study to formally assign them as new species.

Tiering categories: TA_n = nektonic; combined with sediment-water interface category; TA = sediment-water interface; TB = semi-infaunal; TC = shallow-infaunal; TD = deep-infaunal; TD_b = borers; combined with deep infaunal category.

Mobility categories: M1 = swimming; M2 = creeping; M3 = facultatively mobile, unattached; M4 = facultatively mobile, attached; M5 = immobile, unattached; M6 = immobile, attached.

Feeding categories: F1 = suspension feeding; F2 = generalized deposit feeding; F3 = chemosymbiotic deposit feeding; F4 = herbivorous grazing; F5 = browsing predators; F6 = carnivorous predators.

Class	**Genus**	**Tiering**	**Motility**	**Feeding**	**Source and Comments**
B	*Abra*	TD	M3	F2	NMITA
B	*Acanthocardia*	TD	M3	F1	Based on Trachycardium/Cardiidae, NMITA
B	*Aenona*	TD	M3	F2	Based on other Tellinidae, NMITA
B	*Agerostrea*	TA	M6	F1	Based on other Ostreoidea, NMITA
B	*Alectryonia*	TA	M6	F1	Based on other Ostreoidea, NMITA
B	*Anadara*	TB	M4	F1	NMITA
B	*Anatimya*	TD	M3	F1	Hansen et al. 1987

B	*Anodontia*	TD	M3	F3	NMITA
B	*Anomia*	TA	M6	F1	NMITA
B	*Aphrodina*	TD	M3	F1	Kosnik 2005; other Veneridae, NMITA & PaleoDB
B	*Arca*	TA	M4	F1	NMITA
B	*Arcidae indet.* *	TA	M4	F1	Based on lower taxa within Arcidae, NMITA & PaleoDB
B	*Arcopagia (Johnsonella)*	TD	M3	F2	NMITA
B	*Arctostrea*	TA	M6	F1	Based on *Ostrea*, NMITA
B	*Astarte*	TD	M3	F1	Based on *Parastarte*, NMITA
B	*Astartemya*	TD	M3	F1	Based on *Parastarte*, NMITA
B	*Atreta*	TA	M6	F1	Based on other Plicatulidae, NMITA
B	*Atrina*	TB	M6	F1	NMITA
B	*Barbatia*	TA	M4	F1	NMITA
B	*Bathyarca*	TA	M4	F1	NMITA
B	*Bathytormus*	TA	M3	F1	Based on other Crassatellinae, NMITA
B	*Bornia*	TD_b	M3	F1	NMITA
B	*Botula*	TD_b	M4	F1	NMITA
B	*Brachidontes*	TB	M4	F1	NMITA
B	*Brevicardium*	TD	M3	F1	Based on *Cardium*, NMITA
B	*Caestocorbula*	TD	M4	F1	Based on *Caryocorbula*, NMITA
B	*Callista*	TD	M3	F1	Based on *Macrocallista*, NMITA
B	*Calorhadia*	TD	M2	F2	NMITA
B	*Camptonectes*	TA	M3	F1	Kosnik 2005 & PaleoDB, based on family (Kiessling 2004)
B	*Caprinidae*	TA	M6	F1	Based on superfamily, PaleoDB (Kiessling 2003, Kiessling 2004, Aberhan et al. 2004, Hendy et al. 2009)
B	Cardiidae indet. *	TD	M3	F1	Based on lower taxa within Cardiidae, NMITA
B	Carditidae indet. *	TC	M3	F1	Carditidae is somewhat variable in NMITA
B	*Cardium*	TD	M3	F1	Based on *Trachycardium*/Cardiidae, NMITA
B	*Caryocorbula*	TD	M4	F1	NMITA
B	*Chlamys*	TA	M4	F1	NMITA
B	*Clavipholas*	TD_b	M3	F1	Based on *Pholas*, NMITA
B	*Corbula*	TD	M4	F1	Based on *Caryocorbula*, NMITA
B	*Crassatella*	TA	M3	F1	Based on *Crassinella*, NMITA
B	*Crassostrea*	TA	M6	F1	NMITA
B	*Crenella*	TA	M4	F1	NMITA
B	*Cubitostrea*	TA	M6	F1	Based on *Ostrea*, NMITA
B	*Cucullaea*	TB	M3	F1	Based on other Arcoida, NMITA & PaleoDB
B	*Cuna*	TC	M3	F1	Based on other Condylocardiidae, NMITA
B	*Cuspidaria*	TD	M2	F6	Beu et al. 1990
B	Cuspidariidae indet. *	TD	M2	F6	Beu et al. 1990
B	*Cyclorisma*	TC	M3	F4	Kosnik 2005; other Veneridae, NMITA & PaleoDB

B	*Cymbophora*	TC	M3	F1	Kosnik 2005; other Mactridae, NMITA
B	*Cymella*	TC	M3	F6	Based on family, PaleoDB (Aberhan et al. 2004)
B	*Cyprimeria*	TC	M3	F1	Kosnik 2005; other Veneridae, NMITA & PaleoDB
B	*Diplodonta*	TC	M3	F1	NMITA
B	*Dosiniopsis*	TD	M3	F1	Based on other Veneridae, NMITA & PaleoDB
B	*Dreissena*	TA	M4	F1	Based on family, PaleoDB (Aberhan et al. 2004)
B	*Eburneopecten*	TA	M4	F1	Based on various pectins in NMITA
B	*Endocostea*	TA	M6	F1	Based on superfamily, PaleoDB (Kiessling 2003, Roig 1926)
B	*Entolium*	TA	M3	F1	Based on genus, PaleoDB (Kiessling 2004, Roig 1926)
B	*Eomiltha*	TD	M3	F3	Based on other Lucinidae, NMITA
B	*Eophysema*	TD	M3	F3	Based on other Lucinidae, NMITA
B	*Eosolen*	TD	M3	F1	Based on order, PaleoDB (Aberhan et al. 2004) & Coan et al. 2000
B	*Epilucina*	TD	M3	F3	Based on *Lepilucina*, NMITA
B	*Etea*	TD	M3	F1	Based on order, which is not very variable in NMITA
B	*Eufistulina*	TD	M4	F1	Based on other Myoidea, NMITA
B	*Exogyra*	TA	M6	F1	Based on other Gryphaeidae, NMITA
B	*Gari*	TC	M2	F2	Based on family, PaleoDB (Aberhan et al. 2004, Roig 1926)
B	*Gervillia*	TB	M6	F1	Based on genus, PaleoDB (Aberhan et al. 2004)
B	*Gervilliopsis*	TA	M6	F1	Based on other Bakevelliidae, PaleoDB
B	*Gigantostrea*	TA	M6	F1	Based on other Pycnodonteinae, NMITA
B	*Glossus*	TC	M3	F1	Based on other Glossidae, NMITA
B	*Glycymeris*	TC	M3	F1	Based on other Glycymerididae, NMITA
B	*Glyptoactis (Claibornicardia)*	TC	M3	F1	NMITA
B	*Granocardium?*	TD	M3	F1	Based on *Trachycardium*/Cardiidae, NMITA
B	*Gryphaeostrea*	TA	M6	F1	Based on *Ostrea*, NMITA
B	*Hyotissa*	TA	M6	F1	Based on other Gryphaeidae, NMITA
B	*Idonearca*	TA	M4	F1	Based on *Arca*, NMITA
B	*? Icanotia*	TC	M3	F4	PaleoDB, based on superfamily (Aberhan et al. 2004, Roig 1926)
B	*Inoceramus*	TA	M4	F1	Based on genus, PaleoDB (Aberhan et al. 2004)
B	*Isognomon*	TA	M6	F1	NMITA
B	*Jupiteria*	TD	M2	F2	NMITA
B	*Katherinella*	TD	M3	F1	Based on other Pitarinae, NMITA
B	*Kelliella*	TC	M3	F1	NMITA

B	Kelliellidae indet.*	TC	M3	F1	Based on lower taxa within Kelliellidae in NMITA
B	*Kummelia*	TD_b	M5	F1	Based on family, PaleoDB (Aberhan et al. 2004, Eames 1951)
B	*Laternula*	TD	M3	F1	Kosnik 2005
B	*Legumen*	TC	M3	F1	Kosnik 2005; other Veneridae, NMITA
B	*Leptosolen*	TD	M3	F1	Based on other Solenidae, NMITA
B	*Lima*	TA	M3	F1	NMITA & Hansen et al. 1987
B	*Limopsis*	TC	M4	F1	NMITA
B	*Limopsis*	TC	M4	F1	NMITA
B	*Linearis*	TD	M3	F2	Based on other Tellinidae, NMITA
B	*Linga*	TD	M3	F3	Based on Cavilinga, NMITA
B	*Linter*	TA	M3	F1	Based on family, PaleoDB (Aberhan et al. 2004, Hendy et al. 2009)
B	*Liopistha*	TD	M2	F6	Based on other Poromyidae, NMITA
B	*Liothyris*	TD	M3	F2	Based on other Tellinidae, NMITA
B	*Lirodiscus*	TC	M3	F1	Based on superfamily, PaleoDB (Aberhan et al. 2004, Roig 1926)
B	*Lithophaga*	TD_b	M5	F1	NMITA
B	*Litorhadia*	TD	M2	F2	Based on *Calorhadia*, NMITA
B	*Lucina*	TD	M3	F3	NMITA
B	Lucinidae indet.*	TD	M3	F3	NMITA
B	*Lutetia*	TC	M3	F1	Based on other Kelliellidae, NMITA
B	*Lycettia*	TA	M4	F1	Kosnik 2005
B	*Macoma*	TD	M3	F2	NMITA
B	*Macrocallista*	TD	M3	F1	NMITA
B	*Malletia*	TD	M3	F2	Based on family, PaleoDB (Aberhan et al. 2004, Roig 1926)
B	*Margaritella*	TD	M3	F1	Hansen et al. 1987
B	*Myrtea*	TD	M3	F3	Based on other Lucinidae, NMITA
B	*Neithea*	TA	M3	F1	Based on family, PaleoDB (Kiessling 2004)
B	*Nemocardium*	TD	M3	F1	Based on *Trachycardium*/Cardiidae, NMITA
B	*Nemodon*	TA	M4	F1	Based on *Arca*, NMITA & Kosnik 2005
B	*Notocorbula*	TD	M4	F1	Based on *Caryocorbula*, NMITA
B	*Nucula*	TC	M2	F2	NMITA
B	*Nuculana*	TD	M2	F2	NMITA
B	Nuculanidae indet.*	TD	M2	F2	Based on taxa within Nuculanidae in NMITA
B	*Nuculidae indet.**	TC	M2	F2	Based on taxa within Nuculidae in NMITA
B	*Nymphalucina*	TD	M3	F3	Based on *Lucina*, NMITA
B	*Odontogryphaea*	TA	M6	F1	Based on other Ostreinae, NMITA
B	*Opertochasma*	TD	M6	F1	Based on family, PaleoDB (Aberhan et al. 2004, Roig 1926)
B	*Ostrea*	TA	M6	F1	NMITA

B	*Pachecoa*	TA	M4	F1	Based on other Noetiidae, somewhat variable, NMITA
B	*Panopea*	TD	M3	F1	NMITA
B	*Paranomia*	TA	M4	F1	Based on *Anomia*, NMITA
B	*Pecten*	TA	M4	F1	NMITA
B	*Periploma*	TD	M3	F1	NMITA
B	*Perissonata*	TD	M2	F2	Based on other Nuculanoida, NMITA
B	*Phacoides*	TD	M3	F1	Based on other Lucinidae, NMITA
B	*Phelopteria*	TA	M6	F1	Based on subfamily discussion in Boyd and Newell 2002
B	*Pholadomya*	TD_b	M3	F1	Based on family, PaleoDB (Aberhan et al. 2004)
B	*Pholas*	TD_b	M3	F1	NMITA
B	*Pinna*	TB	M6	F1	NMITA
B	*Pitar*	TD	M3	F1	NMITA
B	*Plagiostoma*	TA	M4	F1	Based on other Limidae, NMITA
B	*Plectomya*	TD	M2	F1	Based on family & class, PaleoDB (Aberhan et al. 2004)
B	*Plicatula*	TA	M6	F1	NMITA
B	*Postligata*	TC	M3	F1	Based on other Glycymerididae, NMITA
B	*Propeamussium*	TA_n	M1	F6	NMITA
B	*Protocardia*	TD	M3	F1	Based on *Cardium*, NMITA
B	*Pteria*	TA	M6	F1	NMITA
B	*Pterotrigonia*	TC	M3	F1	Francis & Hallam 2003
B	*Pycnodonte*	TA	M6	F1	NMITA
B	*Saccella*	TD	M2	F2	NMITA
B	*Saxolucina*	TD	M3	F3	Based on other Lucinidae, NMITA
B	*Scambula*	TC	M3	F1	Based on other Crassatellidae, NMITA
B	Semelidae indet.*	TD	M3	F2	Based on lower taxa within Semelidae in NMITA, not very variable
B	*Solemya*	TD	M3	F3	Based on genus, PaleoDB (Mikkelsen and Bieler 2008, Aberhan et al. 2004)
B	*Solyma*	TD	M3	F2	Based on other Tellinidae, NMITA
B	*Sourimis*	TD	M3	F2	Based on other Tellinidae, NMITA
B	*Spisula*	TD	M3	F2	NMITA
B	*Spondylus*	TA	M6	F1	NMITA
B	Sportellidae indet.*	TD	M3	F1	Based on lower taxa within Sportellidae in NMITA
B	*Striarca*	TA	M4	F1	Based on other Noetiidae, somewhat variable, NMITA
B	*Syncyclonema*	TA	M3	F1	Kosnik, 2005; PaleoDB, based on genus (Kiessling 2004, Aberhan et al. 2004)
B	*Tellina*	TD	M3	F2	NMITA
B	Tellinidae indet.*	TD	M3	F2	Based on lower taxa within Tellinidae in NMITA
B	*Tellinimera*	TD	M3	F2	Based on other Tellinidae, NMITA
B	*Tenea*	TD	M3	F1	Kosnik 2005

B	*Tenuipteria*	TA	M6	F1	Based on *Pteria*, NMITA
B	*Teredo*	TD	M5	F1	Based on genus, PaleoDB (Aberhan et al. 2004)
B	*? Thracia*	TD	M3	F1	Based on genus and family, PaleoDB (Aberhan et al. 2004) & Thracioidea in NMITA
B	*Trachycardium*	TD	M3	F1	NMITA
B	*Uddenia*	TC	M3	F1	Based on other Crassatellidae, NMITA
B	*Unicardium*	TD	M3	F1	Based on *Cardium*, NMITA
B	*Venericardia*	TC	M3	F1	Park 1968
B	*Venericardia (Venericor)*	TC	M3	F1	Park 1968
B	Veneridae indet.*	TD	M3	F1	Based on lower taxa within Veneridae in NMITA
B	*Veniella*	TD	M3	F1	Based on order Veneroida, which is not variable in PaleoDB
B	*Verticordia*	TD	M2	F6	NMITA
B	*Vetericardiella*	TC	M3	F1	Based on other Carditidae, NMITA & PaleoDB, somewhat variable
B	*Vokesula*	TD	M4	F1	Based on other Corbulidae, NMITA & PaleoDB
B	*Volsella*	TB	M4	F1	Based on family, PaleoDB (Kiessling 2004, Aberhan et al. 2004)
G	*Aciculiscala*	TA	M2	F5	Based on other Epitoniidae, NMITA
G	*Acirsa*	TA	M2	F5	NMITA
G	*Acmaea*	TA	M3	F4	NMITA & PaleoDB, based on family (Kiessling 2004, Hendy et al. 2009)
G	*Acteocina*	TB	M2	F6	Based on Philinoidea, NMITA & PaleoDB
G	*Acteon*	TA	M2	F6	NMITA
G	*Acteonella*	TA	M2	F6	NMITA
G	Acteonidae indet.*	TA	M2	F6	Based on lower taxa within Acteonidae in NMITA
G	*Admetula*	TA	M2	F5	Petit and Harasewych 1986
G	*Agaronia*	TA	M2	F6	NMITA
G	*Aletes?*	TA	M6	F1	Based on *Serpulorbis*, NMITA & PaleoDB
G	*Aliofusus*	TA	M2	F6	Based on other Buccinidae, not very variable, NMITA
G	*Amaea (Scalina)*	TA	M2	F5	NMITA
G	*Amaurellina*	TB	M2	F6	Based on *Natica*, NMITA
G	*Ampullella*	TB	M2	F6	Based on *Natica*, NMITA
G	*Ampullina (Pseudamaura)*	TA	M2	F6	Kosnik 2005
G	*Amuletum*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Anchura*	TB	M3	F1	Based on genus, PaleoDB (Kiessling 2004, Aberhan et al. 2004)
G	*Ancilla*	TA	M2	F6	NMITA
G	*Ancistrosyrinx*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Anomalofusus*	TA	M2	F6	Kosnik 2005
G	*Antillophos*	TA	M2	F6	Based on other Buccinidae, not very variable, NMITA

G	Aporrhaidae indet.*	TA	M2	F4	Based on family, PaleoDB (Kiessling 2004)
G	*Aporrhais*	TA	M2	F4	Based on family, PaleoDB (Kiessling 2004)
G	*Architectonica*	TA	M2	F5	NMITA
G	*Argobuccinum (Ranella)*	TA	M2	F6	Based on other Ranellidae, NMITA & PaleoDB
G	*Arrhoges*	TB	M3	F4	Based on other Aporrhaidae, PaleoDB (Aberhan et al. 2004)
G	*Astyris*	TA	M2	F6	NMITA
G	*Athleta*	TA	M2	F6	Based on other Volutidae, NMITA & PaleoDB
G	*Atys*	TA	M2	F4	NMITA
G	*Bathytoma*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Bellifusus*	TA	M2	F6	Based on other Fasciolariidae, NMITA & PaleoDB
G	*Beretra*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Bittium*	TA	M2	F4	NMITA & PaleoDB, based on family (Kiessling 2004, Hendy et al. 2009)
G	*Bonellitia*	TA	M2	F5	Based on other Admetinae, PaleoDB
G	*Buccinanops*	TA	M2	F6	Based on other Buccinidae, not very variable, NMITA
G	*Buccinum (Phos)*	TA	M2	F6	Based on other Buccinidae, not very variable, NMITA
G	*Buccitriton*	TA	M2	F6	Based on other Buccinidae, not very variable, NMITA
G	*Bulla*	TA	M2	F6	NMITA
G	*Bulla (Bulliopsis)*	TA	M2	F6	NMITA
G	*Bullata*	TA	M2	F5	Based on other Volutidae, NMITA & PaleoDB
G	*Bullia*	TA	M2	F6	Based on other Nassariidae, NMITA & PaleoDB
G	*Bulovia*	TA	M2	F6	Based on other Nassariidae, NMITA & PaleoDB
G	*Calliomphalus*	TA	M2	F4	Based on other Turbinidae, NMITA
G	*Calyptraea*	TA	M3	F1	NMITA
G	*Calyptraphorus*	TA	M2	F4	Based on other Strombidae, NMITA & PaleoDB (Kiessling 2004, Hendy et al. 2009)
G	*Cancellaria*	TA	M2	F5	NMITA
G	*Cantharus*	TA	M2	F6	NMITA
G	*Capulus*	TA	M2	F1	NMITA
G	*Caricella*	TA	M2	F6	Based on other Volutidae, NMITA & PaleoDB
G	*Caveola*	TA	M2	F5	Based on other Cancellariidae, NMITA & PaleoDB
G	*Cerithiella*	TA	M2	F5	NMITA
G	Cerithiidae indet.*	TA	M2	F4	NMITA
G	*Cerithioderma*	TA	M3	F1	NMITA & PaleoDB, based on family (Kiessling 2004, Hendy et al. 2009)
G	*Cerithiopsis*	TA	M2	F5	NMITA
G	*Cerithium*	TA	M2	F4	Based on genus, PaleoDB (Kiessling 2004, Abbott & Dance 1986)
G	*Clavilithes*	TA	M2	F6	Based on other Fasciolariidae, NMITA & PaleoDB

G	*Closia*	TA	M2	F6	Based on other Volutidae, NMITA & PaleoDB
G	*cf.Cochlespira*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	Columbellidae indet.*	TA	M2	F6	Based on lower taxa within Columbellidae in NMITA, not very variable
G	*Colwellia*	TA	M2	F6	Based on other Nassariidae, NMITA & PaleoDB
G	*Cornulina*	TA	M2	F6	Based on other Fasciolariidae, NMITA & PaleoDB
G	*Coronia*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Cossmannia*	TA	M2	F4	Based on family, PaleoDB (Kiessling 2004, Hendy et al. 2009)
G	*Creonella*	TA	M2	F5	Kosnik 2005 & other Pyramidellidae, NMITA
G	*Crepidula*	TA	M3	F1	NMITA
G	*Crucibulum*	TA	M3	F1	NMITA & PaleoDB, based on genus (Kiessling 2004, Hendy et al. 2009)
G	*Cryptochorda*	TA	M2	F6	Based on family, PaleoDB (Kiessling 2004, Hendy et al. 2009)
G	*Cyclostremiscus*	TA	M2	F4	NMITA
G	*Cylichna*	TA	M2	F6	NMITA
G	*Cylichna (Mnestia)*	TA	M2	F6	NMITA
G	*Cylichnella*	TA	M2	F6	NMITA
G	*Cyllene*	TA	M2	F6	Based on other Nassariidae, NMITA & PaleoDB
G	*Deussenia*	TA	M2	F6	Based on other Melongenidae, NMITA
G	*Diodora*	TA	M2	F4	NMITA
G	*Distortio*	TA	M2	F6	Based on other Ranellidae, NMITA & PaleoDB
G	*Dolicholatirus*	TA	M2	F6	Based on *Latirus*, NMITA
G	*Drepanocheilus*	TB	M3	F4	Based on family, PaleoDB (Aberhan et al. 2004)
G	*Drilluta*	TA	M2	F6	Based on other Fasciolariidae, NMITA & PaleoDB
G	*Ecphora*	TA	M2	F6	Based on family, PaleoDB (Kiessling 2004, Hendy et al. 2009)
G	*Ellipsoscapha*	TA	M2	F6	Kosnik, 2005
G	*Entomope*	TA	M2	F4	Based on family, PaleoDB (Kiessling 2004, Hendy et al. 2009)
G	*Eoacteon*	TA	M2	F6	Based on other Acteonidae, NMITA
G	*Eocypraea*	TA	M2	F5	Based on *Macrocypraea*, NMITA
G	*Eocythara*	TA	M2	F6	Based on *Cytharella* and other Turridae, NMITA
G	*Eoharpa*	TA	M2	F6	Based on family, PaleoDB (Kiessling 2004, Hendy et al. 2009)
G	*Eopleurotoma*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Eosurcula*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Epitonium*	TA	M2	F5	NMITA
G	*Eucheilodon*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Eulima*	TA	M2	F5	NMITA
G	*Eupleura*	TA	M2	F6	NMITA

G	*Euspira*	TB	M2	F6	Based on other Naticidae, NMITA
G	*Exilia*	TA	M2	F6	Based on other Fasciolariidae, NMITA & PaleoDB
G	*Falsifusus*	TA	M2	F6	Based on other Fasciolariidae, NMITA & PaleoDB
G	Fasciolariidae indet. *	TA	M2	F6	Based on lower taxa within Fasciolariidae in NMITA
G	*Ficopsis*	TA	M2	F6	Based on other Ficidae, NMITA
G	*Fissurella*	TA	M2	F4	NMITA
G	*Fulgerca*	TA	M2	F6	Kosnik 2005
G	*Fulgurofusus*	TA	M2	F6	Based on other Turbinellidae, NMITA
G	*Fusimilis*	TA	M2	F6	Kosnik 2005 & NMITA
G	*Fusimitra*	TA	M2	F6	NMITA
G	*Fusinus*	TA	M2	F6	Based on other Fasciolariidae, NMITA & PaleoDB
G	*Galeodea*	TA	M2	F6	Based on order, PaleoDB (Aberhan et al. 2004) & Coan et al. 2000: "Shallow and intertidal regions...where they are rapid and active burrowers"
G	*Gegania*	TA	M2	F5	Based on other Mathildidae, NMITA
G	*Gemmula*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Goniocylichna*	TA	M2	F6	Based on *Cylichna*, NMITA
G	*Graciliala*	TB	M3	F4	Based on family, PaleoDB (Kiessling 2004)
G	*Graphidula*	TA	M2	F6	Based on other Fasciolariidae, NMITA & PaleoDB
G	*Gymnentome*	TA	M2	F4	Based on family, PaleoDB (Kiessling 2004, Hendy et al. 2009)
G	*Gyrodes*	TA	M2	F4/F6	Based on genus, PaleoDB (Kiessling 2004, Aberhan et al. 2004); either carnivore or grazer because of uncertain taxonomic placement of the Ampullospirinae
G	*Hastula*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Haustator*	TA	M2	F1	Based on family, PaleoDB (Kiessling 2004, Hendy et al. 2009)
G	*Hemisurcula*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Hercorhyncus (Haplovoluta)*	TA	M2	F6	Based on other Fasciolariidae, NMITA & PaleoDB
G	*Hesperiturris*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Hexaplex*	TA	M2	F6	NMITA
G	*Hipponix*	TA	M2	F4	NMITA
G	*? Hydrotribulus*	TA	M2	F6	Based on other Buccinidae, not very variable, NMITA
G	*Lacrimiforma*	TA	M2	F5	Based on other Pyramidellidae, NMITA
G	*Lacunaria*	TB	M2	F4/F6	Based on genus, PaleoDB (Kiessling 2004, Aberhan et al. 2004); either carnivore or grazer because of uncertain taxonomic placement of the Ampullospirinae
G	*Laevibuccinum*	TA	M2	F6	Based on other Buccinidae, not very variable, NMITA

G	*Lapparia*	TA	M2	F6	Based on other Fasciolariidae, NMITA & PaleoDB
G	*Latiaxis*	TA	M2	F5	NMITA & PaleoDB, based on family (Kiessling 2004, Hendy et al. 2009)
G	*Latirus*	TA	M2	F6	NMITA
G	*Laxispira*	TA	M2	F1	Based on other Turritellidae, NMITA
G	*Lemniscolittorina*	TA	M2	F4	Based on *Littorina*, NMITA
G	*Leptosurcula*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Levifusus*	TA	M2	F6	Based on other Buccinidae, not very variable, NMITA
G	*Liopeplum*	TA	M2	F6	Based on family, PaleoDB (Kiessling 2004, Hendy et al. 2009)
G	*Lirofusus*	TA	M2	F6	Based on other Fasciolariidae, NMITA & PaleoDB
G	*Lisbonia*	TA	M2	F6	Based on other Nassariidae, NMITA & PaleoDB
G	*Litiopa*	TA	M2	F4	Based on other Litiopidae, NMITA & PaleoDB (Aberhan et al. 2004)
G	*Lomirosa*	TA	M2	F6	Based on family, PaleoDB (Kiessling 2004, Hendy et al. 2009)
G	*Longoconcha*	TA	M2	F6	Based on other Muricoidea, NMITA
G	*Lowenstamia*	TA	M2	F6	Based on other Muricoidea, NMITA
G	*Lupira*	TA	M2	F6	Based on other Turbinellidae, NMITA
G	*Lyrosurcula*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Marginella*	TA	M2	F5	NMITA
G	*Mataxa*	TA	M2	F5	Based on other Cancellariidae, NMITA & PaleoDB
G	*Mathilda*	TA	M2	F5	NMITA
G	*Mazzalina*	TA	M2	F6	Based on other Fasciolariidae, NMITA & PaleoDB
G	*Megalomphalus*	TA	M2	F4	Based on family, PaleoDB (Kiessling 2004, Hendy et al. 2009)
G	*Melanella*	TA	M2	F5	NMITA
G	*Mesalia*	TA	M2	F1	Based on other Turritellidae, NMITA
G	*Mesorhytis*	TA	M2	F6	Based on *Fasciolaria*, NMITA
G	*Metula*	TA	M2	F6	Based on other Buccinidae, not very variable, NMITA
G	*Michela*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Microdrillia*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Mitrella (Clinurella)*	TA	M2	F6	NMITA
G	*Morea*	TA	M2	F6	Based on *Fenimorea*, NMITA
G	*Myobarbum*	TA	M2	F6	Kosnik 2005
G	*Napulus*	TA	M2	F6	Based on other Turbinellidae, NMITA
G	Nassariidae indet. *	TA	M2	F6	Based on lower taxa within Nassariidae in NMITA
G	*Nassarius*	TA	M2	F6	NMITA
G	*Nassarius (Tritiaria)*	TA	M2	F6	NMITA

G	*Natica*	TB	M2	F6	NMITA
G	Naticidae indet.	TB	M2	F6	Based on lower taxa within Naticidae in NMITA
G	Neogastropod sp. A*	TA	M2	F6	Kosnik 2005
G	*Nerita*	TA	M2	F4	NMITA & PaleoDB, based on family (Kiessling 2004)
G	*Neritina*	TA	M2	F4	NMITA
G	*Nonactaeonina*	TA	M2	F6	Based on other Acteonidae, NMITA
G	*Nozeba*	TA	M2	F4	Based on other Rissooidae, NMITA
G	*Odontobasis*	TA	M2	F6	Based on family, PaleoDB (Kiessling 2004, Hendy et al. 2009)
G	*Odostomia*	TA	M2	F5	Based on other Pyramidellidae, NMITA
G	*Oligoptycha*	TA	M2	F6	Based on other Ringiculidae, NMITA
G	Olividae indet.*	TA	M2	F6	Based on lower taxa within Olividae in NMITA
G	*Ornopsis*	TA	M2	F6	Based on other Fasciolariidae, NMITA & PaleoDB
G	*Orthosurcula*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Ovula*	TA	M2	F5	Based on family, PaleoDB (Kiessling 2004, Hendy et al. 2009)
G	*? Pachymelania*	TA	M2	F4	Based on superfamily, PaleoDB (Kiessling 2004, Hendy et al. 2009)
G	*Paladmete*	TA	M2	F6	Kosnik 2005
G	*Paleofusimitra*	TA	M2	F6	Based on other Mitridae, NMITA
G	*Paleopsephaea*	TA	M2	F6	Based on other Fasciolariidae, NMITA & PaleoDB
G	*Papillina*	TA	M2	F6	Based on other Fasciolariidae, NMITA & PaleoDB
G	*Parafusus*	TA	M2	F6	Based on other Volutidae, NMITA & PaleoDB
G	*Perissolax*	TA	M2	F6	Based on other Ficidae, NMITA
G	*Phalium*	TA	M2	F6	NMITA
G	*Piestochilus*	TA	M2	F6	Based on other Fasciolariidae, NMITA & PaleoDB
G	*Pleurofusia*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Pleuroliria*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Pleurotoma*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Pleurotomella*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Polinices*	TB	M2	F6	NMITA
G	*Priscoficus*	TA	M2	F6	Based on other Ficidae, NMITA
G	*Promathilda*	TA	M2	F5	Based on *Mathilda*, NMITA
G	*Protobusycon*	TA	M2	F6	Based on *Busycon* & other Melongenidae, NMITA & PaleoDB
G	*Protosurcula*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Pseudoclaviscala*	TA	M2	F5	Kosnik 2005 & other Epitoniidae, NMITA
G	*Pseudolatirus*	TA	M2	F6	Based on *Latirus*, NMITA
G	*Pseudoliva*	TA	M2	F6	Based on other Buccinidae, not very variable, NMITA
G	*Pseudomalaxis*	TA	M2	F5	NMITA

G	*Pseudoneptunea*	TA	M2	F6	Based on other Buccinidae, not very variable, NMITA
G	*Pterocerella*	TB	M3	F1	Kosnik 2005
G	*Ptychosyca*	TA	M2	F6	Based on family, PaleoDB (Kiessling 2004, Hendy et al. 2009)
G	*Pugnellus*	TA	M2	F4	Based on other Stromboidea, NMITA
G	*Pyramidella*	TA	M2	F5	NMITA
G	*Pyramimitra*	TA	M2	F5	Based on other Pyramidellidae, NMITA
G	*Pyrifusus*	TA	M2	F6	Kosnik 2005
G	*Pyropsis*	TA	M2	F6	Kosnik 2005
G	*Raphitoma*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Remera*	TA	M2	F6	Kosnik 2005 & other Fasciolariidae, NMITA
G	*Remnita*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Retusa*	TA	M2	F6	Based on other Retusidae, NMITA
G	*Rhombopsis*	TA	M2	F6	Based on family, PaleoDB (Kiessling 2004, Hendy et al. 2009)
G	*Ringicula*	TA	M2	F6	NMITA
G	Ringiculidae indet.*	TA	M2	F6	Based on lower taxa within Ringiculidae in NMITA
G	*Rudiscala*	TA	M2	F5	Based on other Fasciolariidae, NMITA & PaleoDB
G	*? Sablea*	TA	M2	F5	Based on other Epitoniidae, NMITA
G	*Sargana*	TA	M2	F6	Kosnik 2005
G	*Sassia*	TA	M2	F6	Based on other Ranellidae, NMITA & PaleoDB
G	*Scaphella*	TA	M2	F6	NMITA
G	*Sceptrum*	TA	M2	F6	Based on other Turbinellidae, NMITA
G	*Schizobasis*	TA	M2	F6	Based on superfamily, PaleoDB (Kiessling 2004, Hendy et al. 2009)
G	*Scobinidola*	TA	M2	F6	Based on other Acteonidae, NMITA
G	*Seila*	TA	M2	F5	NMITA
G	*Semiacteon*	TA	M2	F6	Based on other Acteonidae, NMITA
G	*Serpulorbis*	TA	M6	F1	NMITA
G	*Sigatica*	TB	M2	F6	NMITA
G	*Sinum*	TB	M2	F6	NMITA
G	*Siphonalia*	TA	M2	F6	Based on other Buccinidae, not very variable, NMITA
G	*Solariella*	TA	M2	F4	NMITA
G	*Solariorbus*	TA	M2	F4	NMITA
G	*Stantonella*	TA	M2	F6	Based on other Buccinidae, not very variable, NMITA
G	*Stossichia*	TA	M2	F4	Based on family, PaleoDB (Kiessling 2004, Hendy et al. 2009)
G	*Strepsidura*	TA	M2	F6	Based on other Buccinidae, not very variable, NMITA
G	*Striaticostatum*	TA	M2	F5	Kosnik 2005 & based on other Epitoniidae, PaleoDB
G	*Sulcoretusa*	TA	M2	F6	Based on family, PaleoDB (Kiessling 2004, Hendy et al. 2009)

G	*Sullivania*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Surcula*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Surculites*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Surculoma*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Sycostoma*	TA	M2	F6	Based on other Melongenidae, NMITA
G	*Teinostoma*	TA	M2	F4	NMITA
G	*Terebrifusus*	TA	M2	F6	Based on other Buccinidae, not very variable, NMITA
G	*Texmelanatria*	TA	M2	F4	Based on other Cerithioidea, NMITA
G	*Thylacus*	TA	M3	F1	Based on other Calyptraeidae, NMITA
G	*Tornatellaea*	TA	M2	F6	Based on other Acteonidae, NMITA
G	*Trichotropis*	TA	M3	F1	Based on other Capulidae, NMITA
G	*Trigonostoma*	TA	M2	F5	NMITA
G	*Trochita (Calyptrea)*	TA	M3	F1	NMITA
G	*Tropisurcula*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Trypanotoma*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Tubiola*	TA	M2	F4	Based on other Turbinidae, NMITA
G	*Turboella*	TA	M2	F4	Based on other Rissooidae, NMITA
G	*Turbonilla*	TA	M2	F5	Based on other Pyramidellidae, NMITA
G	*"Turricula"*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	Turridae indet. *	TA	M2	F6	Based on lower taxa within Turridae in NMITA & PaleoDB
G	*Turris*	TA	M2	F6	Based on other Turridae, NMITA & PaleoDB
G	*Turritella*	TA	M2	F1	NMITA
G	*Tylotrochus*	TA	M2	F6	Trochidae is somewhat variable in NMITA
G	*Tympanotonus*	TA	M2	F4	Based on genus, PaleoDB (Kiessling 2004, Abbott and Dance 1986)
G	*Umbraculum*	TA	M2	F5	NMITA
G	*Variseila*	TA	M2	F5	Based on other Cerithiopsidae, NMITA
G	*? Vitrinella*	TA	M2	F4	NMITA
G	Volutidae indet. *	TA	M2	F6	Based on lower taxa within Volutidae in NMITA & PaleoDB
G	*Volutocorbis*	TA	M2	F6	Based on other Volutidae, NMITA & PaleoDB
G	*Volutomorpha*	TA	M2	F6	Based on other Muricoidea, NMITA
G	*Volvariella*	TA	M2	F6	Based on other Mitridae, NMITA
G	*Volvulella*	TA	M2	F4	NMITA & PaleoDB, based on genus (Kiessling 2004, Hendy et al. 2009)
G	*Weeksia*	TA	M3	F1	Based on family, PaleoDB (Kiessling 2004)
G	*Xenophora*	TA	M2	F4	NMITA
G	*Zikkuratia*	TA	M2	F6	Based on other Acteonidae, NMITA
S	*Cadulus*	TD	M2	F2	Based on order, PaleoDB (Aberhan et al. 2004; Hendy et al. 2009)
S	*Dentalium*	TD	M2	F2	Based on class, PaleoDB (Aberhan et al. 2004)
S	*Episiphon*	TD	M2	F2	Based on class, PaleoDB (Aberhan et al. 2004)
S	*Fustiaria*	TD	M2	F2	Based on class, PaleoDB (Aberhan et al. 2004)
S	Scaphopoda indet. *	TD	M2	F2	Based on class, PaleoDB (Aberhan et al. 2004)

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