Macroecological drivers of extinction risk in early Cenozoic mollusks

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MACROECOLOGICAL DRIVERS OF EXTINCTION RISK
IN EARLY CENOZOIC MOLLUSKS

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BY

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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ABSTRACT

Understanding the factors that contribute to extinction risk is essential for predicting the response of species to environmental change. For many extant and extinct taxa, intrinsic biological factors play a critical role, but their relative importance is poorly known. Using the Paleogene fossil record of marine mollusks from the Gulf and Atlantic Coastal Plains of the eastern United States, I present new methods for unveiling rare diversity and a series of multivariate analyses of the direct and indirect effects of intrinsic biological factors on extinction risk through the early Cenozoic. I show that combining museum, literature, and field data using a modeling approach can provide a more comprehensive estimate of taxonomic richness and abundance without substantial increase in current sampling effort. I then assess the contributions of abundance, body size, and geographic range to the duration of bivalve species and find that geographic range has the strongest direct effect on extinction risk and that an apparent direct effect of abundance is explained entirely by its covariation with geographic range. The influence of geographic range is broadly manifest, explaining variation in extinction risk in three ecologically-disparate bivalve clades. Body size also contributes significantly to extinction risk, but in opposing directions in different clades, such that it has no net effect for bivalves as a whole. Using structural equation modeling, I reveal indirect effects of both abundance and body size on extinction risk via their positive influence on geographic range size. Lastly, I evaluate the

stability of intrinsic biological correlates of extinction risk over the early Cenozoic by comparing a model in which these effects were invariant over time with several time-dependent models. I find that geographic range size always had a significant positive effect on extinction resistance but its strength varied over the early Cenozoic in tandem with variation in extinction intensity and clade diversity. My dissertation provides a new understanding of the interacting forces which drive extinction in ancient communities, and offers an explicit methodological framework for assessing general versus specific controls on extinction risk over the variable history of Earth and life.

CHAPTER ONE

INTRODUCTION

My dissertation addresses a long-standing problem in evolutionary biology and ecology: *the complex interactions between factors believed to influence extinction risk*. A wealth of empirical data exists on the relationships between intrinsic biological factors and extinction risk (or extinction selectivity) in the fossil record (e.g., Kammer et al. 1998; Jablonski and Hunt 2006; Smith and Roy 2006; Liow 2007). Many of these factors are also widely used to assess the risk status of extant species (IUCN 2001). However, a synthesis of the relative importance of multiple factors is lacking. This is due to two limitations present in most studies. First, rare species are expected to be at greater risk of extinction, yet are also less likely to be sampled (Meldahl 1990; Holland and Patzkowsky 2002). Poor sampling may artificially generate, or strengthen, a relationship between abundance and extinction risk. Conversely, abundance and extinction risk may appear decoupled when sampling is exceptionally limited and analyses restricted to common and abundant taxa. Second, intrinsic biological factors are rarely independent, yet most studies assume them to be when factors are analyzed separately. The interrelationships between abundance, body size, and geographic distribution have been discussed by ecologists, biogeographers, and paleontologists for more than a century. Yet, relatively few studies have explicitly accounted for such covariation when modeling extinction risk (though see Purvis et al. 2000a; Jablonski and Hunt 2006; Kiessling and Aberhan 2007; Payne and Finnegan 2007; Rivadeneira and Marquet 2007; Cooper et al. 2008; Purvis 2008).

In my dissertation, I have addressed the effects of multiple intrinsic biological factors on extinction risk using the early Cenozoic fossil record of marine mollusks. The fossil record of marine mollusks is relatively complete (Valentine 1989; Harper 1998; Jablonski et al. 2003b; Kidwell 2005; Valentine et al. 2006), and recent studies have shown that molluscan skeletal concentrations can record ecological data such as relative abundance with significant fidelity (Kidwell 2001, 2002; Lockwood and Chastant 2006). The Paleogene of the Gulf and Atlantic Coastal Plains has been well studied, providing a mature stratigraphic (Dockery 1986b; Mancini and Tew 1992) and taxonomic (Palmer and Brann 1965, 1966) framework in which to conduct this research. The Paleogene also spans markedly different environmental conditions and is well-suited for testing the general applicability of intrinsic biological correlates of extinction risk over geologic time. The ecological and evolutionary data that form the basis for these analyses were gathered through my own fieldwork in the Gulf Coastal Plain, and through the use of existing museum collections, and data compilation using the Paleobiology Database (http://paleodb.org) and literature.

DISSERTATION OUTLINE

One of the principal challenges in assessing extinction risk today and in the geologic past is that rarity is believed to influence extinction but is also known to affect sampling. Rare taxa are, by definition, encountered infrequently and their observed occurrences strongly controlled by sampling effort. In Chapter 2, "*Unveiling rare diversity by integrating museum, literature, and field data*," I present two new methods for sampling rare species through the integration of historical data from museum collections and the published literature and estimates of species abundance gathered from quantitative field samples. Combining these different sources of data can provide a more comprehensive estimate of abundance and taxonomic diversity without substantial increase in current sampling effort, thereby greatly expanding the scale of abundance and the sample size of species that can be included in paleoecological and evolutionary analyses. I illustrate these methods by applying them to data for bivalve and gastropod species from three well-known Paleogene localities in Mississippi and Alabama. These results demonstrate the magnitude of taxonomic richness veiled under most reasonable sampling schemes and the impact rare taxa can have on comparative analyses of taxonomic richness.

Intrinsic biological factors such as abundance may contribute directly to extinction risk, and indirectly via their contributions to other factors such as geographic range size. In Chapter 3, "*Direct and indirect effects of biological factors on extinction risk in fossil bivalves*," I model the direct and indirect effects of abundance, body size, and geographic range on the duration of species over the Paleogene. I focus on three superfamilies of marine bivalves: the Carditoidea, Pectinoidea, and Veneroidea. These three ecologically-disparate clades provide an excellent system for assessing the general applicability of intrinsic biological predictors of extinction risk. These analyses reveal that geographic range had a strong direct effect on extinction risk in marine bivalves over the Paleogene. In contrast, abundance contributed only indirectly to extinction risk via its positive influence on geographic range size. In individual clades, geographic range had a strong positive effect on species duration, whereas the effect of body size was weaker and was less predictable in direction. These analyses underscore the importance of accounting for covariation between factors when modeling extinction risk, and provide additional support for the dominant role of geographic range size in driving extinction risk over geologic time.

Intrinsic biological factors have contributed to extinction risk over the history of life, but the magnitude of these contributions has varied over time. Comparison between the strength of selectivity in background and mass extinction intervals has received the most attention. However, selectivity also varies during intervals characterized by more moderate extinction intensity. In Chapter 4, "*Time-dependent models of extinction risk in the early Cenozoic*," I use a model-selection approach to assess the relative support for a time-independent versus time-independent model of extinction selectivity. In the time-independent model, the effects of geographic range and body size on species duration were invariant, while in the time-dependent model such effects were allowed to vary over the Paleogene. Geographic range was a strong predictor over the early Cenozoic, but its effect varied over time and a time-dependent model of extinction risk was much better supported than a time-independent model. Selectivity was strongest during the middle-late Eocene and weakened in the Paleocene-early Eocene and early Oligocene. Such variability may result from temporal shifts in environmental drivers, biological distributions within clades or biotas, extinction intensity, and/or the quality of the preserved and sampled fossil record. I review the support for each of these potential drivers and conclude that temporal variation in the strength of selectivity is best explained by variations in extinction intensity and clade diversity. These analyses suggest that clade-dependent effects may be important contributors to the relationships between intrinsic biological factors and extinction risk observed at more inclusive phylogenetic scales.

CHAPTER TWO

UNVEILING RARE DIVERSITY BY INTEGRATING MUSEUM, LITERATURE, AND FIELD DATA[1]

ABSTRACT

Estimates of taxonomic richness and abundance are complicated by sampling biases. The failure to sample rare taxa is most often attributed to inadequate sampling and to removal during the process of sample-size standardization. Here I present two methods for unveiling rare diversity by integrating species presence/absence data from museum collections and the literature with quantitative estimates of species richness and abundance gathered from field-based bulk samples. Combining museum, literature, and field data can provide a more comprehensive estimate of taxonomic richness and abundance without substantial increase in current sampling effort. First, in a given bulk sample, the lowest proportional abundance value observed can be used to estimate the maximum abundance of rare species known to have occurred at the locality at least once but not recorded in the current sample. Second, a model-selection approach can be used, in which a set of relative abundance distribution models are fit to the bulk-sample abundance data and the parameter estimates for the best model used to calculate

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[1] This manuscript previously appeared in Paleobiology, 2009, volume 35, pages 190-208. Included with permission from the Paleontological Society.

the abundance distribution for all species known from the locality. The Paleogene marine fossil record of the U.S. Gulf Coastal Plain is suitable for applying these methods, because (1) the molluscan fauna is well represented in museum collections and the literature, (2) the molluscan fauna has been taxonomically standardized, and (3) many classic localities remain accessible for standardized bulk sampling. I introduce these methods by applying them to a single locality and then, using the faunas of the Gosport, Moodys Branch, and Red Bluff Formations, I demonstrate how the model-fitting approach can be used to compare taxonomic richness among multiple localities. A substantial fraction of the molluscan richness known from each locality is not captured in bulk samples and much of this unobserved richness may be attributed to the rarity of species. The multiple-locality comparison suggests that the greatest Paleogene decline in standing richness occurred in the middle Eocene and that the recovery of richness following the Eocene-Oligocene extinction was quite rapid despite substantial loss of taxa. These analyses underscore the magnitude of veiled diversity in marine fossil assemblages and the potential of existing sources of data to unveil rare taxa, allowing them to be incorporated into quantitative diversity studies.

INCORPORATING RARE TAXA INTO BIODIVERSITY ESTIMATES

The major approaches to measuring biodiversity, such as bulk sampling, sampling standardization, and accumulation of historical collection records, weight richness and abundance differently and capture rare species with varying effectiveness. How can these be combined to develop a robust, synthetic biodiversity estimate? Both richness and abundance are informative, providing insights, albeit at times indirectly, into species interactions, niche partitioning, and community assembly (e.g., Pandolfi 1996; Olszewski and Erwin 2004; Jackson and Erwin 2006; Wagner et al. 2006; Bush et al. 2007; Novack-Gottshall 2007), as well as diversification rates and the selectivity of extinctions and originations (e.g., Budd and Johnson 2001; Lockwood 2003; Kiessling and Baron-Szabo 2004). However, attempts to quantify richness and abundance in both Recent and fossil communities are complicated by sampling biases. Rare species are, by definition, encountered infrequently and their observed occurrences are strongly influenced by sampling effort (Preston 1948; Signor and Lipps 1982; Meldahl 1990; Gaston 1994; Hayek and Buzas 1997; Holland and Patzkowsky 2002; Thompson 2004). In a classic paper, Preston (1948) described the sample-size dependency of richness estimates by using the analogy of a veil behind which rare species are concealed from observation. The position of the veil line is controlled by the number of individuals sampled and the shape of the underlying abundance distribution (Preston 1948; Chisholm 2007, although see Dewdney 1998).

Given the sensitivity of biodiversity estimates to sampling effort, many have advocated the use of rarefaction or similar sampling standardization protocols in comparing patterns of relative richness (Raup 1975; Bush et al. 2004; Crampton et al. 2006; Kowalewski et al. 2006; Alroy et al. 2008). In recent years, analyses of evenness have also been increasingly emphasized (Powell and Kowalewski 2002; Olszewski 2004; Peters 2004, 2006; Bulinski 2007), in part because of the insensitivity of some evenness metrics to sample size (Hurlburt 1971; Peters 2004; Bulinski 2007), and because sample-level differences in evenness affect taxonomic richness estimates (Sanders 1968; Powell and Kowalewski 2002; Peters 2006). Although these methodological advances have been critical in evaluating changes in biodiversity while minimizing some sampling biases, they have also tended to focus attention on the dynamics of abundant and common taxa. Sampling standardization frequently results in comparison among only those taxa sufficiently common to be found in sample sizes of 100 or fewer specimens (e.g., Kowalewski et al. 2006), whereas sample-size "independent" evenness metrics provide information primarily about the numerical dominance of top taxa, largely neglecting the abundances of most taxa in any given assemblage (Kosnik and Wagner 2006).

Surveys of Recent shallow marine habitats (Sanders 1968; Schlacher et al. 1998; Ellingsen 2001; Bouchet et al. 2002; Shin and Ellingsen 2004; Zuschin and Oliver 2005) underscore how much benthic richness in the global oceans is rare. In New Caledonia, for example, approximately 50% of macrobenthic molluscan species were represented by five or fewer specimens in a survey of over 127,000 individuals (Bouchet et al. 2002). Similarly, in Hong Kong, 38% of macrobenthic invertebrate species were known from only one or two individuals out of a sample size of 16,334 specimens (Shin and Ellingsen 2004). Although elevated tropical richness may accentuate the patterns cited here, similar results have also been reported for temperate shelf faunas (Ellingsen 2001). In most Recent marine and terrestrial communities that have been surveyed, rare species compose the bulk of taxonomic diversity (Gaston 1994; Brown 1995; Kunin and Gaston 1997; Gaston and Blackburn 2000, and references therein).

The magnitude of rare richness prompts questions about the ecological and evolutionary properties of rare species. For example, to what extent does rarity increase extinction risk? How rapidly does richness recover following extinction, and how is this partitioned with respect to abundance? Do rare and abundant taxa differ in per capita rates of origination? Given that ubiquitous sampling limitations prevent quantitative field-sampling approaches from fully addressing such questions, is there a way to study diversity that takes into account the often considerable number of rare species? In this paper, I present two methods for unveiling rare diversity by integrating species presence/absence data available in museum collections and the literature (hereafter referred to as "faunal lists") with species abundance data gathered from field-based random samples (hereafter referred to as "bulk samples").

To explore diversity patterns of species beyond those recovered in bulk samples of limited size, we can capitalize on historical sampling effort by augmenting bulk-sample abundance data with faunal-list occurrence data in two ways. First, for a given bulk sample (or set of pooled samples), we can estimate the maximum relative abundance of rare species found at least once before at that spatial and temporal scale but not observed in a new bulk sample of individuals by dividing one by the current sampling effort (i.e., the sample size of individuals). Second, using a model-selection approach, we can fit a set of relative abundance distributions (RADs) to the bulk-sample data and use the parameter estimates for the best RAD to model the abundances of all species reported previously from the locality including those not found in the new bulk sample. These approaches enable rare species to be incorporated into quantitative studies of macroecology (e.g., body size-abundance relationships), macroevolution (e.g., abundance-extinction relationships), and taxonomic richness without substantially increasing new sampling effort. Although gathering new diversity data is essential in regions where little prior research has been conducted, I will show here that for well-studied systems (e.g., Paleogene and Neogene of the Gulf and Atlantic Coastal Plains, Ordovician of the Cincinnati Arch) we can benefit from the emphasis on richness of historical data by using these to extend bulk-sample diversity estimates.

DATA AND METHODS

Two methods are presented for estimating the abundances of "list-only" species (i.e., those species reported previously from the locality but not found in bulk samples). The first involves the assignment of maximum proportional abundance values to specific "list-only" species, and the second uses the RAD observed in the bulk-sample data to model the abundances of all species reported from that stratigraphic unit at that locality. These methods require quantitative abundance data, ideally derived from replicate bulk samples, and faunal lists compiled at comparable spatial and temporal scale from museum records and published occurrences. The Paleogene fossil record of the Gulf Coastal Plain is suitable for exploring these methods because the molluscan fauna is well represented in museum collections and the literature and has been the subject of extensive taxonomic standardization (Palmer and Brann 1965, 1966; Dockery 1977, 1982; MacNeil and Dockery 1984), and because many historical localities remain accessible for standardized bulk sampling. Furthermore, extensive work on the Paleogene stratigraphy of the Gulf Coastal Plain has resulted in a sequence stratigraphic framework (Dockery 1986b; Mancini and Tew 1992; Davidoff and Yancey 1993; Tew and Mancini 1995; Ivany 1998; Jaramillo and Oboh-Ikuenobe 1999) resolved to approximately one-million-year (Myr) intervals using nannoplankton and foraminiferal zones. Mollusks are a particularly well-suited group in which to apply these methods because they are diverse and abundant in Recent and ancient shallow marine environments and exhibit significant agreement in species rank-order abundances between life and death assemblages (Kidwell 2001, 2002; Kowalewski et al. 2003; Lockwood and Chastant 2006).

Data Compilation

To illustrate these methods, I compiled bulk-sample data and faunal lists from the literature (see supplemental data online). Bulk-sample data for gastropods and bivalves from the Gosport Formation at Claiborne Bluff (CB), Monroe County, Alabama, were compiled from studies by Swindel (1986), CoBabe and Allmon (1994), and Harrison (1994). The authors of each study bulk-sampled the Gosport at CB in somewhat different ways (Table 2.1): Harrison (1994) divided the stratigraphic section into contiguous 30 cm units and then trenched and sieved each of these; Swindel (1986) collected stratigraphic samples from the lower, middle, and upper portions of the stratigraphic section; CoBabe and Allmon (1994) collected multiple replicates from the same stratigraphic position in the lower third of the section. Gastropod individuals were counted as numbers of apices, and bivalves were corrected for the number of individuals either by dividing the total count of valves for each species by two (CoBabe and Allmon 1994; Harrison 1994) or by using the greater number of either left or right valves (Swindel 1986); this correction was made by the original authors with the exception of the CoBabe and Allmon data which I corrected prior to analysis. Minimum sieve size varied among studies, ranging from 1 mm (Swindel 1986) to 3 mm (CoBabe and Allmon 1994; Harrison 1994).

A faunal list for the Gosport at CB was compiled from publications by Palmer and Brann (1965; 1966), with the addition of ten species found in bulk samples by CoBabe and Allmon; Harrison, and Swindel, but not previously listed as occurring in that unit at that locality. The faunal list included only those species described as occurring in the Gosport at CB; Gosport taxa with uncertain locality information and CB taxa with uncertain stratigraphic assignments were excluded. Taxonomic inconsistencies among the three studies were minimized by removing all indeterminate occurrences and standardizing the remaining bulk-sample data following the taxonomy of Palmer and Brann (1965; 1966), which synthesized a century of Paleocene and Eocene molluscan systematics in the Gulf and Atlantic Coastal Plains. Few taxonomic changes were required because Palmer and Brann's publications were the primary references used for the three studies examined here. Following taxonomic standardization, the bulk-sample data set contained 150 species from a total of 28 samples, comprising 87,130 individuals, with a median sample size of 920 individuals. When pooled, these bulk-sample data are assumed to sample the underlying species pool over the temporal and spatial extent of the Gosport exposure at CB. This assumption is reasonable given that bulk samples encompass the complete vertical thickness of the Gosport at CB (Table 2.1). Possible spatial variation is less well constrained because none of the authors collected laterally spaced replicate samples, but it is likely that the data pooled across studies encompass both lateral and vertical variation if such exists. The spatial and temporal

Table 2.1. The sampling domains of bulk collections at the Gosport, Moodys Branch, and Red Bluff localities. For each study, the number of sampled outcrops is one with the exception of Red Bluff in which bulk samples were pooled by the original authors from two outcrops (see Hansen et al. 2004 for details). Sample spacing is the mean vertical spacing of bulk samples. Sampling extent is a measure of the overlap in coverage of bulk-sample and faunal-list data sets, measured for a given locality as the maximum vertical separation between bulk samples divided by the thickness of the focal stratigraphic unit; faunal lists are resolved to the locality scale and are assumed to sample the complete spatial and temporal extent of the focal stratigraphic unit at the locality scale. Stratigraphic thicknesses were compiled from the following references: Gosport (Harrison 1994); Moodys Branch (Dockery 1986a); the stratigraphic thickness for the Red Bluff locality was estimated using the maximum recorded thickness of that unit in Wayne Co., MS as a proxy due to the lack of a detailed measured section. None of the authors collected lateral replicate bulk samples, but the Gosport data at CB pooled across studies probably includes a lateral component.

	No. of outcrops	No. of bulk samples	No. of individuals	Sample spacing	Sampling extent (maximum sample spacing / unit thickness)	Reference
Red Bluff	2	7	3746	0.33 m	82% (3.5 m / 4.25 m)	Hansen et al. (2004)
Moodys Branch	1	5	6171	0.45 m	100% (4.3 m / 4.3 m)	Elder (1981)
Gosport	1	7	6733	<0.50 m	7% (0.50 m / 7.05 m); samples collected ~2 m above base of Formation	CoBabe & Allmon (1994)
	1	18	16,898	Contiguous	100% (7.05 m / 7.05 m)	Harrison (1994)
	1	3	63,499	Not reported	Not reported	Swindel (1986)

distributions of species occurrences in the associated faunal list are resolved to the locality scale, and specimens may have come from anywhere in the exposure.

In addition to the data for the middle Eocene Gosport Formation at CB, bulk-sample data were compiled from the literature for two other localities (Table 2.1): the late Eocene Moodys Branch Formation at Fossil Gulch, Hinds County, Mississippi (Elder 1981), and the early Oligocene Red Bluff Formation along the Chickasawhay River near Hiwanee, Wayne County, Mississippi (Hansen et al. 2004). The Red Bluff bulk-sample data were pooled by the original authors from samples collected from two localities, Mississippi Geological Survey localities MGS-35 and MGS-38 (MacNeil and Dockery 1984), located less than 2 km apart with equivalent stratigraphy (see discussion in Hansen et al. 2004). Counting protocols for the Moodys Branch and Red Bluff localities were comparable to those described above for the Gosport at CB and the minimum sieve size used was 1 mm. Faunal lists were generated from published species occurrences for each of these localities and both bulk-sample data and faunal lists were taxonomically standardized prior to analysis (Palmer and Brann 1965; Dockery 1977, 1982; MacNeil and Dockery 1984; Dockery and Lozouet 2003). Bulk samples were distributed over more than 80% of the vertical extent of the stratigraphic units exposed at each of these localities (Table 2.1) and provide a representative sample of the diversity and abundance of marine mollusks at the locality scale.

Samples at the middle and late Eocene localities come from well-mixed fossiliferous sands deposited on the shelf during maximum transgression (Mancini and Tew 1992). The early Oligocene samples come from sandy fossiliferous lenses preserved in silty clays deposited in shelf and delta-margin environments (Dockery 1982), likely during sea level highstand (Mancini and Tew 1992; Jaramillo and Oboh-Ikuenobe 1999, though see Pasley and Hazel 1995 and Hansen et al. 2004 for alternative sequence stratigraphic interpretations). Molluscan preservation at these three localities is exceptional, with primary aragonite preserved at all localities, making these data well suited for comparisons of richness and abundance within largely iso-taphonomic conditions.

Relative Abundance Distributions and Model Selection

To incorporate "list-only" species into comparative analyses of richness it is necessary to estimate the sampling effort that would be necessary to unveil them. To determine the bulk-sample size that would be necessary to capture the cumulative known richness, I estimated the relative abundances of all species known from a locality by using a model of the RAD derived from the observed bulk-sample data. For each locality, I used the maximum-likelihood method to fit a candidate set of RAD models (broken stick, geometric, lognormal, Zipf, Zipf-Mandelbrot) to the observed bulk-sample data, providing estimates of the parameter values and the log-likelihood of each model given the data. The candidate set of models included representatives from most of the major families of RAD models, and the candidates have shapes similar to many RADs not considered (Marquet et al. 2003; McGill et al. 2007); the zero-sum multinomial (Hubbell 2001) was not included in the candidate set of models because many algorithms for evaluating the zero-sum fail to converge in a reasonable time given sample sizes as large as those analyzed here. The equations and routines used to calculate the expected abundances of taxa for each model are outlined in several works on RADs (Frontier 1985; Mouillot and Lepretre 1999;

Kosnik and Wagner 2006). Akaike's Information Criterion (AIC) was then used to select the best model (Akaike 1974; Burnham and Anderson 2002) through the calculation of the Akaike weights. AIC is a parsimony-based approach and its calculation can be thought of as a measure of the fit of a given model to the data penalized by the complexity of the model. AIC is calculated as follows:

$$AIC = -2\ell + 2k \tag{1}$$

where ℓ is the log-likelihood of the model and k is the number of estimated parameters. The Akaike weights are calculated as

$$w_i = \exp\left(-\frac{1}{2}\Delta_i\right) \Big/ \left[\sum_{r=1}^{R} \exp\left(-\frac{1}{2}\Delta_i\right)\right] \tag{2}$$

where w_i is the weight of the i^{th} model, Δ_i is the difference in AIC values between the i^{th} model and the best model (identified as the model with the smallest AIC value), and this is then scaled to the sum of Δ_i values for all models in the set. Akaike weights sum to 1 and are a measure of the relative support for each model in the candidate set given the observed data. An Akaike weight >0.95 was used as the criterion for model selection. The percentage of Explained Deviance for each model, calculated as 100·([Null Deviance – Residual Deviance]/Null Deviance), was used as a measure of goodness-of-fit (McCullagh and Nelder 1989).

Using the estimated RAD model parameters, I then calculated the expected abundance of each species known for each locality, including those not found in bulk samples. Assuming the rarest species at each locality was known from only a single specimen, I estimated the sample size that would be necessary to recover the known bivalve and gastropod species.

Assessing the Sensitivity of Model Selection and Parameter Estimation to Variations in Sample Size

I illustrate these methods with data from extensive bulk sampling and more than a century of qualitative collecting in the Gulf Coastal Plain. But are tens of thousands of specimens required to apply this approach? The question of sample-size sensitivity has two components: model selection and parameter estimation. To address model-selection uncertainty, I used the CB Gosport data and compared the mean Akaike weights for the five different RAD models as a function of sample size, using a bootstrap resampling procedure with 1000 replicates per sample size. I evaluated the effects of sample size on parameter estimation in a similar fashion, fitting the set of RADs to a range of sample sizes and comparing the resulting parameter estimates with those obtained from models fit to the total sample.

Assessing Whether Individual Localities Shared the Same RAD

Unless observations are identical, the hypothesis that two or more localities had unique RADs will always be the most likely. However, given uncertainty in parameter estimation, a null hypothesis that localities shared the same RAD requires rejection in this case. This step is necessary because the modeled RADs are then used to compare the relative differences in taxonomic richness among localities. To address this, I used a bootstrap resampling routine in which the RADs were fit repeatedly to the bulk-sample data at each locality in question, and then contrasted the mean model parameters and 95% confidence intervals.

All analyses were conducted using the statistical programming environment R, version 2.3.1 (R Development Core Team 2006). RAD models were fit to observed abundances of species using the community ecology package "vegan" (Oksanen et al. 2007), with the Zipf-Mandelbrot distribution (Frontier 1985) fit using code modified for application to large data sets provided by J. Oksanen (personal communication 2006).

RESULTS

Comparing Faunal-List and Bulk-Sample Richness

The expectation is that the total known richness compiled from more extensive and, in many cases, nonrandom sampling should exceed that observed in bulk samples. An observed deficit in the richness of bulk samples may be due to the rarity of "list-only" species. These expectations were assessed by comparing the richness of faunal-list and bulk-sample data sets and then examining the distribution of rarity among species observed in bulk samples. Total known richness for the Gosport at CB (i.e., the sum of faunal-list and bulk-sample richness) greatly exceeds bulk-sampled richness, with only 41% of known species recovered in bulk samples (Figure 2.1). A small number of species recovered in bulk samples were not previously known from the Gosport at CB. These "bulk-sample-only" species were all rare (ten species with a median numerical abundance of 22 specimens and proportional abundance = 0.0002).

The large discrepancy in richness between the faunal-list and bulk-sample data cannot be attributed simply to taxonomic inconsistency because all species names were standardized, or to species lumping due to poor monographic coverage because over 97% of bivalve and gastropod

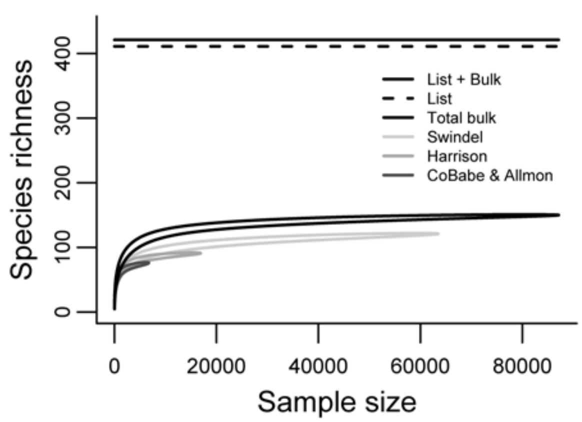

Figure 2.1. Rarefaction curves for the middle Eocene Gosport Formation at Claiborne Bluff (CB), Alabama. The horizontal dashed line indicates the species richness reported from the Gosport at CB in museum collections and the literature (S = 411). The slightly elevated solid black line indicates the cumulative species richness from the Gosport at CB, including species found in bulk samples as well as those found in museum collections and the literature (S = 421). Rarefaction curves from top to bottom follow the order presented in the legend. Over 50% of species known from the Gosport at CB are not captured in bulk samples, even those of substantial size.

Table 2.2. Agreement in rank abundance and taxonomic composition between bulk-sample data sets for the Gosport at CB.

	Spearman Rho	Bray-Curtis dissimilarity
CoBabe & Allmon vs. Swindel	0.24**	0.83
CoBabe & Allmon vs. Harrison	0.67***	0.43
Swindel vs. Harrison	0.19*	0.68

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

species known from the Gosport at CB have been figured (Palmer and Brann 1965, 1966). Nonetheless, some of the variation between the faunal-list and bulk-sample data undoubtedly still results from differences in taxonomic practice. Paleoecologists may tend to lump species more than systematists, or conversely systematists may split species more often, which would contribute to the discrepancy in richness observed between the faunal-list and bulk-sample data. However, differing taxonomic practices are unlikely to account for the nearly three-fold difference in richness observed between the faunal-list and bulk-sample data. To mitigate any remaining taxonomic effects, the most conservative application of the methods presented below would involve taxonomically standardizing all identifications at the specimen level, both in bulk samples and faunal lists, by using museum collections and monographic plates.

Individual bulk-sample data sets for the Gosport at CB recovered between 19% and 33% of the known richness, with higher recovery found in studies of greater spatial and temporal extent and larger sample size (Swindel 1986; Harrison 1994). Species rank abundances were positively correlated across all bulk-sample data sets using Spearman rank correlation tests, although the strengths of these correlations varied (Spearman rho values of 0.19 to 0.67; Table 2.2). Bray-Curtis dissimilarity values also varied among the three data sets, ranging from 0.43 to 0.83, reflecting differences in the taxonomic composition of bulk samples (Table 2). These differences may reflect variation in sampling methods, spatial or temporal variation in the underlying species pool being sampled, taxonomic practice, or some combination of these different factors.

Low correlations among bulk samples are expected if species are patchily distributed and/or occur at low densities. Examination of the frequency of species occurrences in bulk samples corroborates this expectation, with 46% of Gosport mollusk species found in three or fewer samples and 15% restricted to a single sample (Figure 2.2A). To determine whether species found in few samples were rare or common, I plotted the relationship between the number of samples in which a species occurs and its mean proportional abundance in those samples (Figure 2.2B). Locally abundant species occurred in more samples, and with decreasing abundance, the frequency of occurrence also declined (Spearman rho = 0.90, $p < 0.00001$). Positive abundance-occupancy relationships are one of the most ubiquitous macroecological patterns and may be generated through true covariance between local density and spatial occurrence and/or through poor sampling of rare taxa (Brown 1984; Gaston et al. 1997; Schlacher et al. 1998). Either mechanism implies that taxa sampled infrequently were rare.

Assuming that the abundance-occupancy relationship observed in the bulk-sample data is general for the Gosport fauna at CB as a whole, we can assign an abundance value to species found previously but absent in the new bulk sample of individuals. These “list-only” species were probably no more abundant than the rarest bulk-sampled species and potentially much rarer. The maximum proportional abundances of rare “list-only” species can be estimated as $1/N$ where N is the bulk-sample size of individuals. The precision of these abundance estimates

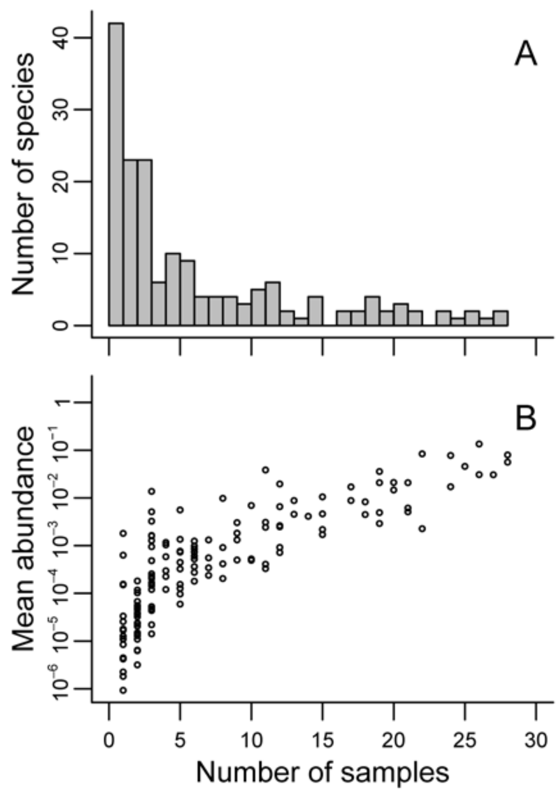

Figure 2.2. A, Frequency distribution of bulk-sampled occurrences for mollusk species from the Gosport at CB. Most species are known from relatively few samples although a few species are common throughout. B, The relationship between sampled occurrences and the mean proportional abundances of species in the samples in which they occur. Common species occur in more samples, and with declining abundance the frequency of occurrence also declines.

depends on the accuracy of bulk-sample estimates of the underlying species RAD. For the Gosport at CB, "list-only" species would be assigned an abundance of 1/87,130. Although this will likely overestimate the proportional abundance of some rare species, the estimated abundance value for these "list-only" species will still be "rare," given sufficiently large samples. This approach is particularly useful for clade or guild-based analyses in which the total sample size is easily calculated (e.g., the total number of bivalve individuals) but species-level abundance and faunal-list occurrence data are gathered only for a subset of the preserved fauna (e.g., species of scallops). If one were to estimate the abundances of all "list-only" species as $1/N$, the sum of proportional abundances would exceed 100%, which may necessitate recalculating species proportional abundances depending on the specific research questions being addressed. Estimating the maximum proportional abundances of "list-only" species as $1/N$ allows poorly sampled rare taxa to be incorporated into macroecological and macroevolutionary analyses such as abundance–body size and abundance-extinction relationships.

To incorporate "list-only" species into comparative analyses of richness it is necessary to determine the sampling effort that would be necessary to unveil them with greater precision than that provided by the maximum proportional abundance approach described above. To determine the bulk-sample size that would be necessary to capture the cumulative known richness, I estimated the relative abundances of all species known from a locality using a model of the RAD derived from the observed bulk-sample data. Using the model-fitting approach, the Zipf-Mandelbrot RAD was identified as the best model in the set given the observed data for the Gosport at CB ($w_{ZM} >> 0.99$; Table 2.3, Figure 2.3). The Zipf-Mandelbrot RAD model explains

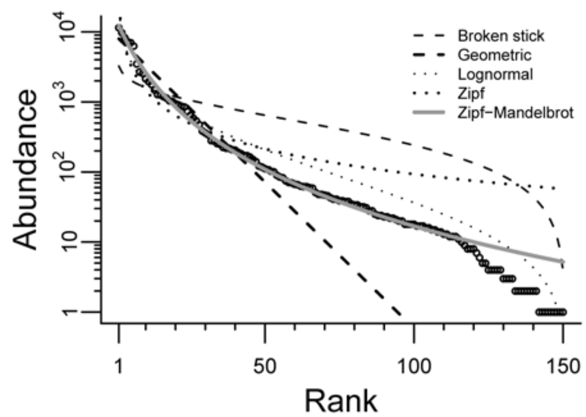

Figure 2.3. Set of five relative abundance distribution (RAD) models fit to bulk-sample data from the Gosport at CB. For these data the best-supported model is the Zipf-Mandelbrot distribution (see Table 2.3 and discussion in text). Absolute rather than relative abundance is plotted here to illustrate the number of species known from only one or two specimens even at large sample sizes.

Table 2.3. Model selection criteria used to identify the best model among the set of five RADs fit to the CB Gosport bulk-sample data. k, number of model parameters; AIC, AIC values; Δ_i, AIC differences between the model and the best model with low values indicating greater support; w_i, Akaike weights for each model; ED, percent explained deviance. A model with an Akaike weight >0.95 is unambiguously identified as the best model in the set given the data.

RAD Model	K	AIC	Δ_i	w_i	ED
Zipf-Mandelbrot	3	2792.5	0	>0.999	99.1%
Lognormal	2	15,299.1	12,506.6	<<0.0001	95.0%
Geometric	1	15,453.1	12,660.6	<<0.0001	94.9%
Zipf	2	30,371.4	27,578.9	<<0.0001	90.1%
Broken stick	0	107,113.4	104,320.9	<<0.0001	64.9%

>99% of the observed deviance in the Gosport CB data and is largely an unbiased estimator of observed species abundances (Figure 2.4). Using the estimated Zipf-Mandelbrot model parameters, I calculated the expected abundance of each species known from the Gosport at CB, including those not found in bulk samples (Frontier 1985; Mouillot and Lepretre 1999).

Assuming the rarest species at CB was known from only a single specimen and that the best fit RAD is an accurate description of the underlying RAD at that spatial and temporal scale, an estimated sample size of 416,548 specimens would be necessary to recover the 421 known bivalve and gastropod species. The estimated sampling effort required to unveil the known richness is approximately five times the current sampling effort and unlikely to be met using only quantitative field-based approaches. By estimating the RAD of the cumulative faunal list and the sampling effort necessary to unveil it, this second approach enables rare species to be incorporated into sample-standardized comparisons of richness.

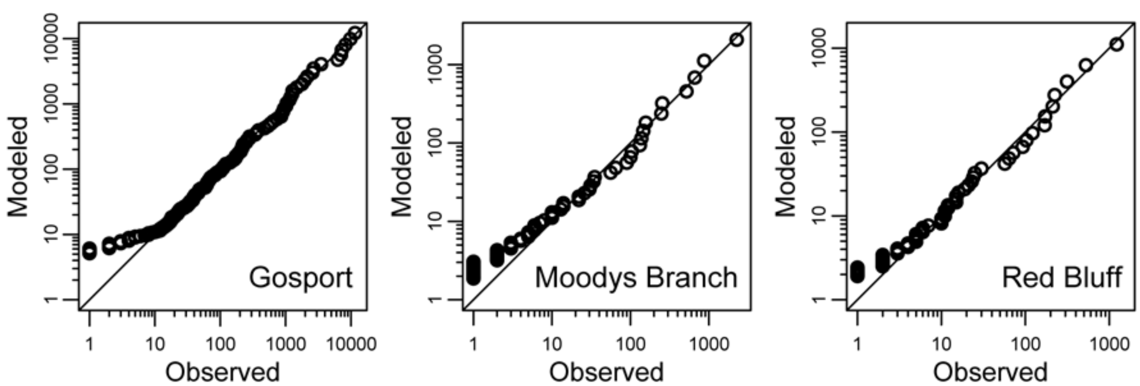

Figure 2.4. Observed versus modeled abundance data for the Gosport, Moodys Branch, and Red Bluff localities. Species abundances modeled using the Zipf-Mandelbrot RAD are largely unbiased estimators of the observed abundances of species, with most values falling along the line of unity. Where modeled and observed values systematically differ is in the rare tail, in which modeled values overestimate the observed abundances of the rarest species (though the magnitude of this offset is accentuated by plotting the data on logarithmic axes).

Comparing Richness among Multiple Localities

The three Paleogene localities considered here vary in bulk-sampling effort (*N*), bulk-sampled richness (S_{Bulk}), and total known richness ($S_{Cumulative}$) (Table 2.4). As with the middle Eocene example, bulk-sampled richness for both the late Eocene and early Oligocene data falls short of the cumulative richness known from each locality ($S_{Cumulative} > S_{Bulk}$). Approximately 100 species are known from the late Eocene Moodys Branch and early Oligocene Red Bluff Formations at these localities, of which approximately 60% are recovered in the bulk-sample data. How much additional sampling would be needed to unveil the known local richness? Furthermore, do the patterns of relative richness among localities change when these poorly sampled rare species are incorporated into comparisons?

Using the model-fitting approach, the lognormal RAD is better supported than the Zipf-Mandelbrot for both the Moodys Branch and Red Bluff data sets (Table 2.5). However, when the lognormal is used to estimate the number of veiled species (i.e., the number of species represented by zero specimens), these estimates fall short of the cumulative richness known for each of these localities (e.g., total richness for the Red Bluff is estimated to be 90 using the lognormal parameters although 106 species are already known). If the lognormal model is rejected post hoc as being inconsistent with the excess of rare species observed at each of these localities, then the next best model in both cases is the Zipf-Mandelbrot. Examining the evidence ratio for the Zipf-Mandelbrot relative to the third ranked model, calculated as the ratio of Akaike weights for these two models (Burnham and Anderson 2002), confirms that the Zipf-Mandelbrot is much better supported than the next best model for both the Moodys Branch and Red Bluff

Table 2.4. Summary of the taxonomic richness of the three Paleogene Gulf Coastal Plain localities exposing the Red Bluff, Moodys Branch, and Gosport Formations respectively. Localities vary in bulk-sampling effort (N), bulk-sampled richness (S_{Bulk}), sample-standardized richness at a sample size of 3700 individuals ($S_{Bulk(N=3700)}$), and the cumulative known richness compiled from museum, literature, and bulk-sample data ($S_{Cumulative}$).

Locality	N	S_{Bulk}	$S_{Bulk(N=3700)}$	$S_{Cumulative}$
Red Bluff	3746	65	64	106
Moodys Branch	6171	62	55	101
Gosport	87,130	150	101	421

(evidence ratios of 2.07e+81 and 5.88e+40 respectively). For these two localities the Zipf-Mandelbrot RAD explains >96% of the deviance in the observed data (Table 2.5, Figure 2.4).

Using the parameter estimates for the Zipf-Mandelbrot RAD, the sample sizes necessary to capture the known richness can be calculated for each locality. For the Moodys Branch, a sample size of 9341 individuals is expected to reveal the 101 species known from the locality, and for the Red Bluff, 5345 individuals are expected to reveal the known richness of 106 species. Sampling at the late Eocene Moodys Branch and early Oligocene Red Bluff localities would need to increase by a factor of 1.5 and 1.4 respectively over current sampling efforts. For both of these localities the known richness and sample sizes necessary to recover it pale in comparison to the middle Eocene locality. This is likely an artifact of sampling effort (i.e., the middle Eocene Gosport at CB has been sampled intensively for over a century) as well as a real difference in the underlying diversities of these stratigraphic units.

Treating the modeled species abundances as the sample for each locality, I calculate the species richness expected for a given sample size using analytical rarefaction (Raup 1975; Tipper 1979). Sample-standardized richness estimates that incorporate both faunal-list and bulk-sample

Table 2.5. Model selection criteria used to identify the best model among the set of five RADs fit to the middle Eocene (Gosport, G), late Eocene (Moodys Branch, MB), and early Oligocene (Red Bluff, RB) data sets. *k*, number of model parameters; AIC, AIC values; Δ_i, AIC differences between the model and the best model, with low values indicating greater support; w_i, Akaike weights for each model; ED, percent explained deviance. A model with an Akaike weight >0.95 is unambiguously identified as the best model in the set given the data.

		AIC			Δ_i		
RAD model	*k*	G	MB	RB	G	MB	RB
Zipf-Mandelbrot	3	2792.5	472.97	403.81	0	38.21	32.13
Lognormal	2	15299.1	434.76	371.68	12506.6	0	0
Zipf	2	30371.4	847.44	591.56	27578.9	412.68	219.88
Geometric series	1	15453.1	1818.76	1338.93	12660.6	1384	967.25
Broken stick	0	107113.4	8163.62	4135.45	104320.9	7728.86	3763.77

Table 2.5. Continued.

	w_i			ED		
RAD model	G	MB	RB	G	MB	RB
Zipf-Mandelbrot	>0.999*	<<0.0001	<<0.0001	99.1	97.8	96.6
Lognormal	<<0.0001	>0.999*	>0.999*	95.0	98.0	96.9
Zipf	<<0.0001	<<0.0001	<<0.0001	90.1	96.1	95.0
Geometric series	<<0.0001	<<0.0001	<<0.0001	94.9	91.7	88.7
Broken stick	<<0.0001	<<0.0001	<<0.0001	64.9	62.8	65.1

data exhibit many similarities and key differences from patterns derived exclusively from bulk samples (Figure 2.5). Both data sets exhibit the same rank ordering of localities with respect to species richness, but the relative differences in richness change as sample size increases and rare, "list-only" species are included in the comparisons (Figures 2.5, 2.6). For example, the middle Eocene locality still exhibits the highest standing richness, but the decline in richness to the late Eocene is damped somewhat by the inclusion of rare late Eocene species. Similarly, although both the modeled and bulk-sample data sets indicate that the early Oligocene locality was marginally more diverse than the late Eocene locality, this difference becomes more apparent when rare early Oligocene species are incorporated into the comparison (Figure 2.5). All else being equal, comparable degrees of time-averaging among localities may further strengthen the pattern of elevated early Oligocene richness because the early Oligocene samples come from highstand deposits whereas the middle and late Eocene samples are derived from transgressive-systems-tract shell beds (Dockery 1982; MacNeil and Dockery 1984; Mancini and Tew 1992) and are expected to contain more species simply as a result of to increased time-averaging (but see Scarponi and Kowalewski 2007). Although estimates of richness are sensitive to temporal binning (i.e., longer time bins should sample more species (Foote 2000)]), these three stratigraphic units were deposited under approximately equivalent lengths of time (1 Myr or less).

A regional history of molluscan taxonomic richness from synoptic Formation-level data (Dockery 1986b; Dockery and Lozouet 2003) implied a secular decline from the middle Eocene through the early Oligocene in the Gulf Coastal Plain (Table 2.6). In contrast, sample-standardized local richness estimates based on either bulk-sample or modeled diversity data

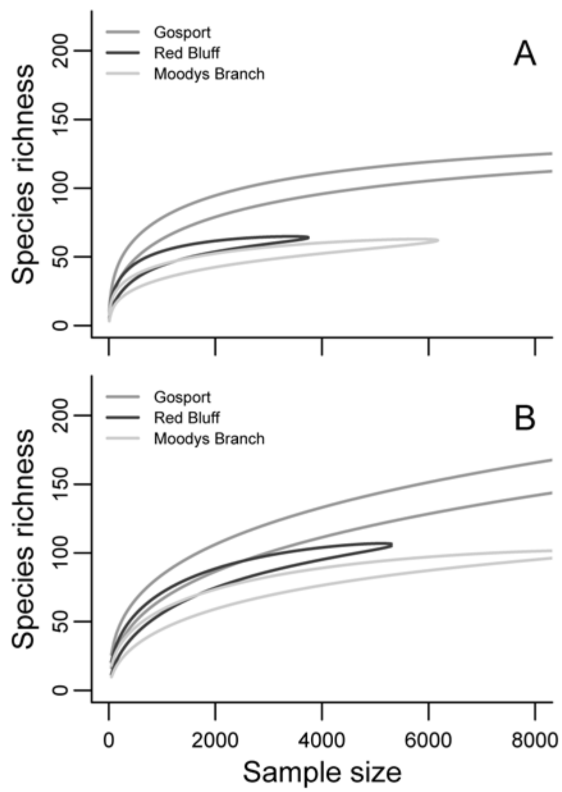

Figure 2.5. Rarefaction curves for three Paleogene Gulf Coastal Plain localities. A, Rarefaction curves derived solely from bulk-sample data. B, Rarefaction curves derived from modeled abundance data that incorporates both bulk and faunal-list data. Rarefaction curves from top to bottom follow the order presented in the legend. Relative differences in richness among localities are observed between the bulk and modeled data sets, although the rank ordering of localities by richness does not change.

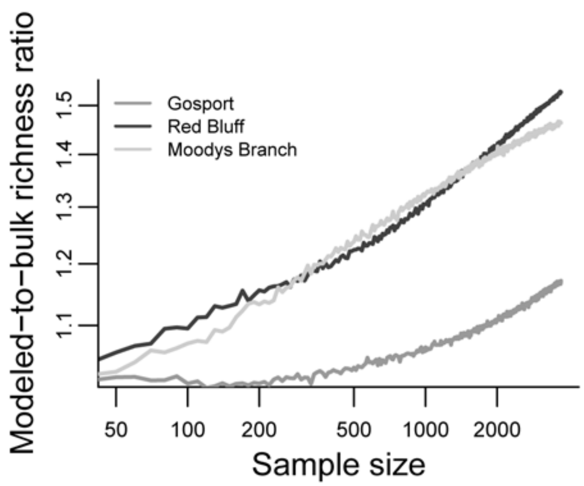

Figure 2.6. The mean ratio of modeled to bulk-sampled richness calculated by using a bootstrap resampling approach with 1000 replicates per sample size over a range of sample sizes for the three Paleogene localities. Little difference is observed in the expected richness ratio at low sample sizes, but as sampling effort increases, rare species are progressively unveiled in the modeled diversity data.

Table 2.6. Comparison of species richness estimates under several different data treatments. Regional richness values are from a synoptic compilation of species stratigraphic occurrences in the central and western Gulf Coastal Plain (Dockery 1986b; Dockery and Lozouet 2003); $Local_{list}$ are the known faunal lists for the three Paleogene localities examined; $Local_{Bulk}$ are the expected richness values for bulk-sample sizes of 100 and 3700 specimens; $Local_{Model}$ are the expected richness values for the modeled diversity data at a sample size of 5300 specimens.

	Regional	$Local_{list}$	$Local_{Bulk\ (N=100)}$	$Local_{Bulk\ (N=3700)}$	$Local_{Model\ (N=5300)}$
Red Bluff	196	106	21 ± 5	64 ± 1	106 ± 1
Moodys Branch	346	101	18 ± 4	55 ± 4	89 ± 6
Gosport	495	421	30 ± 6	101 ± 7	134 ± 11

suggest that the primary drop in richness occurred between the middle and late Eocene, with early Oligocene richness slightly elevated over the preceding interval. This is consistent with recent findings that the early Oligocene recovery interval following the Eocene-Oligocene extinction was relatively brief, with Oligocene regional richness reaching values close to that observed for the late Eocene by the top of the early Oligocene Vicksburg Group (Hansen et al. 2004). This study corroborates that result, and finds support for rapid recovery of local richness to pre-extinction late Eocene levels within the oldest Oligocene macrobenthic assemblages in the Red Bluff Formation. This result is robust even when rare species are incorporated into the comparison. The regional decline in standing richness from the late Eocene to early Oligocene may be an artifact of more extensive preservation of shallow marine facies during deposition of the late Eocene Moodys Branch Formation (Dockery 1977, 1982).

In contrast to species richness, evenness does not differ dramatically between the bulk-sampled and modeled abundance data (Table 2.7). This lack of difference is expected because evenness metrics such as PIE and Ess are primarily measures of the numerical dominance of top

Table 2.7. Evenness values calculated using Hurlburt's PIE (Hurlburt 1971) for the bulk-sample versus modeled abundance data for each Paleogene locality.

Locality	PIE_{Bulk}	PIE_{Model}
Red Bluff	0.85	0.86
Moodys Branch	0.82	0.83
Gosport	0.94	0.94

taxa, which is not influenced greatly by the inclusion of additional rare species.

Sample-Size Sensitivity of Model Selection and Parameter Estimation

Although differences in the shapes of RAD models can be difficult to distinguish with small samples (Kosnik and Wagner 2006; Wagner et al. 2006; McGill et al. 2007), it is clear for these data from the CB Gosport that even at relatively small sample sizes (<300 specimens) differences in model support are sufficient to identify the best model unequivocally (Figure 2.7). This result is consistent with a study by Wagner and collaborators (2006), who found that RAD models could be distinguished in fossil samples containing as few as 100 specimens when the underlying RAD is relatively uneven.

The relationship between parameter estimates and sample size is illustrated in Figure 2.8 by two of the parameters of the Zipf-Mandelbrot RAD for the CB Gosport data. For a given RAD, considerable variation in parameter values is seen at small sample sizes. However, with increased sample size the variance in parameter values decreases dramatically and the mean bootstrapped model parameters begin to converge on the maximum likelihood parameter estimates fit to the entire data set.

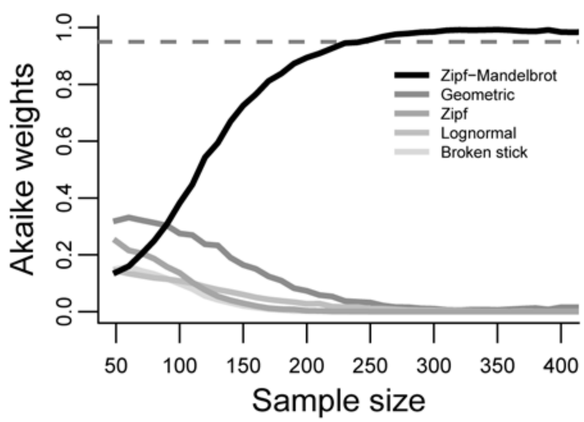

Figure 2.7. Akaike weights as a function of sample size for each of the relative abundance distribution models fit to the Gosport bulk-sample data from CB. Even at relatively small sample sizes (N > 300) the Zipf-Mandelbrot RAD is unequivocally identified as the best model.

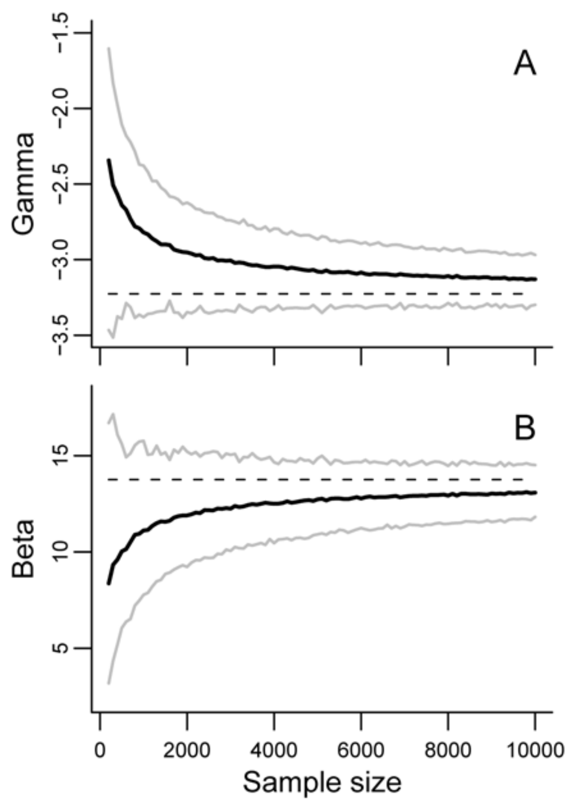

Figure 2.8. Sensitivity of parameter value estimation to sample size for the gamma and beta parameters of the Zipf-Mandelbrot model fit to the CB Gosport bulk-sample data. Solid black lines are the mean model parameter values calculated from 1000 bootstrap replicates for each sample size. Dashed lines are the maximum-likelihood parameter values estimated from fitting the model to the complete data set. Light-gray lines are the 95% bootstrap confidence intervals. A, Bootstrapped values of the gamma parameter of the Zipf-Mandelbrot distribution. B, Bootstrapped values of the beta parameter of the Zipf-Mandelbrot distribution.

Support for Unique RAD Models for Each Locality

Although the Red Bluff and Moodys Branch parameters are more similar to each other than either is to the Gosport, each parameter combination is significantly different ($p < 0.0001$ for *t*-tests of the bootstrapped gamma and beta parameters for the Moodys and Red Bluff localities), supporting the use of unique models for each locality (Figure 2.9).

DISCUSSION

The methods presented here are demanding with respect to data, requiring not only species presence/absence but also abundance data. However, they provide an opportunity to incorporate rare, poorly sampled species into paleobiological studies. These rare species can be integrated into quantitative analyses by modeling their abundances either by assigning maximum proportional abundance values or by estimating their abundances using parametric models fit to the abundance data gathered from bulk samples. This latter approach should not be misconstrued as an attempt to extrapolate species richness from rarefaction curves (Tipper 1979). This important point is evident by comparing Figure 2.5A and 2.5B, in which the rarefaction curves calculated using bulk-sample versus modeled abundance data differ in their overall shapes as well as endpoints. The different trajectories of modeled versus bulk-sample rarefaction curves are not due to changing the abundance structure of the observed RAD, because modeled abundances are largely unbiased estimates of the observed abundances of species (Figure 2.4) and modeled and bulk sampled data sets do not differ substantially in evenness (Table 2.7). Rather the different trajectories between modeled and bulk-sample rarefaction curves result from

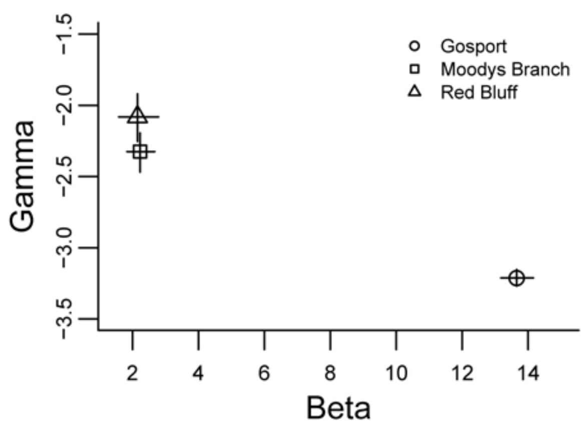

Figure 2.9. Mean bootstrapped parameter values and 95% confidence intervals for the Zipf-Mandelbrot RAD fit separately to the three Paleogene localities. The gamma and beta parameter values for the Moodys Branch and Red Bluff are significantly different and both are entirely nonoverlapping with those observed for the Gosport, providing support for unique model parameters for each locality.

increasing the frequency of species known from few specimens that constitute the long rare tails of the modeled RADs.

Rather than attempting to estimate the total number of species present at a given sampling scale, I have addressed here the much more modest problem of how to incorporate species already known to occur at a given sampling scale but which lack the quantitative abundance data necessary to incorporate them into comparative studies of macroecology and taxonomic richness. However, species occurrence data in museum collections and the literature can be used to test the accuracy of existing methods of species richness estimation (Gotelli and Colwell 2001; Petersen et al. 2003). As has been shown in other studies (e.g., Petersen et al. 2003), species richness estimators such as the Chao and lognormal underestimate the known richness for the samples considered here, and by extension fall short of the total richness, which includes additional species that have yet to be sampled.

Rarity provides a plausible explanation for the observed differences in taxonomic richness between bulk samples and faunal lists. However, spatial and temporal heterogeneity in species abundance and occurrence might contribute to the observed discordance. How confident can we be that species not recovered in bulk samples were rare and not simply abundant elsewhere at a given locality? To address this question the focal scale of interest must be explicitly defined—are we interested in estimating the diversity of a bulk sample, a biofacies exposed at a single outcrop, or a stratigraphic unit exposed regionally? The sampling domains of the bulk-sample and faunal-list data should then be compared. At broad scales, such as those considered here (e.g., an outcrop or greater), pooling bulk samples provides the best estimate of the RAD, encompassing finer-scale variation (Bennington 2003; Zuschin et al. 2006; Scarponi and Kowalewski 2007) while minimizing differences in the sampling domains of bulk samples and faunal lists.

For the three Paleogene data sets analyzed here, I examined heterogeneity at the locality scale in three ways. First, I compared the sampling domains of bulk samples and faunal lists. Second, I compared the rank-order correlation between the average abundance and sampled occurrence of species. A strong positive relationship would provide support for “list-only” species being rare whereas a weak relationship would suggest greater uncertainty in abundance estimates for species with few or no bulk sampled occurrences. Species found in high frequencies within a single sample may still have been rare at the outcrop scale, but a weak relationship between abundance and occurrence would suggest that more extensive sampling is needed to accurately describe the RAD at the outcrop scale. Third, I subdivided the bulk sample data into lower and upper stratigraphic bins and compared the rank-order abundances of species in these stratigraphic subsets; for the Gosport at CB a middle stratigraphic unit was also included. To minimize differences due simply to sample-size variation, I subsampled with replacement the abundance data from each stratigraphic bin and calculated the Spearman correlation coefficient between subsamples and repeated this procedure 1000 times.

The sampling domains of bulk samples and faunal lists largely overlap (Table 2.1), although our ability to measure this is constrained by the resolution of historical locality information. At each locality, average abundance and sampled occurrence were significantly positively correlated (Rho values from 0.85 to 0.92, all significant at the p <0.0001); species

Table 2.8. Rank-order correlation between species abundances in stratigraphic subsets at each locality. Rho values are the average Spearman correlation coefficient for 1000 bootstrap iterations in which samples containing *N* individuals were drawn from each stratigraphic subset and compared.

	Rho	*p*	*N*
Red Bluff	0.49 ± 0.09	0.001	1570
Moodys Branch	0.17 ± 0.07	0.21	2400
Gosport (lower versus middle)	0.67 ± 0.02	<< 0.00001	20,160
Gosport (lower versus upper)	0.47 ± 0.03	<< 0.00001	20,160
Gosport (middle versus upper)	0.59 ± 0.03	<< 0.00001	20,160

restricted to few samples did not occur at high frequencies. For the middle Eocene and early Oligocene localities, species abundances were also significantly correlated among stratigraphic subdivisions (Table 2.8). These results are not surprising, because the stratigraphic context of these deposits also suggests that outcrop-scale spatial and temporal heterogeneity should generally be low. Shellbeds formed during the Transgressive Systems Tract may subsume greater periods of time-averaging, which likely reduces local-scale spatial and temporal heterogeneity (Zuschin and Stanton 2002; Scarponi and Kowalewski 2004, 2007). At the late Eocene locality, positive correlations are observed among some individual samples but abundance data between the lower and upper portions of the outcrop are not correlated, suggesting the presence of vertical heterogeneity in species abundance and occurrence; additional bulk samples at the late Eocene locality may change abundance estimates derived from the observed RAD.

Does the Zipf-Mandelbrot RAD fit the observed abundance data sufficiently to warrant its use in modeling the abundances of "list-only" species? For these three localities the Zipf-

Mandelbrot explains greater than 96% of the deviance in the observed abundance data and is largely an unbiased estimator of species abundances (Table 2.5, Figure 2.4). The modeled versus observed abundance values for species fall along the line of unity for each locality (Figure 2.4), though closer inspection reveals a consistent offset in the abundances of the rarest taxa (those known from ten or fewer specimens), with modeled values always slightly elevated over observed values. Although the Zipf-Mandelbrot model fails to replicate the rarest portion of the observed RAD, it is arguable that the observed abundances of these rare species are those most subject to uncertainty, and previous studies that have noted this offset have suggested not weighting these data heavily in the model-fitting procedure (Frontier 1985; Mouillot and Lepretre 2000). Furthermore, although the Zipf-Mandelbrot RAD fails to fit the observed rare tail of species, the predictive failure of the model is consistent in direction with the excess of unobserved species known from each locality. Another RAD model might fit the observed abundance data even better, but the improved fit to the rare tail of species would generate distributions inconsistent with the plethora of "list-only" species known from these localities. If the modeled RAD replicated the observed abundances of the rarest taxa, the abundance estimates generated for unobserved "list-only" species (and the sample sizes necessary to unveil them) would be implausible.

Further work is necessary to understand the causes of rarity in fossil macrobenthic assemblages. Do fossil concentrations accurately capture the long rare tail of the abundance distributions of the living communities they are derived from, or might rare "list-only" species have different taphonomic half-lives than bulk-sampled species and disproportionately accrue during time-averaging (Kidwell 2002)? For the three localities considered here, the frequency of species known from few specimens is within the range of that observed in Recent marine benthic surveys. For example, 30-50% of species observed in fossil bulk samples from these localities are known from five or fewer specimens. This frequency is slightly elevated in the modeled abundance data (40-60% of species) but not considerably greater than the 50% of species observed in some Recent marine benthic surveys (Bouchet et al. 2002; Zuschin and Oliver 2005).

Alternatively, were rare "list-only" species simply aberrant forms of existing species that would be synonimized given taxonomic revision? Although it has been argued that species-level taxonomic revisions tend to eliminate taxa rather than add them (e.g., Alroy 2002; Wagner et al. 2007), generalities are wanting. Wagner and collaborators (2007), for example, documented a net increase in the richness of Cenozoic bivalve genera following taxonomic revision and net declines in the genus-level diversity of Jurassic bivalves and Paleozoic gastropods. The growing molecular systematics literature also contains many examples in which diversity has increased following taxonomic revision (e.g., Nunes et al. 2008). For the data analyzed here, it is unlikely that further taxonomic revision would greatly reduce the discordance between bulk-sampled and faunal-list richness for these Paleogene localities, because each fauna has been the subject of previous taxonomic standardization (Palmer and Brann 1965, 1966; Dockery 1977, 1982; MacNeil and Dockery 1984) and subsequent taxonomic revisions of individual clades have both added and eliminated species (e.g., Heaslip 1968; Dockery 1977; Allmon 1996; Garvie 1996).

Alternatively, "list-only" species may have been ecological relicts resulting from habitat-averaging during the accrual of the death assemblage, or ephemeral members of either the living community or the resulting death assemblage via postmortem transport. Several studies of Recent communities have suggested that excess rare diversity may be explained in part by increased migration rates among species and/or autocorrelation resulting from the pooling of small spatial or temporal samples (McGill 2003). In some instances, when "transient" species are removed (using criteria other than rarity) the observed abundance data are best fit by the lognormal RAD, which lacks the fat tail of rare species characteristic of both Zipf-Mandelbrot zero-sum RAD models (Gregory 2000; Magurran and Henderson 2003; Ulrich and Ollik 2004; McGill et al. 2007). Taphonomic studies comparing the age-distributions, taphonomic condition, and habitat breadth of rare versus abundant species within skeletal concentrations would help test these hypotheses and are necessary to determine if the magnitude of rare richness in fossil assemblages is a signature of the diversity of the living community, spatial and temporal averaging, and/or differential decay.

Integrating data from museum collections, the literature, and quantitative bulk samples can unveil diversity data, allowing for more comprehensive comparative biodiversity studies. Such an approach enables us to capitalize on the historical sampling effort represented by museums and the literature. Although some workers have emphasized the importance of gathering new data for analyses of fossil diversity (Jackson and Johnson 2001; Adrain and Westrop 2003; Johnson 2003), citing in part the historical emphasis of museum collections on taxonomic richness rather than ecological structure, it is evident that relying solely on a field-based approach cannot eliminate the sampling biases affecting rare taxa and constrains studies to consideration of the dynamics of abundant and common taxa. Understanding the temporal and spatial distribution of rarity as well as its ecological and phylogenetic context is critical for evaluating patterns of extinction and recovery, and for addressing questions related to the evolutionary ecology of species and clades. If, for example, taxa are rare early or late in their histories—with respect to either spatial occurrences (Foote 2007; Foote et al. 2007; Liow and Stenseth 2007) or local densities of individuals—then bulk-sample diversity data will tend to overemphasize the stability of taxon ecology through time. At a different scale, identifying covariances between species abundance and other variables such as body size, geographic range, or trophic level may depend upon adequately sampling the full range of abundance values within a clade or community, with distributions truncated by inadequate sampling perhaps being more likely to exhibit an apparent lack of structure. Comparisons between museum, literature, and field data have typically concentrated on the misfit between these sources of data, focusing primarily on the negative effects of biases on the reconstruction of ecological and evolutionary patterns (e.g., Hunter and Donovan 2005; Davis and Pyenson 2007). However, historical archives are a rich resource for comparative analyses (Webster et al. 2003; Bieler and Mikkelsen 2004; Allmon 2005; Guralnick and Van Cleve 2005; Krause et al. 2006), given an understanding of the directions and magnitudes of biases contained within them.

CONCLUSIONS

This paper provides two approaches for estimating the abundances of rare species by capitalizing on the extensive, and often nonrandom, sampling effort housed within museum collections and the literature. Species occurrences in museums and monographs can be integrated into quantitative diversity analyses by using the relative abundance distributions observed in quantitative samples compiled at comparable spatial and temporal scales to estimate species abundances. Rather than dismissing museum and literature data as biased records unfit for study, the direction of this bias (i.e., an emphasis on taxonomic diversity over ecological structure) facilitates the sampling of rare species that would otherwise be veiled from observation under most reasonable quantitative sampling schemes. Data for three Paleogene Gulf Coastal Plain localities demonstrate both the magnitude of local diversity that can be missed when only bulk samples are used and the substantial sampling effort that would be necessary to unveil this diversity. From the observed RAD and the cumulative faunal list a modeling approach can be used to include rare species into comparative analyses of richness. Although there are risks involved in using simple models to extend the observed RAD to include "list-only" species, such risks are not unique to this approach. In practice, sample-standardized richness estimates are also used as models of the relative differences in diversity among samples, localities, and biotas, with the exact form of the extrapolation not made explicit. When combined, these two approaches to estimating taxonomic richness provide useful end-members for examining patterns of biodiversity, differing in their comprehensiveness of sampling and underlying assumptions. When these methods are applied to three Paleogene data sets, the effects of the Eocene-Oligocene extinction on local richness in the Gulf Coastal Plain are less dramatic than expected from examination of synoptic regional-scale patterns (Dockery 1986b). Furthermore, these results suggest that the primary drop in local richness in the Gulf Coastal Plain occurred earlier during the middle Eocene. Most broadly, these results stress the value of exploring novel approaches for extracting new information from old data. Even data gathered under quite different sampling regimes can be integrated to better understand patterns of diversity and distribution through time.

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CHAPTER THREE

DIRECT AND INDIRECT EFFECTS OF BIOLOGICAL FACTORS ON EXTINCTION RISK IN FOSSIL BIVALVES

ABSTRACT

Understanding the factors that contribute to extinction risk is essential for predicting the response of species to environmental change. Intrinsic biological factors such as abundance may contribute directly to extinction risk and indirectly through their influence on other biological characteristics such as geographic range size. Here, I assess the contributions of three canonical predictors of extinction – abundance, body size, and geographic range – to the duration of bivalve species using the early Cenozoic marine fossil record of the eastern United States. I find that geographic range size has the strongest direct effect on extinction risk and that an apparent direct effect of abundance can be explained entirely by its covariation with geographic range. The influence of geographic range on extinction risk is broadly manifest, explaining variation in species duration in three ecologically-disparate bivalve clades. Body size also contributes significantly to extinction risk but in opposing directions in different clades, such that it has no net effect on extinction risk for bivalves as a whole. While abundance does not contribute directly to extinction risk, structural equation modeling reveals indirect effects of both abundance and body size on duration via their positive influence on geographic range size. Models that account for the rich covariation between biological factors and extinction are

necessary for inferring causality in evolutionary processes and for making informed predictions in applied conservation efforts.

INTRODUCTION

All species eventually go extinct and biological correlates of extinction risk have been identified in many studies of extant and extinct taxa (McKinney 1997; Purvis et al. 2000b; Jablonski 2005; Purvis et al. 2005). Most studies have analyzed biological factors separately, tacitly assuming independence among them. However, few biological characteristics are independent and such covariation confounds causal interpretation, weakens the power of predictive models, and inhibits attempts at synthesis. In addition, most studies have considered only the direct effects of biological factors on extinction. Some factors may contribute both directly and indirectly via their influence on other more proximal biological characteristics, and accounting for indirect effects can be important when assessing the relative influence of multiple factors (Wootton 1994; Shipley 2000; Grace 2006).

Here I investigate the direct and indirect effects of multiple biological factors on extinction using the early Cenozoic marine fossil record of the eastern United States (U.S.). I focus on the contributions of three factors held to be important in extant and ancient biotas: abundance, body size, and geographic range. Measures of geographic range and abundance are commonly used to set conservation priorities (IUCN 2001), and their influence on extinction risk over deeper time scales is supported empirically (Jablonski and Hunt 2006; Payne and Finnegan 2007; Jablonski 2008; Simpson and Harnik 2009). Body size is also widely believed to influence extinction risk, though support is more equivocal (Jablonski 1996; Lyons et al. 2004; Lockwood 2005; Payne 2005). All three factors often covary (Gaston and Blackburn 2000), though our understanding of these relationships is mostly restricted to extant birds and mammals, and little is known about their temporal variation over evolutionary time.

Using species in three superfamilies of marine bivalves (the Carditoidea, Pectinoidea, and Veneroidea), I ask: (1) what are the direct effects of abundance, body size, and geographic range on the duration of species, and do these effects change when covariation between factors is accounted for? (2) Do abundance and body size contribute indirectly to species duration via their influence on geographic range size? (3) Are correlates of duration broadly applicable or clade-dependent?

Marine bivalves are well-suited for testing models relating biological factors to extinction over a range of spatial and temporal scales. The fossil record of marine mollusks is relatively complete (Valentine et al. 2006) and preserves ecological data such as relative abundance with considerable fidelity (Kidwell 2001, 2002; Kowalewski et al. 2003; Kidwell 2005; Lockwood and Chastant 2006). The Paleogene (65.5 - 28.4 million years ago, MYA) sedimentary deposits of the U.S. Gulf and Atlantic Coastal Plains has been studied intensively for over a century, providing a well-resolved taxonomic (Palmer and Brann 1965) and stratigraphic framework (Toulmin 1977; Dockery and Lozouet 2003) in which to conduct these analyses.

DATA AND METHODS

Database Compilation

A database containing the occurrence, size, and abundance of fossil marine bivalve species in three bivalve superfamilies (Carditoidea, Pectinoidea, and Veneroidea) was assembled for the Paleogene of the Gulf and Atlantic Coastal Plains of the eastern United States. Occurrence and abundance data were collected through fieldwork by the author and supplemented by the use of the fossil mollusk collections at the Paleontological Research Institution, National Museum of Natural History, Florida Museum of Natural History, Academy of Natural Sciences Philadelphia, records in the Paleobiology Database (http://paleodb.org), and the published literature (Appendix A). The database consists of approximately 3600 occurrences of species over the Paleogene (65 - 28.4 MYA), distributed over 14 states and 153 counties in the eastern U.S. (Figure 3.1). Analyses were restricted to 108 species for which abundance, body size, geographic range, and duration could be either measured or estimated (details below). These 108 species include 39 species in the Carditoidea, 28 species in the Pectinoidea, and 41 species in the Veneroidea.

Geographic Range

The geographic range of each species was measured as the maximum great circle distance between the centroids of counties in which the species occurred. Historical records from museum collections and the literature cannot always be resolved finer than the county scale. Owing to variation in the preserved and sampled sedimentary record over the Paleogene, the

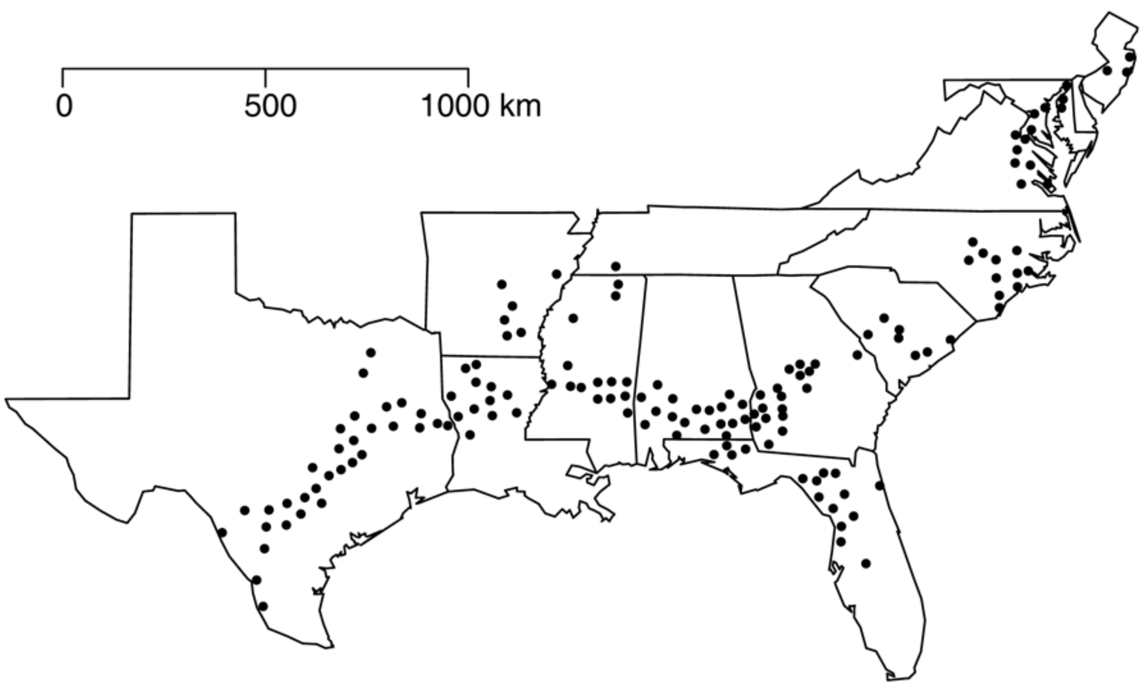

Figure 3.1. Map illustrating the distribution of fossil occurrences over the Paleogene of the eastern United States. Points are the centroids of each county containing one or more occurrences in the database.

extent of each species was scaled relative to the maximum linear distance between counties containing fossiliferous sedimentary rocks over its duration. The geographic extent of species restricted to a single county was estimated as the median length of a county in Coastal Plain states containing fossils (39 km). Variation in sampling extent over time can, however, generate markedly different measures of proportional extent for these single-county taxa (Foote et al. 2008). To account for this, the minimum geographic extent was subtracted from the observed extent of all species, thus setting the extent of single-county species to zero. The results presented here do not depend on the value of geographic extent assigned to species restricted to a single county.

Occupancy is an alternative measure of the geographic distribution of species and is generally less sensitive to geographic outliers (Gaston 1994; Jetz et al. 2008). Occupancy was calculated as the number of counties in which a species occurred over its observed duration relative to the total number of counties it could have possibly occurred in during that time. A value of one was subtracted from the numerator to standardize the occupancy of all single-county species as described above (Foote et al. 2008). Species occupancy is strongly correlated with extent, and the results are qualitatively the same regardless of which geographic range metric is used.

Body Size

The body size of each species was calculated as the square root of the product of shell length versus shell height (Stanley 1986; Jablonski 1996), using specimens in museum collections and plates in taxonomic monographs. The median number of measurements for each species was 12 specimens. As these species show indeterminate growth, the maximum size of species was analyzed in all models (Jablonski 1996).

Abundance

The relative abundance of species was estimated using counts of specimens recovered in bulk samples of fossiliferous sediment collected by the author for this study, as well as published data compiled in the Paleobiology Database and other literature reports (Appendix A). The relative abundance of each species at a locality was calculated as the number of individuals of that species relative to the total number of bivalve individuals in a sample. Where possible, data from replicate bulk samples were pooled to provide an estimate of the abundance of species in that environment at the locality-scale. The abundance of species known from historical collections at a locality but absent from the current sample of individuals (N) was estimated as 1/N (Harnik 2009). The dataset contains counts of 84,870 individuals from 71 localities spanning the Paleogene. The median sample size for each locality was 502 individuals, and the mean was 1195. Samples containing exclusively calcitic bivalves were excluded from the abundance estimates to minimize the effects of taphonomic biases such as dissolution.

As most species are rare in most localities, I analyzed the maximum abundance at a single locality for each species in all extinction models. Using maximum abundance may approximate the peak abundance of species in their favored habitats and should minimize the effects of temporal variation in the environmental breadth of sampling. Abundance estimates for each species were derived from 1-17 samples, with a median of 2 and a mean of 3.5.

Duration

The duration of each species was measured from the mid-point of the stratigraphic unit in which it first occurred to the mid-point of the stratigraphic unit in which it last occurred. This value was then rounded to the nearest million years. All species restricted to a single stratigraphic unit were assigned a duration of zero. Alternative methods of calculating durations (e.g., assuming species ranged from the base of the unit of first occurrence to the top of the unit of last occurrence, use of alternative binning strategies, etc.) generate equivalent results and are not presented here.

Modeling Extinction Risk

To assess the relative contribution of biological factors to species duration I used two methods: (1) Generalized Linear Models (GLM, McCullagh and Nelder 1989) and (2) Structural Equation Modeling (SEM, Grace 2006). Both methods model linear relationships between factors. In SEM, however, multiple endogenous (response) variables can be considered simultaneously, thus allowing direct and indirect effects to be evaluated. GLMs were fit to the observed data, assuming a Poisson family and log link function. Proportional data (extent and abundance) were transformed using an arcsine-square root transformation commonly applied to proportional data. Non-parametric rank-order methods generate similar results for individual direct effects but do not allow the unique contributions of multiple variables to be distinguished. To assess the support for a model in which biological factors contribute both directly and indirectly to extinction risk, I fit two structural equation models to the observed data using AMOS, a SEM package available through SPSS. The support for the indirect effects model was assessed by comparing the difference in AIC values between models that included or excluded them, and by comparing the observed and expected covariance matrices under the indirect effects model; a p-value > 0.05 associated with the model Chi-square, i.e. a lack of significant difference, would indicate an acceptable fit of the indirect effects model to the observed data.

Akaike's Information Criterion (AIC) was used to measure the support for each model, with the Akaike Weights (AW) summarizing the relative support for each model in the candidate set. Because log-likelihoods are additive, the clade-dependent GLM of extinction risk was assessed by summing the log-likelihoods for the three individual clade models, the number of model parameters, and calculating the AIC. All analyses, except where noted, were conducted using the statistical programming environment R, version 2.6.2 (R Development Core Team 2006).

RESULTS

When each factor is considered independently, geographic range had the strongest direct effect on the duration of bivalve species (Figure 3.2A; Table 3.1). Species with larger geographic ranges persisted over longer intervals of time in the early Cenozoic than those with smaller geographic ranges. Abundance also positively affected species duration, although with a more

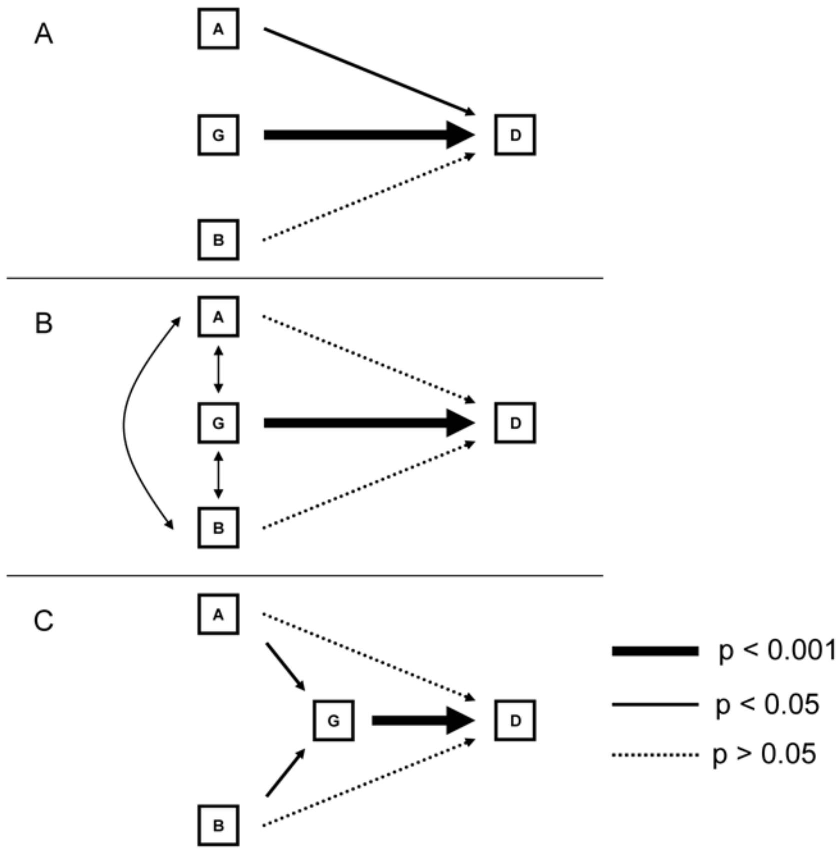

Figure 3.2. Summary of models of the direct and indirect effects of biological factors on extinction risk in Cenozoic mollusks, depending on whether covariation between factors is accounted for. Variables are defined as A, Abundance; B, Body size; G; Geographic range; D, Duration. A. When biological factors are assumed to be independent in their affects on extinction risk, geographic range is the strongest predictor with abundance also contributing. B. When the covariation between the three factors is accounted for, geographic range is the only factor that contributes directly to extinction risk. C. An indirect-effects model identifies weak indirect effects of abundance and body size on extinction risk via their positive contribution to geographic range size; a model incorporating both direct and indirect effects is substantially better supported than a model of direct effects alone.

Table 3.1. Direct effects of biological factors on species duration when factors are assessed independently versus when their covariation is accounted for. Two multivariate models are considered, one in which the contributions of each factor to extinction risk is additive and another in which synergistic effects are modeled as multiplicative. Coefficients presented are those that were significant at $\alpha = 0.05$ level. Asterisks denote the level of significance (*** $p < 0.001$; ** $p < 0.01$, * $p < 0.05$, • $p < 0.1$). Model selection was assessed using Akaike's Information Criterion, AIC. ΔAIC summarizes the difference between the AIC value of that model and the best supported model among the candidate set of models considered. The relative support for each model in the set is summarized using the Akaike Weights, AW. ED = Explained Deviance, calculated as the Deviance Explained / Total Deviance, summarizes the fit of the model to the data. Model results indicate that geographic range has the primary direct effect on species duration and that an apparent direct effect of abundance can be explained entirely by its covariation with geographic range.

	Coefficient	AIC	ΔAIC	AW	ED
Abundance	0.41*	633.98	69.78	<<0.01	0.01
Body Size	n.s.	638.85	74.65	<<0.01	< 0.01
Geographic Range	1.21***	567	2.8	0.19	0.17
A+B+G	G, 1.23***	570.77	6.57	0.03	0.17
A×B×G**	G, 1.56**; A×B×G, -0.05•	564.2	0	0.78	0.21

modest influence (Table 3.1). In contrast, body size had no measurable direct effect (Table 3.1). These results are robust to distributional assumptions, remaining when non-parametric rank order correlation is used to assess the association between biological factors and species duration (Table 3.2).

The relative strengths of these direct effects are confounded by the lack of independence between factors. Abundance is positively correlated with geographic range size (Spearman rho = 0.37; $p < 0.001$), as are body size and geographic range (Spearman rho = 0.20; $p = 0.04$).

Table 3.2. Non-parametric correlation tests for the association between biological factors and species duration. Asterisks denote the level of significance (*** $p < 0.001$; ** $p < 0.01$, * $p < 0.05$, • $p < 0.1$). When examined separately, both abundance and geographic range are significantly correlated with species duration.

	Spearman rho
Abundance vs. duration	0.27**
Body Size vs. duration	0.09
Geographic Range vs. duration	0.42***

Abundance negatively covaries with body size in some marine and terrestrial systems (Damuth 1987; Marquet et al. 1990), but this relationship depends on the spatial and phylogenetic scale of analysis (Nee et al. 1991; Blackburn and Gaston 1997). Across species in the three superfamilies analyzed here, abundance and body size are decoupled (Spearman rho = 0.18, $p = 0.07$). I use a multivariate GLM to measure the unique direct effect of each biological factor on species duration. Abundance no longer has a direct effect when its covariation with geographic range is accounted for (Figure 3.2B; Table 3.1), but geographic range remains a strong predictor of extinction risk. The simpler model in which geographic range directly affects duration is moderately better supported (Akaike's Information Criterion (AIC) = 567; Akaike Weight (AW) = 0.87) than the more complex multivariate model in which abundance and body size also directly contribute (AIC = 570.77; AW = 0.13).

The multivariate GLM described above estimated the additive direct effects of each biological factor on duration. However, synergistic effects on extinction risk may be predicted by the interactions between factors. To address this possibility I compared two multivariate models: the additive GLM above and a second GLM in which the effects of geographic range, body size, and abundance on duration were multiplicative (Table 3.1). The multiplicative model is somewhat better supported than the additive effects model ($AIC_{multiplicative} = 570.77$; $AW_{multiplicative} = 0.96$; $AIC_{additive} = 564.2$; $AW_{additive} = 0.04$), and identifies a strong direct effect of geographic range ($p < 0.01$) and a weak direct effect of the all three factors acting synergistically on duration ($p = 0.08$).

To assess whether the direct effects of biological factors on species duration observed across this broad sampling of bivalves are generally applicable, I fit the additive GLM model to data partitioned for each of the three bivalve superfamilies in the dataset. A more complex clade-dependent model of extinction risk, in which coefficients between biological factors and species duration were estimated separately for each of the three superfamilies, is better supported than a clade-independent model describing the dynamics of bivalve species as a whole ($AIC_{clade\text{-}dependent} = 512.42$; $AW_{clade\text{-}dependent} > 0.99$; $AIC_{clade\text{-}independent} = 570.77$; $AW_{clade\text{-}independent} < 0.01$). However, in each of the three clades geographic range had a strong effect on extinction risk (Table 3.3). In the Pectinoidea and Veneroidea body, size also significantly affected extinction risk, but in opposite directions in the two clades. Larger size is associated with greater extinction risk in pectinoid species whereas the converse is true among veneroid species (Table 3.3). Among pectinoid species, abundance also plays a weak role with more abundant species being at elevated risk of extinction. This somewhat unexpected negative relationship between abundance and extinction risk has been observed in other paleontological analyses (Layou 2007; Simpson and Harnik 2009), and is expected under some metapopulation models when there is a strong trade-off between competition (local abundance) and dispersal ability (Tilman et al. 1994).

Table 3.3. Support for a clade-independent model of extinction risk versus a more complex clade-dependent model in which the interactions between biological factors and species duration were estimated separately for each superfamily of marine bivalves. The clade-dependent model is much better supported than the clade-independent model, yet in all three superfamilies geographic range has a strong direct effect. Body size also contributes significantly to extinction risk in the Pectinoidea and Veneroidea but in opposing directions such that there is no net effect when bivalve species are analyzed as a whole. Abundance also is a relatively minor contributor to selectivity within the Pectinoidea. Coefficients presented are those that were significant at $\alpha = 0.05$ level. Asterisks denote the level of significance (*** $p < 0.001$; ** $p < 0.01$, * $p < 0.05$, • $p < 0.1$). Model selection was assessed using Akaike's Information Criterion, AIC. ΔAIC summarizes the difference between the AIC value of that model and the best supported model among the candidate set of models considered. The relative support for each model in the set is summarized using the Akaike Weights, AW. ED = Explained Deviance, calculated as the Deviance Explained / Total Deviance, summarizes the fit of the model to the data.

	Coefficient	AIC	Δ AIC	AW	ED
Clade-Independent	G, 1.23***	570.77	58.35	< 0.01	0.17
Clade-Dependent	Carditoidea: G, 1.17***	512.42	0	> 0.99	0.33
	Pectinoidea: G, 2.00***				
	A, -1.53**				
	B, -0.06***				
	Veneroidea: G, 2.28***				
	B, 0.05***				

Clade-level results demonstrate first-order agreement in the strong effect of geographic range size on extinction risk, and identify additional biological factors such as body size which contribute to extinction dynamics at finer phylogenetic and ecological scales.

When examined individually, abundance and geographic range size both directly affect species duration. When the covariation between these two factors is accounted for, geographic range is the single significant predictor of extinction risk across bivalve species, with body size having no measurable direct effect. However, both body size and abundance may contribute causally to the geographic distributions of species, and thus indirectly to extinction risk. Among marine invertebrates body size and fecundity may positively covary (Jablonski et al. 2003a), and increased fecundity could result in broader geographic distributions via propagule pressure (Roy et al. 2002). Abundance may also contribute positively to variation in geographic range size over the history of a species, with species with larger local populations having greater opportunity to disperse and establish new populations on the landscape.

I evaluate the likelihood of a model incorporating these indirect effects using structural equation modeling (SEM) (Grace 2006). In the indirect effects model, abundance and body size contribute directly to species duration and indirectly via their effects on geographic range size (Figure 3.2C). The indirect effects model is better supported than a model of direct effects alone ($AIC_{indirect} = 21.24$; $AW_{indirect} = 0.98$; $AIC_{direct} = 28.74$; $AW_{direct} = 0.02$), and the covariance structure implied by the indirect effects model does not deviate significantly from the observed data providing additional support that it is an adequate model of the processes that generated the data (Chi-square = 3.240; d.f. = 1; $p = 0.07$). The indirect effects model indicates a strong direct effect of geographic range on species duration (standardized path coefficient = 0.40; p-value < 0.001), and weak indirect effects of abundance and body size and on duration via their positive contributions to geographic range size. The indirect effect of abundance on species duration equals 0.09, and is measured as the product of the standardized path coefficients from abundance to geographic range (standardized path coefficient 0.23, $p < 0.05$) and geographic range to duration (standardized path coefficient = 0.40; $p < 0.001$). The indirect effect of body size on species duration equals 0.08, and is measured as the product of the standardized path coefficients from body size to geographic range (standardized path coefficient 0.19, $p < 0.05$) and geographic range to duration (standardized path coefficient = 0.40; $p < 0.001$).

These results indicate that geographic range played a strong role in structuring the observed durations of bivalve species in the early Cenozoic fossil record. However, sampling and incomplete preservation can affect estimates of the temporal and spatial distributions of fossil taxa. Incomplete sampling can truncate the observed durations of species in the fossil record (Holland and Patzkowsky 2002), though stratigraphic range extension can also occur when preservation is poor (Jablonski 2005; Kidwell 2005; Plotnick and Wagner 2006). If the observed duration of species is strongly affected by the quality of sampling, the frequency of species with first and last occurrences in a given time interval should correlate with the quality of sampling in the preceding and subsequent intervals respectively (Foote 2003). Poor sampling should result in an observed increase in the number of last occurrences in the preceding time interval, and an apparent increase in the number of first occurrences in the subsequent interval. I use the number of occurrences in a time interval - defined here as the unique occurrence of a species at a locality - as a measure of sampling quality, and find no correlation between sampling in an interval and the frequency of first (Spearman rho = -0.03, p-value = 0.9) and last occurrences (Spearman rho = -0.03, p-value = 0.9) in the preceding and subsequent intervals (Figure 3.3). These results suggest that variation in sampling does not contribute greatly to the durations of species analyzed here.

Measures of geographic range for fossil taxa are also sensitive to variation in the spatial extent of preserved and sampled sedimentary rocks. To account for this variation, geographic

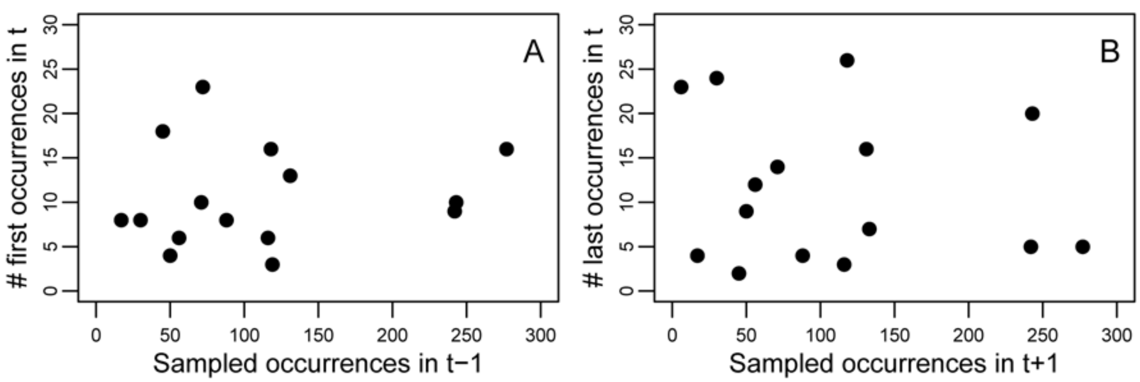

Figure 3.3. Relationship between sampling quality and the observed stratigraphic distribution of species first (A) and last (B) occurrences. If variation in sampling strongly affects the observed durations of species, a negative correlation is expected between the frequency of first occurrences in time bin t, and the number of sampled occurrences in the preceding bin (t-1). Conversely, poor sampling in interval t+1 is expected to generate an excess of last occurrences in time bin t. No correlation is observed between quality of sampling and the temporal distribution of observed stratigraphic range endpoints.

Table 3.4. Direct effects of geographic range on duration when geographic extent is measured relative to the maximum extent of localities over (1) the Paleogene (Pgene), or (2) the individual durations of species (Dur). Both measures of geographic extent have a significant effect on species duration, but uncorrected measures (Pgene) show a stronger association due to the pooling of species from intervals characterized by differing degrees of sampling.

	Coefficient	p-value
Extent (Pgene)	2.09	<< 0.001
Extent (Dur)	1.21	<< 0.001

range was estimated as the observed extent of a species scaled to the maximum extent possible over its observed duration. This relative measure of extent accounts for sampling variability and was used in all analyses above. Uncorrected measures of geographic extent show a somewhat stronger association with species duration due to the pooling of species from intervals characterized by different degrees of sampling (Table 3.4). As measures of extent may be sensitive to geographic outliers (Gaston 1994; Jetz et al. 2008), I also estimated the occupancy of each species. Occupancy was calculated as the number of counties in which a species occurred over its observed duration relative to the total number of counties containing fossils during that same interval of time. Occupancy is strongly correlated with extent (Spearman rho = 0.77, $p < 0.001$), and is also strongly associated with species duration (Table 3.5).

Most species are rare, in that they have narrow geographic ranges and low local abundances (Figure 3.4), and the results above strongly suggest that narrow geographic ranges are associated with elevated extinction risk. However, rare species are also less likely to be sampled, which can artificially elevate apparent rates of extinction. The results presented above

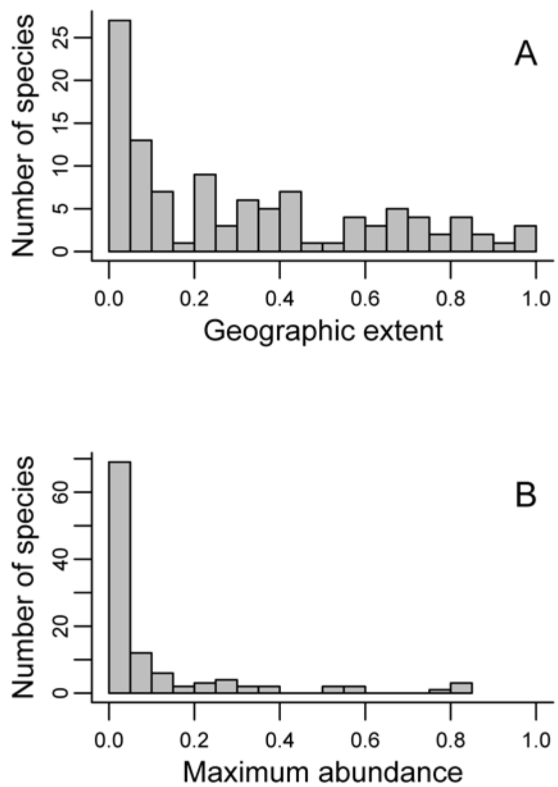

Figure 3.4. Frequency distributions of the geographic extent (A) and maximum abundance (B) of species. Most species are narrowly distributed and rare. Both of these factors covary with extinction risk when examined separately and are known to affect sampling probability. If species restricted to a single county, or rare species for which abundance was estimated, are excluded from analyses the strong effect of geographic range on extinction risk remains though the direct effect of abundance on species duration when considered independently weakens.

Table 3.5. Direct effects of geographic range on duration when either extent or occupancy is used to estimate species geographic range size. A = maximum abundance; B = maximum body size; E = geographic extent; O = occupancy. Coefficients presented are those that were significant at $\alpha = 0.05$ level. Asterisks denote the level of significance (*** $p < 0.001$; ** $p < 0.01$, * $p < 0.05$, • $p < 0.1$). Model results indicate that geographic range has a significant direct effect on species duration, regardless of the metric used.

	Coefficient	AIC	ΔAIC
Extent	1.21***	567	0
A+B+E	E, 1.23***	570.77	3.77
Occupancy	1.00***	625.51	58.51
A+B+O	0.91**	628.94	61.94

included species known from only a single county, as well as species for which abundance was estimated from their presence in historical collections from a locality but absence in quantitative samples (Harnik 2009). If species known from one or more localities within a single county are excluded, geographic range still has a strong direct effect on species duration (Table 3.6). If hyper-rare species - those known from historical collections but absent from current quantitative samples from a locality - are excluded from the dataset, the apparent direct effect of abundance on duration is no longer significant but geographic range remains a strong predictor of extinction risk (Table 3.6).

DISCUSSION

Although many studies have attempted to pinpoint biological factors that influence the evolution and extinction of species, the interrelationships among these correlates of evolutionary rates are rarely evaluated. Charles Darwin observed 150 years ago that broadly distributed

Table 3.6. Direct effects of biological factors on duration when taxa with narrow geographic distributions or estimated abundances are either included or excluded from the dataset. Coefficients presented are those that were significant at $\alpha = 0.05$ level. Asterisks denote the level of significance (*** $p < 0.001$; ** $p < 0.01$, * $p < 0.05$, • $p < 0.1$). Model results indicate that geographic range has a significant direct effect on species duration whether single-county or rare species with estimated abundances are included or excluded. The apparent direct effect of abundance on duration is no longer significant when hyper-rare species with estimated abundances are excluded from the dataset.

	Coefficients when single-county & rare species with estimated abundances are included	Coefficients when single-county species are excluded	Coefficients when rare species with estimated abundances are excluded
Abundance	0.41*	n.s.	n.s.
Body Size	n.s.	n.s.	n.s.
Geographic Range	1.21***	0.95***	1.08***
A+B+G	G, 1.23***	G, 0.99***	G, 1.08***
A×B×G**	G, 1.56**; A×B×G, -0.05•	A×B×G, -0.06*	G, 1.13*

species also tend to be locally abundant, and both geographic range and abundance are widely used today to assess extinction risk (Purvis et al. 2005; Purvis 2008). However, studies that have attempted to untangle their unique contributions or identify synergistic effects are still scarce. The analyses presented here demonstrate the impact that accounting for such covariation can have on models of extinction risk. When analyzed separately, both abundance and geographic range correlate with the duration of fossil bivalve species. However, when the covariation between abundance and geographic range is accounted for, geographic range is the only factor that has a consistent demonstrable direct effect on species duration.

Whereas abundance and body size do not directly contribute to extinction risk, there are reasons to expect they may contribute indirectly via their contributions to variation in geographic range size. Larger-bodied individuals and species containing larger populations are both hypothesized to contribute positively to geographic range size through propagule pressure and by acting as source populations respectively. Structural equation modeling is a useful method for estimating the relative importance of direct and indirect effects and for model comparison. A model predicting extinction risk that incorporates indirect effects was much better supported than a model describing direct effects alone, with both abundance and body size contributing indirectly via their positive contribution to geographic range size. Geographic range size is, however, the predominant variable and it is the size of a species' range, not the factors that structure it, that is most critical for survivorship (Jablonski and Hunt 2006; Powell 2007).

Geographic range is increasingly recognized as a primary determinant of extinction risk in the fossil record (Jablonski and Hunt 2006; Kiessling and Aberhan 2007; Payne and Finnegan 2007; Powell 2007; Foote et al. 2008; Jablonski 2008). In most studies, however, correlates of extinction risk are assessed by pooling taxa from different clades with markedly different evolutionary histories and biological characteristics. Variation between clades in their biology and patterns of survivorship may generate patterns of association between biological factors and extinction risk that are not generally applicable at finer ecological or phylogenetic scales. By comparing the covariation between biological factors and species duration for three superfamilies of ecologically-disparate bivalves to the overall structure of association between these factors when species are pooled irrespective of clade-membership, I found that correlates of extinction risk varied among clades. A clade-dependent model incorporating such variation was much better supported than a simpler model describing the association between biological factors and duration by pooling all bivalve species in the dataset. The strong effect of geographic range on duration was observed across all three clades, with broadly-distributed species more extinction-resistant.

Clade-level analyses also identify body size as an important factor in extinction risk in two of the three superfamilies. However, body size operates in opposing directions such that larger-bodied veneroid species were relatively buffered from extinction, whereas larger-bodied pectinoid species were at greater risk. These opposing directions of selection may explain the general lack of a relationship between body size and extinction risk observed across bivalves as a whole, a result in accord with many other paleontological studies (Jablonski 1996; Lockwood 2005). These results illustrate the hierarchical nature of selection in which factors that operate consistently in direction and magnitude (e.g., geographic range size) may have strong effects at multiple scales, while those important at lower levels (e.g., body size) but which operate in opposing directions may have no net effect.

Body size covaries with many biological characteristics (Peters 1983), and its effect on extinction risk likely reflects the contributions of other covariates such as metabolic rate or fecundity. Among burrowing bivalves, body size also covaries with infaunal depth which has been hypothesized to buffer species from environmental stress and to reduce predation pressure (Vermeij 1977; Stanley 1979, 1986; Vermeij 1994; Lockwood 2004). The differences in the effect of body size on duration in the Pectinoidea and Veneroidea may reflect variations in life history traits between epifaunal and infaunal species, or a common response to environmental stress diminishing in intensity with increasing infaunal depth. As body size in species with indeterminate growth reflect such diverse factors as growth rate, ambient temperature, and age, further work is needed to tease apart the relationships between shell size and life history traits. Scallops are particularly well-suited for such research given the extensive aquaculture literature on their reproduction and growth (Shumway and Parsons 2006).

The analyses presented here support a role for intrinsic biological factors, in particular geographic range, in structuring extinction dynamics over geologic time. However, the models are relatively simple, and explain a small fraction of the variation in species duration (Table 3.1). They also assume linear relationships between factors and may perform poorly when non-linear relationships are present. Nevertheless, it is encouraging that correlates of extinction can be identified that transcend the idiosyncratic histories of individual clades. More broadly, these results highlight the importance of considering simultaneously the effects of multiple predictors on extinction risk. Intrinsic biological factors are rarely independent, and when analyzed separately their effects are frequently confounded.

CONCLUSIONS

Intrinsic biological factors such as abundance may contribute directly to extinction risk and indirectly through their influence on other biological characteristics. When examined individually, both geographic range and abundance have an apparent direct effect on extinction risk. Yet abundance, body size, and geographic range are not independent, which confounds causal interpretation of these relationships. When covariation between factors is accounted for, extinction risk can be predicted on the basis of a single factor: geographic range size. This result is generally applicable across three diverse clades that differ in many other biological characteristics, and provides support for the important role of geographic range in diversity dynamics over the history of life. Abundance and body size may contribute indirectly to extinction risk, and though these effects are weak a model that incorporates them is considerably better supported than a model of direct effects alone. Because both abundance and body size covary with geographic range, macroevolutionary trends in either of these factors may be weakly driven by extinction selectivity on geographic range size.

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CHAPTER FOUR

TIME-DEPENDENT MODELS OF EXTINCTION RISK IN THE EARLY CENOZOIC

ABSTRACT

The fossil record is a natural laboratory in which to test for the long-term influence of intrinsic biological factors on extinction risk. The constancy of their influence has rarely been evaluated through periods of marked environmental change. I assess the stability of intrinsic biological correlates of extinction risk in the Paleogene using the marine fossil record of the eastern United States. I evaluate two classes of models: a time-independent model in which the effects of geographic range and body size were invariant, and a time-dependent model in which these effects varied over the Paleogene. Models were fit to species-level data compiled for three ecologically-disparate superfamilies of marine bivalves. These data were generated through quantitative sampling, use of existing museum collections, and literature compilation. Model results indicate that geographic range size had a significant positive effect on extinction resistance over the Paleogene, whereas body size had a minor, and less predictable, effect. Time-dependent models were considerably better supported, and indicate that extinction selectivity was strongest in the middle-late Eocene and weaker during preceding and subsequent intervals. Changes in the intensity of extinction and the species richness of clades are likely drivers of the observed temporal variation in selectivity over the early Cenozoic. The methodological approach

used here provides an explicit framework for assessing general versus specific controls on extinction risk over the variable history of Earth and life.

INTRODUCTION

Intrinsic biological factors have contributed to extinction risk over the Phanerozoic, but the magnitude of these contributions has varied over time. For example, geographic range size was an important correlate of extinction risk among mollusk species during the Triassic and Jurassic (Kiessling and Aberhan 2007), late Cretaceous (Jablonski 1986; Jablonski and Hunt 2006), Paleogene (Chapter Three herein), and Neogene (Foote et al. 2008), but had little association during the end-Cretaceous mass extinction (Jablonski 1986, 2008). Considerable attention has been devoted to the weakening of selectivity during mass extinctions (Jablonski 2005; Payne and Finnegan 2007; Jablonski 2008). However, intervals of time characterized by more moderate extinction rates also exhibit considerable variation in the association between intrinsic biological factors and extinction risk (Jablonski 1986; McKinney 1995, 1997; Jablonski 2005; Payne and Finnegan 2007; Simpson and Harnik 2009). Such variation may be generated by (1) biotic response to different environmental stressors, (2) the intensity of extinction, (3) changes in the biological characteristics of clades and biotas over geologic time, and (4) variation in the quality of the preserved and sampled fossil record. How much of this temporal variation needs to be accounted for in models predicting extinction risk in the geologic past?

The early Cenozoic is well-suited to address this question. The Paleogene (65- 28.4 million years ago, MYA) records a peak in global temperatures during the Paleocene-Eocene

Thermal Maximum (PETM, Aubry et al. 1998; Zachos et al. 2003; Gingerich 2006; Weijers et al. 2007), followed by a transition from greenhouse to icehouse climates in the late Eocene-early Oligocene (Prothero et al. 2002; Miller et al. 2005; Ivany et al. 2006; Lear et al. 2008; Liu et al. 2009). Marine and terrestrial taxa responded to these environmental changes in a variety of ways, including changes in population density (Aronson et al. 2009), body size (Hunt and Roy 2006), and geographic range limits (Wilf and Labandeira 1999; Bowen et al. 2002; Aronson et al. 2009), as well as via regional and global extinction (Dockery and Lozouet 2003; Hansen et al. 2004; Gibbs et al. 2006). Such responses occurred in tandem with the recovery and diversification of clades following the end-Cretaceous mass extinction, which unfolded at rates approximately double the Cenozoic average (Miller and Sepkoski 1988; Krug et al. 2009). Diversification during the recovery also initiated a series of ecological shifts, including a trend toward increased burrowing depth among veneroid bivalves (Lockwood 2004).

I examine temporal variation in the contributions of intrinsic biological factors to extinction risk over this eventful time in the early Cenozoic using the marine fossil record of the eastern United States (U.S.). I compare a time-independent model of extinction selectivity, in which intrinsic biological factors were invariant in their effects on extinction risk, with a more complex model in which these effects varied temporally. I focus on the direct effects of two factors – geographic range and body size – held to influence extinction risk in extant and fossil taxa. Widespread species tend to be extinction resistant (Purvis et al. 2000b, and references above; Purvis et al. 2005; Powell 2007; Purvis 2008), whereas the relationship between body size and extinction risk is more complex. Among terrestrial vertebrates, body size might be directly correlated with extinction risk because it negatively covaries with fecundity, population density, and home range size (Gaston and Blackburn 2000; Harcourt et al. 2002; Johnson 2002; Purvis et al. 2005). Among marine invertebrates, a positive relationship between body size and fecundity (Roy et al. 2002; Jablonski et al. 2003a) would predict an inverse effect of body size on extinction risk. Empirical support for an association between body size and extinction risk among marine mollusks is generally lacking (Jablonski 1996; Lockwood 2005), though at finer ecological and phylogenetic scales, size can be important (Smith and Roy 2006; Chapter Three herein).

DATA AND METHODS

A database containing the occurrences and body size of species in three superfamilies of marine bivalves (Carditoidea, Pectinoidea, and Veneroidea) was assembled for the Paleogene of the Gulf and Atlantic Coastal Plains. These three superfamilies differ in many aspects, including life history, ecology, and patterns of diversification over the early Cenozoic; the family Carditidae was one of several clades in which species richness increased rapidly following the end-Cretaceous mass extinction (Hansen 1988; Jablonski 1998). These three superfamilies also encompass much of the species-richness of Paleogene bivalves in the eastern U.S. (Palmer and Brann 1965), and when considered together provide a reasonable approximation of the ecological and evolutionary dynamics of bivalves as a whole.

Occurrence and body size data were collected through fieldwork by the author, use of the fossil mollusk collections at the Paleontological Research Institution, National Museum of

Table 4.1. Number of species in each superfamily with last occurrences in time bins spanning the Paleocene through early Oligocene of the Gulf and Atlantic Coastal Plains. Time bins correspond roughly to the five major stratigraphic groups in the Gulf Coastal Plain.

Time bin	Stratigraphic group	Age range (MYA)	Carditoidea	Pectinoidea	Veneroidea
T1	Midway	65.5-58.4	15	1	5
T2	Wilcox	58.4-50.2	14	6	10
T3	Claiborne	50.2-38.7	29	13	32
T4	Jackson	387-34.2	9	23	6
T5	Vicksburg	34.2-28.7	2	16	17

Natural History, Florida Museum of Natural History, Academy of Natural Sciences Philadelphia, and data compilation using records in the Paleobiology Database (http://paleodb.org) and the published literature (Appendix A). The database consists of approximately 3600 occurrences of species over the Paleogene, distributed over 14 states and 153 counties. Analyses included 196 species for which body size, geographic range, and duration could be measured (Table 4.1).

The geographic range of each species was measured as the maximum great circle distance between the centroids of counties in which the species occurred over its duration (historical reports in museums and the literature cannot always be resolved to finer spatial scales). To account for temporal variation in the preserved and sampled sedimentary record, the geographic range of each species was calculated as a proportion of the maximum distance between fossiliferous localities over its duration. Measuring geographic range integrated over the duration of each species was necessary because occurrences in historical collections cannot always be assigned to an individual stratigraphic unit, and because some stratigraphic units in the Atlantic Coastal Plain are not as finely subdivided temporally (e.g., the Santee Limestone may span ~7 m.y. (NP zones 16-18, Edwards et al. 1997)) as correlative units in the Gulf Coastal Plain. The geographic range of species restricted to a single county was estimated as the median length of a county in Coastal Plain states containing fossils (39 km). However, variation in sampling extent over time can generate markedly different values of proportional range for single-county taxa. To account for this, the minimum geographic range (39 km) was subtracted from the observed range of all species, thus setting the range of single-county species to zero (Foote et al. 2008). The results summarized below do not depend on this correction factor.

Body size for each species was calculated as the square root of the product of shell length versus height, using specimens in museum collections and plates in taxonomic monographs (Stanley 1986; Jablonski 1996). The median number of measurements for each species was 12 specimens. As these species show indeterminate growth, the maximum size of species was used in all analyses (Jablonski 1996).

The duration of each species was measured between the mid-points of the stratigraphic units containing its first and last occurrences and rounded to the nearest million years. All species restricted to a single stratigraphic unit were assigned a duration of zero. Alternative methods of calculating stratigraphic ranges (e.g., assuming species ranged from the base of the unit of first occurrence to the top of the unit of last occurrence) generate equivalent results and are not presented here. Age relationships for stratigraphic units were derived primarily from the work of Dockery (1986b), Toulmin (1977), and Randazzo and Jones (1997), with absolute dates taken from calibrated nannoplankton zones (Berggren et al. 1995).

To assess the relative contributions of body size and geographic range to species duration, I used Generalized Linear Models (GLM, McCullagh and Nelder 1989). A multivariate approach is necessary because of the lack of independence between intrinsic biological factors (Purvis et al. 2000a; Jablonski and Hunt 2006; Kiessling and Aberhan 2007; Payne and Finnegan 2007; Jablonski 2008; Chapter Three herein). GLMs were fit to the observed data, assuming a Poisson error distribution and a log link function. Geographic range was transformed using an arcsine-square root transformation commonly applied to proportional data. Akaike's Information Criterion (AIC) was used for model selection, with the Akaike Weights (AW) used to summarize the relative support for each model in the candidate set (Akaike 1974; Burnham and Anderson 2002). The AIC value for the time-dependent GLM was calculated by summing the log-likelihoods and numbers of model parameters across models fit to individual time bins. Explained Deviance (ED) was used as a measure of goodness-of-fit (McCullagh and Nelder 1989).

Two classes of models were compared: a time-independent model in which the effects of intrinsic biological factors on extinction risk were invariant, and a time-dependent model in which these effects varied temporally. Three temporal binning schemes were used: (A) a three-bin scheme comprising (1) the Paleocene and early Eocene (65.5 – 50.2 MYA) biotic recovery following the end-Cretaceous mass extinction and the PETM interval, (2) middle and late Eocene (50.2 – 34.2 MYA) greenhouse conditions prevalent following the PETM, and (3) early Oligocene (34.2 – 28.7 MYA) icehouse conditions; (B) a five-bin scheme defined by the major stratigraphic groups in the Gulf Coastal Plain and correlative units in the Atlantic Coastal Plain;

(C) a third scheme consisting of equal-length bins of 10 m.y. duration. The second scheme largely overlaps the first, but separates the early Paleocene from the PETM interval, and the middle from the late Eocene. GLMs were fit separately to the set of species with last occurrences in each time bin. The relative support for a time-dependent model was then compared to a time-independent model in which all species were pooled irrespective of the interval in which they went extinct.

Selectivity is expected to weaken with increasing extinction intensity (Jablonski 2005; Payne and Finnegan 2007; Jablonski 2008). If extinction rates have varied over the Paleogene, such temporal variation may structure the strength of association between intrinsic biological factors and extinction risk. To quantify extinction intensity, I compared the median durations of species in each time bin, including and excluding singletons (Foote and Raup 1996). Because duration distributions are highly skewed, non-parametric Mann-Whitney U-tests were used to assess the difference in median duration between bins.

Selectivity is also expected to weaken when the variance in intrinsic biological factors decreases. To assess this possibility, frequency distributions of geographic range size and body size were compared over the Paleogene. To examine the role sampling may have played in shaping these distributions, the geographic extent of fossiliferous localities and the frequencies of three broadly-defined depositional environments (carbonate, siliciclastic, and mixed lithologies) were quantified. Lithofacies were assigned to stratigraphic units using the USGS National Geologic Map Database (http://ngmdb.usgs.gov/Geolex/geolex_home.html). This database provides descriptions and associated references for most of the lithostratigraphic units in the Gulf and Atlantic Coastal Plains. Additional references were consulted for select lithostratigraphic units absent from the database (Wasem and Wilbert 1943; Colton and Bush 1988; Zachos and Molineux 2003). The frequency of carbonate, mixed, and siliciclastic localities were tabulated for each time bin and differences among bins assessed using a chi-square test.

RESULTS

Geographic range size had a significant positive effect on species duration over the Paleogene, but the strength of this effect varied over time (Table 4.2). Time-dependent models that accounted for this variation were much better supported than a time-independent model (Table 4.2). In both the three- and five-bin schemes, the positive effect of geographic range on species duration was relatively weak during the Paleocene-early Eocene and early Oligocene relative to the middle-late Eocene (Table 4.2). When the Paleogene was more finely partitioned (scheme B), a few differences emerged (Table 4.2). First, the weak relationship between geographic range and duration seen in the Paleocene-early Eocene was weakest during the PETM interval (Wilcox Group and equivalents). Second, body size - which had no effect on duration in either the time-independent or three-bin time-dependent model – was a significant, albeit weak and inconsistent, predictor. Larger body size was associated with shorter durations during the early Paleocene and late Eocene, while the opposite relationship prevailed during the middle Eocene. The five-bin model was better supported than the three-bin model in which time bins were defined using major evolutionary/climatic boundaries (Table 4.2). Models fit to equal-length 10 m.y. bins reveal qualitatively similar patterns, thus demonstrating that temporal

Table 4.2. Summary of time-independent versus time-dependent models. Reported values for body size and geographic range are the effect of each factor on species duration, with significance denoted as: (.) $p < 0.1$; * $p < .05$; ** $p < 0.01$. Akaike's Information Criterion (AIC) and Akaike Weights (AW) were used in model selection. ED denotes the fraction of deviance in the data explained by a given model. In the three-bin model, T1 = Paleocene-early Eocene; T2 = middle-late Eocene, and T3 = early Oligocene. In the five-bin model, time bins correspond approximately to the major stratigraphic groups in the Gulf Coastal Plain: T1 = Midway; T2 = Wilcox; T3 = Claiborne; T4 = Jackson; T5 = Vicksburg. In the four-bin model, equal-length 10 m.y. bins were used. Geographic range had a significant positive effect on species duration, but the strength of this effect varied over the early Cenozoic. A time-dependent model of extinction selectivity was much better supported than a time-independent model.

	Body Size	Geographic Range	AIC	AW	ED
Time-Independent	0.0	1.53**	860.4	<< 0.01	0.22
Time-Dependent	T1 = 0.0	T1 = 0.78*	817.4	< 0.01	0.27
	T2 = 0.0	T2 = 1.82**			
	T3 = 0.1	T3 = 0.89 (.)			
Time-Dependent (stratigraphic groups)	T1 = -0.03*	T1 = 1.22*	806.4	> 0.99	0.31
	T2 = 0.00	T2 = 0.70 (p = 0.1)			
	T3 = 0.01*	T3 = 1.61**			
	T4 = -0.02*	T4 = 2.58**			
	T5 = 0.01	T5 = 0.89 (.)			
Time-Dependent (equal-length 10 m.y. bins)	T1 = 0.00	T1 = 0.95*	814.3	< 0.01	0.27
	T2 = 0.00	T2 = 0.56 (p = 0.1)			
	T3 = 0.00	T3 = 1.91**			
	T4 = 0.01	T4 = 0.89 (.)			

differences cannot be attributed to variation in bin duration (Table 4.2).

The intensity of extinction, as measured by the median duration of species, varied over the Paleogene. The median durations of species in the Paleocene-early Eocene, middle-late Eocene, and early Oligocene were not significantly different (Figure 4.1; $p > 0.05$ for each Mann-Whitney U-test). However, this result is driven entirely by the high frequency of singletons in each time bin. If singletons are excluded, species that last occurred in the

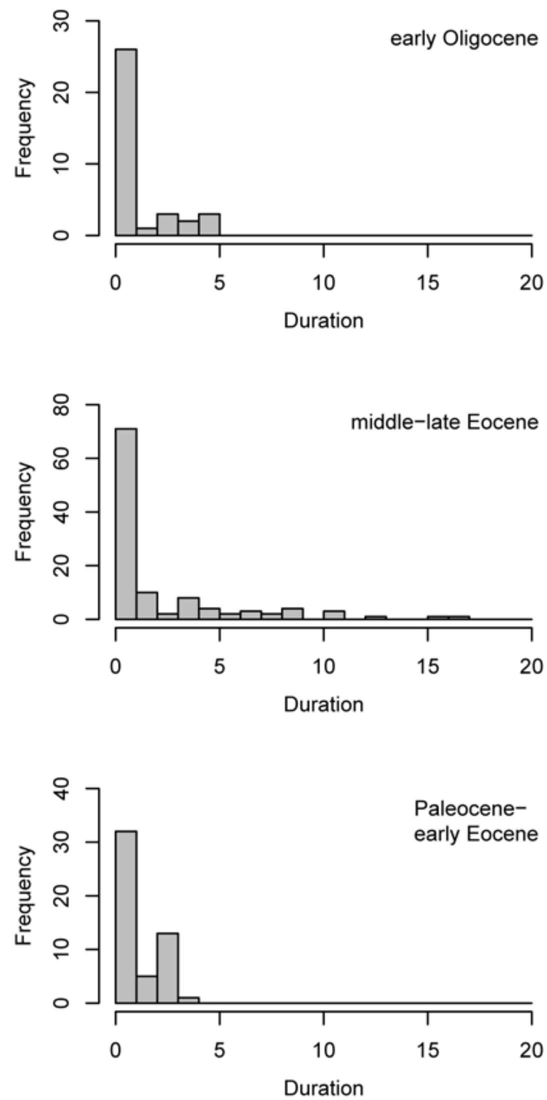

Figure 4.1. Frequency distributions of species durations over the Paleogene. Singletons are common in all intervals and Mann-Whitney U-tests of the difference in median duration between time bins are not significant when they are included in the comparison ($p > 0.05$). If singletons are removed, species in the middle-late Eocene had significantly longer durations than those in the Paleocene-early Eocene ($p < 0.01$) and early Oligocene ($p < 0.001$).

Paleocene-early Eocene and early Oligocene had significantly shorter durations than those in the middle-late Eocene ($p < 0.01$ for both U-tests). Variation in bin duration was not a strong factor as relative differences in rates are qualitatively similar when equal-length 10-m.y. bins were used (Figure 4.2). A significant positive relationship was observed between median duration (excluding singletons) and the strength of the effect of geographic range on duration (Figure 4.3; GLM, $p < 0.05$). During the middle-late Eocene, when extinction intensity was low, the effect of geographic range was high, while the converse held during both preceding and subsequent intervals.

Frequency distributions of Paleocene-early Eocene and middle-late Eocene geographic range sizes were indistinguishable (Figure 4.4). In contrast, the distribution of geographic range sizes in the early Oligocene differed significantly from distributions in both the middle-late Eocene and Paleocene-early Eocene. The early Oligocene shift in geographic range sizes could reflect a true biological shift toward broader range sizes under cooling climates, but is more parsimoniously explained by the > 60% decline in the preserved and sampled extent of fossiliferous localities between the Eocene and early Oligocene (Figure 4.5).

In contrast to geographic range, body size distributions did change over the Paleogene. Size-frequency distributions for species in the Carditoidea differed significantly between the Paleocene-early Eocene and middle-late Eocene (KS test, $D = 0.52$; $p < 0.001$), reflecting a decline in median size between these two intervals (Figure 4.6). In the Pectinoidea, size distributions changed gradually over the Paleogene, with little measurable change between adjacent time bins, but significant cumulative differences between the Paleocene-early Eocene

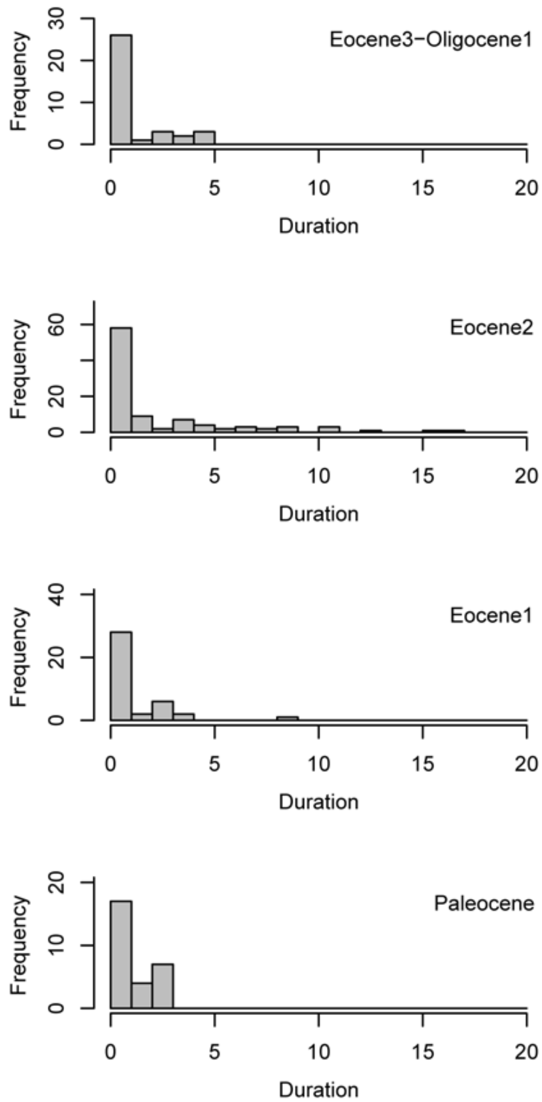

Figure 4.2. Frequency distributions of species durations in equal-length 10-m.y.-bins over the Paleogene. Differences observed in the median duration of species (excluding singletons) do not result from differences in bin duration. The durations of species last occurring in Eocene2 are longer than those in the preceding ($p < 0.05$) and subsequent ($p < 0.001$) bins.

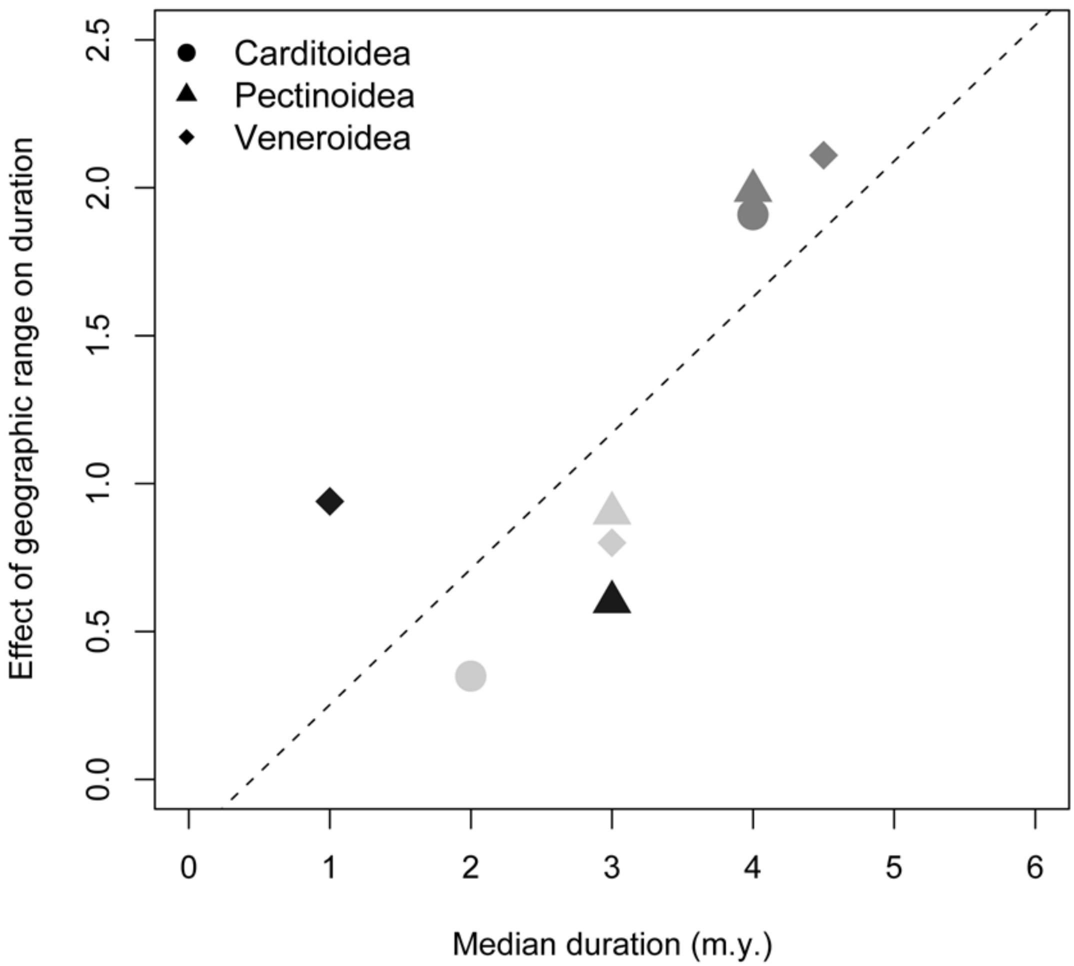

Figure 4.3. The relationship between extinction intensity and strength of selectivity. The effect of geographic range is plotted against median duration (excluding singletons) for each superfamily under the three-bin model. Colors indicate temporal bins, with lighter colors corresponding to older intervals. In the early Oligocene there are too few Carditoid species to estimate the effect of geographic range on duration. The dashed line is the linear regression of median duration on the effect of geographic range. A significant positive association is observed ($p < 0.05$), with selectivity strengthening with increasing duration (i.e., declining extinction intensity).

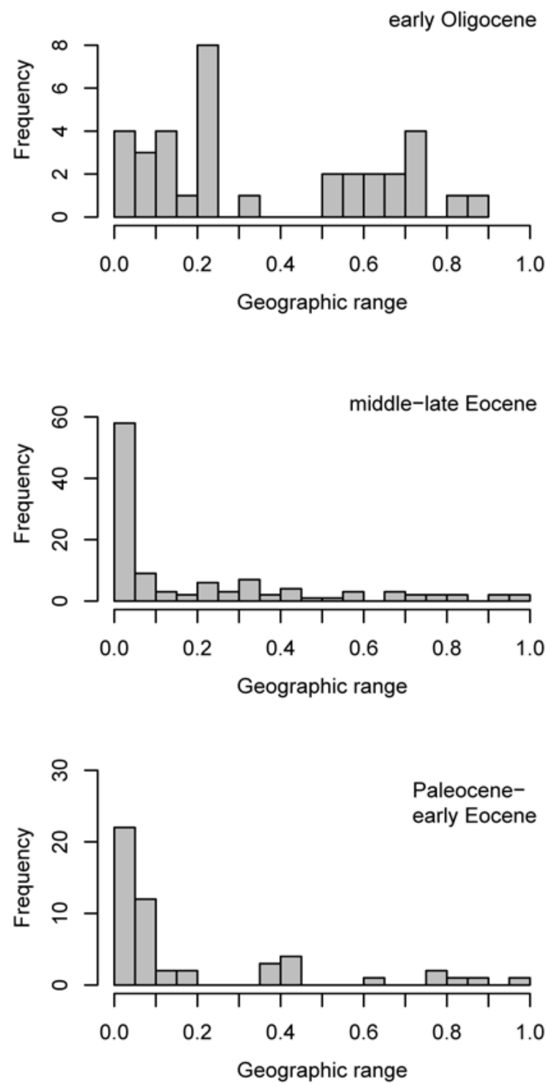

Figure 4.4. Frequency distributions of species geographic ranges over the Paleogene. Distributions in the Paleocene-early Eocene and middle-late Eocene were indistinguishable (Kolmogorov-Smirnov (KS) test, $D = 0.15$, $p = 0.39$) while both the middle-late Eocene (KS test, $D = 0.40$; $p < 0.001$) and Paleocene-early Eocene (KS test, $D = 0.43$; $p<0.001$) distributions differed significantly from that of the early Oligocene.

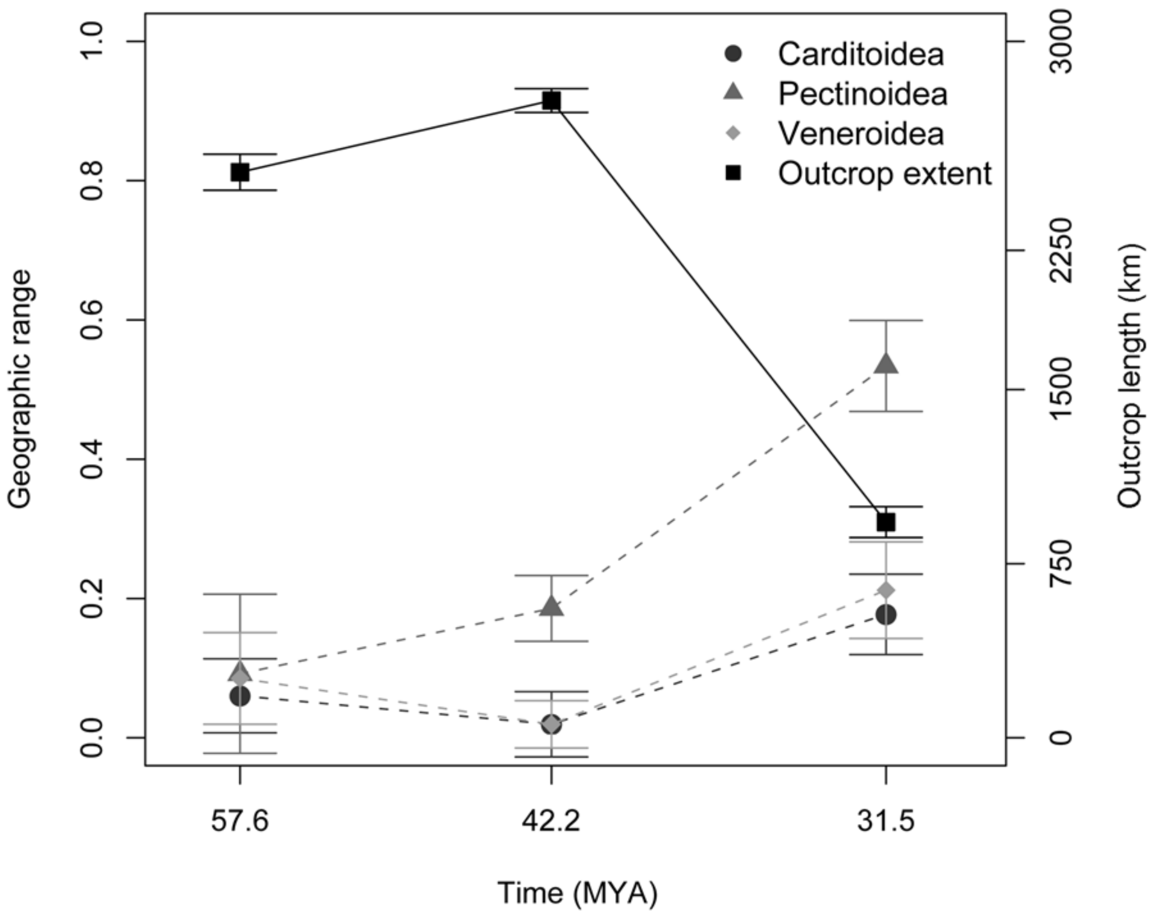

Figure 4.5. The median geographic range size for species in each superfamily over the Paleogene. The left axis is species geographic range size scaled to the length of available outcrop over the species duration. The right axis is outcrop length (km), measured as the maximum distance between fossiliferous localities in each time. Confidence intervals are 1 standard error. The solid line indicates the maximum distance between fossiliferous localities in each time bin. Median geographic range size as a proportion of outcrop extent significantly increased from the Eocene to Oligocene. This shift is most parsimoniously explained by the large decline in outcrop extent in the early Oligocene.

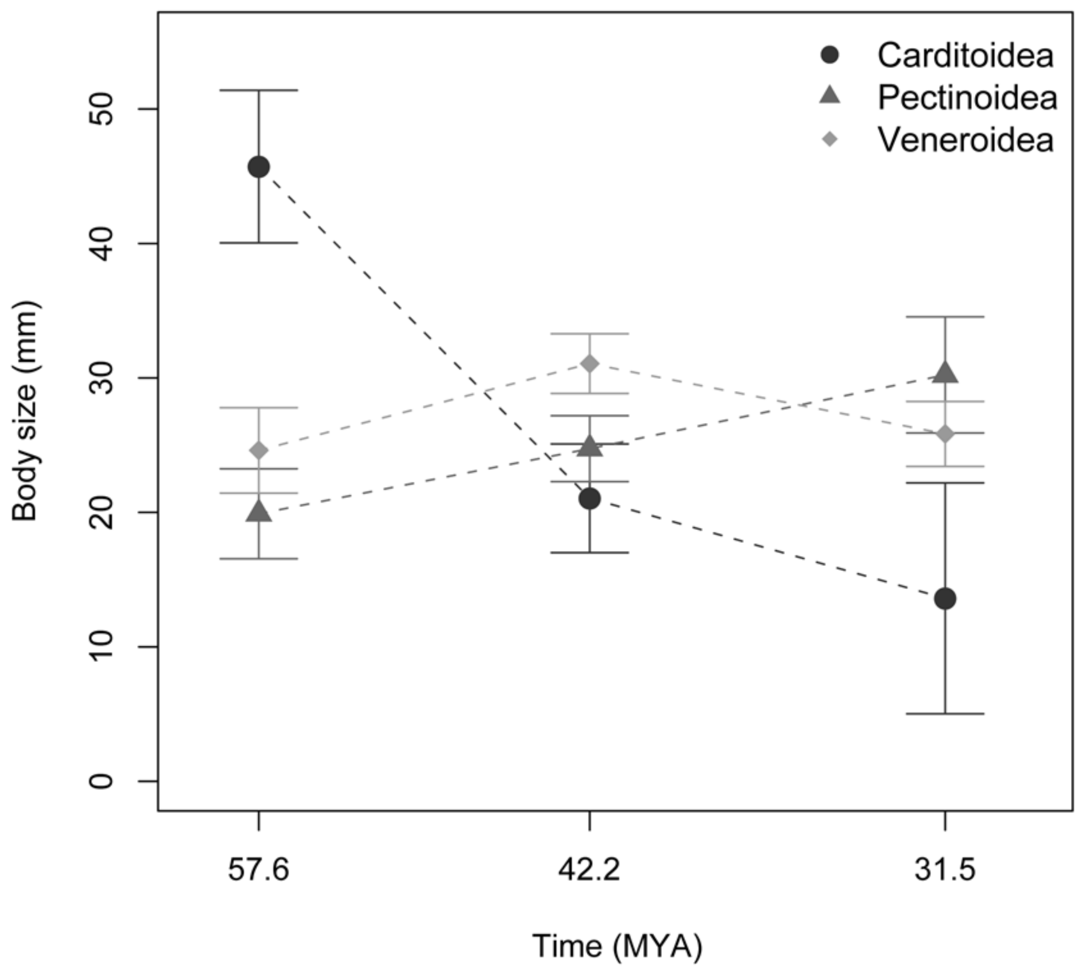

Figure 4.6. Median size of species in each superfamily over the Paleogene. Confidence intervals are 1 standard error. Species in the Carditoidea declined in size over time, while size increased among species in the Pectinoidea. In the Veneroidea, size varied over time with no net trend.

and early Oligocene (KS test, D = 0.58, p = 0.03). Changes in size distributions in the Pectinoidea were associated with an increase in median size among species (Figure 4.6). Among species in the Veneroidea, there was no net trend in median size over the Paleogene (Figure 4.6), though size-frequency distributions did differ significantly between the middle-late Eocene and early Oligocene (KS test, D = 0.39, p = 0.04). Because smaller-bodied taxa are less likely to be preserved, sampled, and/or identified (Cooper et al. 2006; Valentine et al. 2006; Hendy 2009; Sessa et al. 2009), analyses were repeated excluding species < 5 mm (Sessa et al. 2009). This sensitivity test culled 7 of the 196 species, and had no effect on the results presented above (Figure 4.7), suggesting that the temporal trends in decreasing size in the Carditoidea and increasing size in the Pectinoidea reflect biological pattern and not preservational artifact. Thus Cope's Rule - that size should increase over time within clades – did not apply, as size decreased or varied with no net trend in two of the three superfamilies.

Shifts in the sampling of depositional environments over time may have contributed to the observed trends in body size. Over the Paleogene, the proportion of localities containing carbonate and mixed lithologies significantly increased, as extensive carbonate units developed in the eastern Gulf and western Atlantic (Figure 4.8). Within the middle-late Eocene, species in the Pectinoidea that occurred in carbonate environments were significantly larger (median size = 35 mm) than those that occurred in mixed (29 mm) or siliciclastic (22 mm) settings (Figure 4.9). Pectinoid species found only in siliciclastic environments, however, still exhibited a general increase in size between the Paleocene-early Eocene (21 mm), middle-late Eocene (22 mm), and early Oligocene (32 mm) (Figure 4.9).

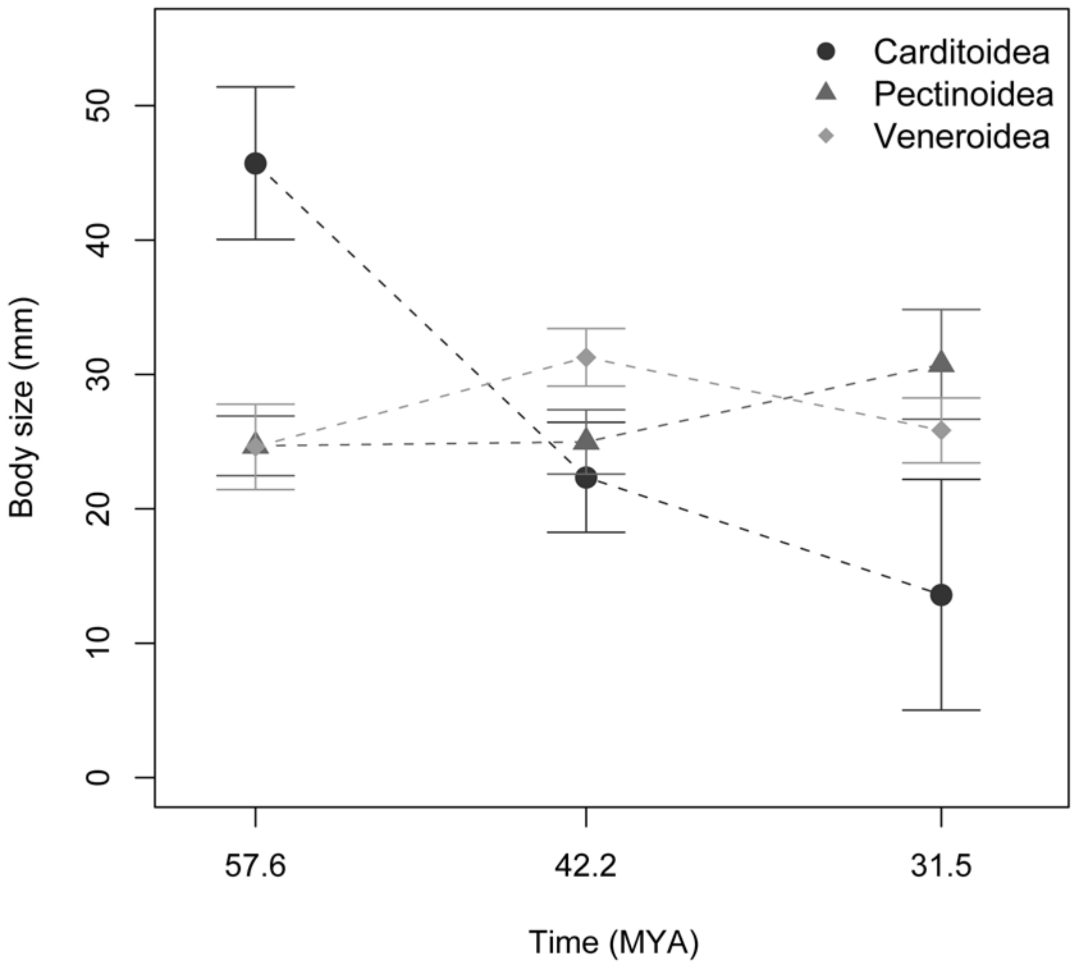

Figure 4.7. Median size of species in each superfamily over the Paleogene when species < 5 mm are excluded. Confidence intervals are 1 standard error. Even when small-bodied species are excluded due to potential taphonomic bias, a decrease in median size among Carditoid species and increase among Pectinoid species is observed.

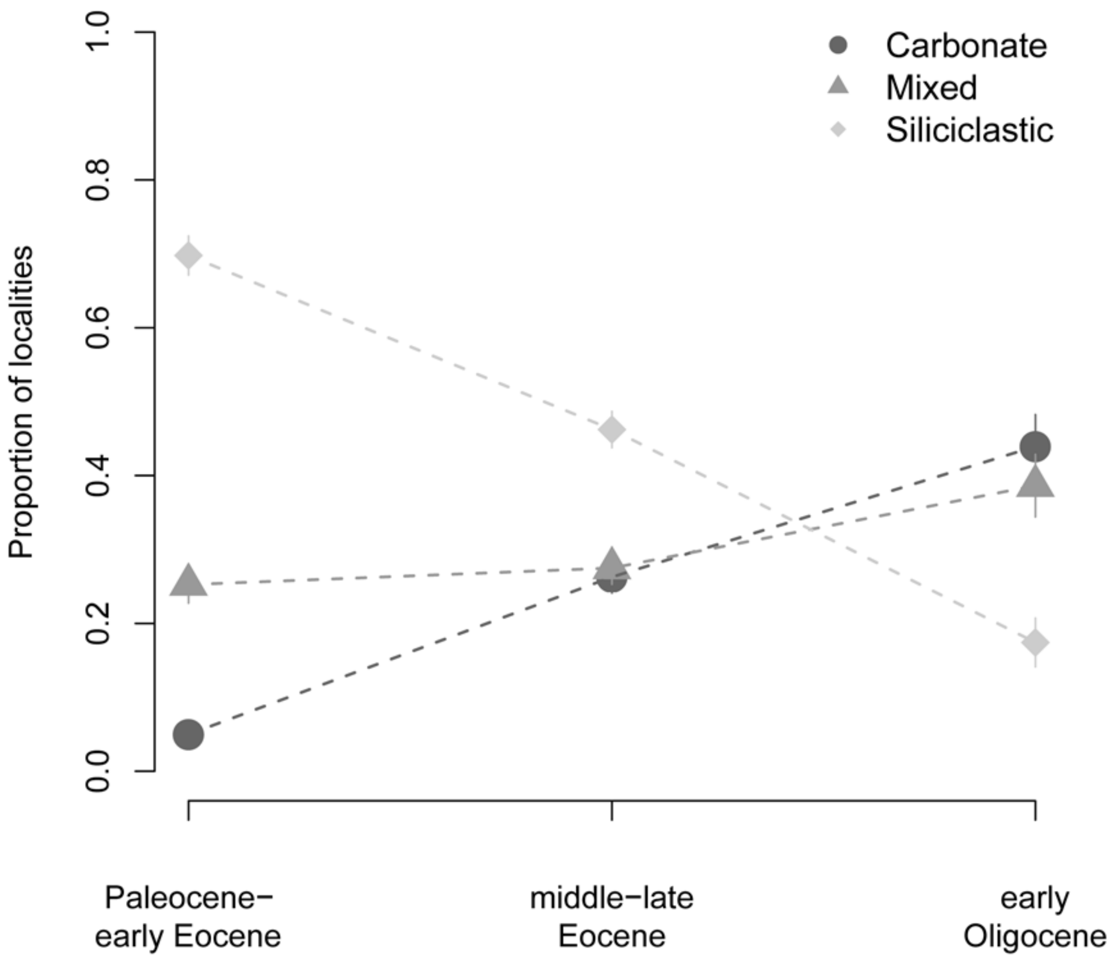

Figure 4.8. Variation in the proportion of carbonate, siliciclastic, and mixed localities over the Paleogene. Confidence intervals are 1 standard error. The sampling of carbonate and mixed depositional environments increased significantly from the Paleocene to early Oligocene (chi-squared = 132.3, df = 4, p < 0.001).

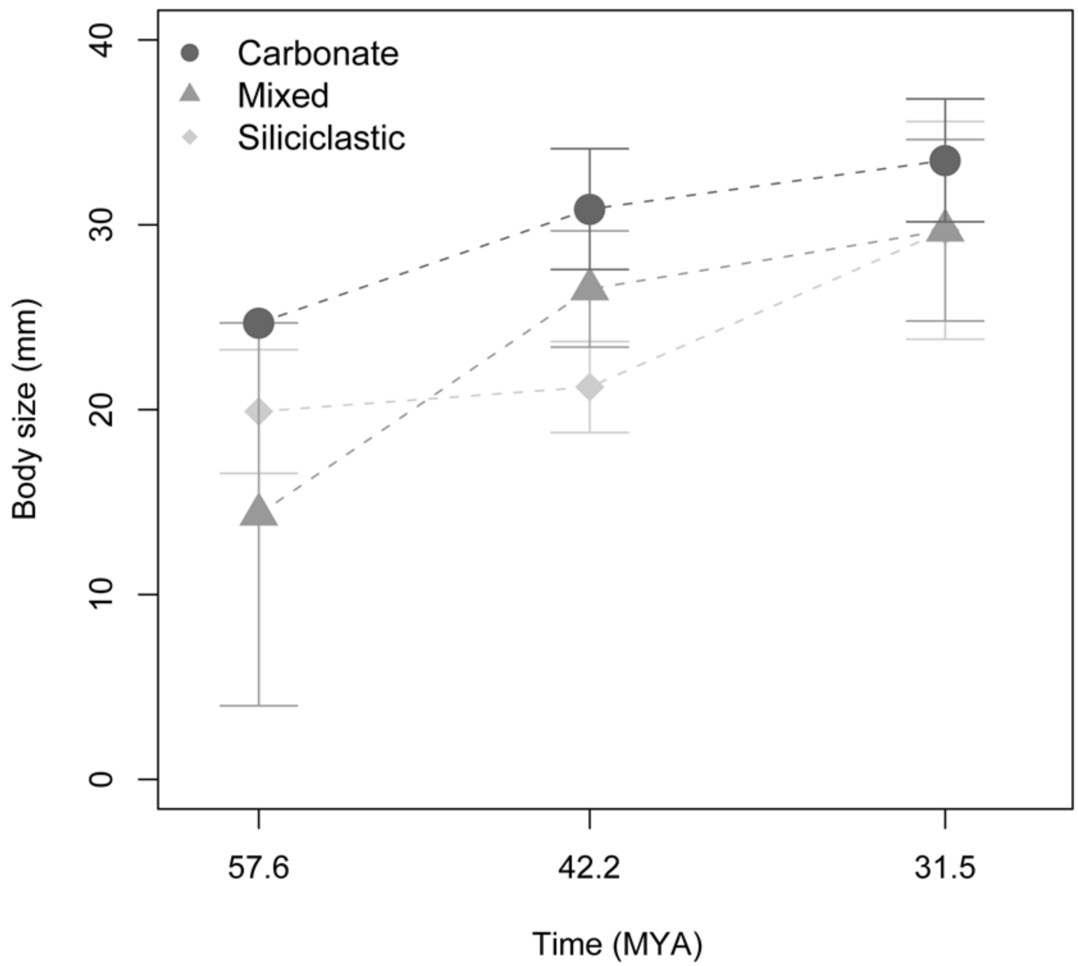

Figure 4.9. Variation in the median size of pectinoid species among depositional environments over the Paleogene. Within each time bin, there was a tendency for larger-bodied species to occur in carbonate environments. Within each environment, there was a general increase in size from the Paleocene to early Oligocene.

DISCUSSION

A number of mechanisms might explain the time-dependent nature of extinction selectivity over the early Cenozoic. These include variation in extinction drivers and/or intensity, biological distributions, and sampling. Selectivity is expected to weaken as extinction intensity increases, even when the probability of extinction is spatially-homogeneous (Duncan and Lockwood 2001; Fisher et al. 2003; Jablonski 2005; Payne and Finnegan 2007). The Paleogene data are consistent with this pattern, as the strength of selectivity of geographic range was strongest when extinction intensity was low. Weaker selectivity was associated with the intensity of environmental change, not the specific drivers.

The strength of selectivity is also expected to vary as the biological characteristics of the biota change over time. For example, selectivity may be relatively weak, and/or difficult to detect, when variance in factors such as geographic range or body size is moderate. If variance in intrinsic biological factors increases with species richness, selectivity should have strengthened over the Paleogene, as clades diversified following the end-Cretaceous mass extinction. This hypothesis is consistent with the temporal trend in selectivity from the Paleocene-early Eocene to middle-late Eocene, but not supported when geographic range or body size distributions are examined in detail. Over the time scales considered here, frequency distributions of geographic range size were largely invariant with the shift in geographic ranges observed in the early Oligocene easily explained by the decline in fossiliferous outcrop at that time. Size-frequency distributions shifted over the Paleogene reflecting, in part, the changing distribution of depositional environments. However, size trends were heterogeneous across the three clades, and the modest and variable effect of size on extinction risk is not well explained by temporal variation in the size-frequency distribution of bivalves as a whole.

When models of extinction risk are fit to species pooled from multiple clades, the estimated effects of intrinsic biological factors are a composite of individual clade-level effects. As species richness varies within clades over time, time-dependent models of extinction risk may reflect temporal variation in the relative diversities of clades that differ in selectivity. The three superfamilies analyzed here each differed in the effects of geographic range and body size on extinction risk over the Paleogene (Chapter Three herein). Geographic range had a relatively weak effect on species duration in the Carditoidea, compared with its effect in the Pectinoidea, and Veneroidea. Body size was an important factor in two of the three clades, but had opposing effects on extinction risk; larger size was associated with shorter durations in the Pectinoidea and longer durations in the Veneroidea. The strengthening effect of geographic range on duration in the middle-late Eocene may have been due, in part, to the increase in diversity of the Pectinoidea and Veneroidea (Figure 4.10). Similarly, the relatively weak and variable effect of body size over the Paleogene may be partially attributed to variation in the relative diversities of the Pectinoidea and Veneroidea; increasing size was associated with increasing duration during the middle Eocene when veneroid richness exceed that of pectinoids, while the opposite relationship was observed in the upper Eocene when pectinoid richness exceeded that of veneroids (Table 4.3).

Variation in the strength of selectivity observed at broader phylogenetic scales is most likely explained by changes in extinction intensity and clade diversity. These two drivers are not

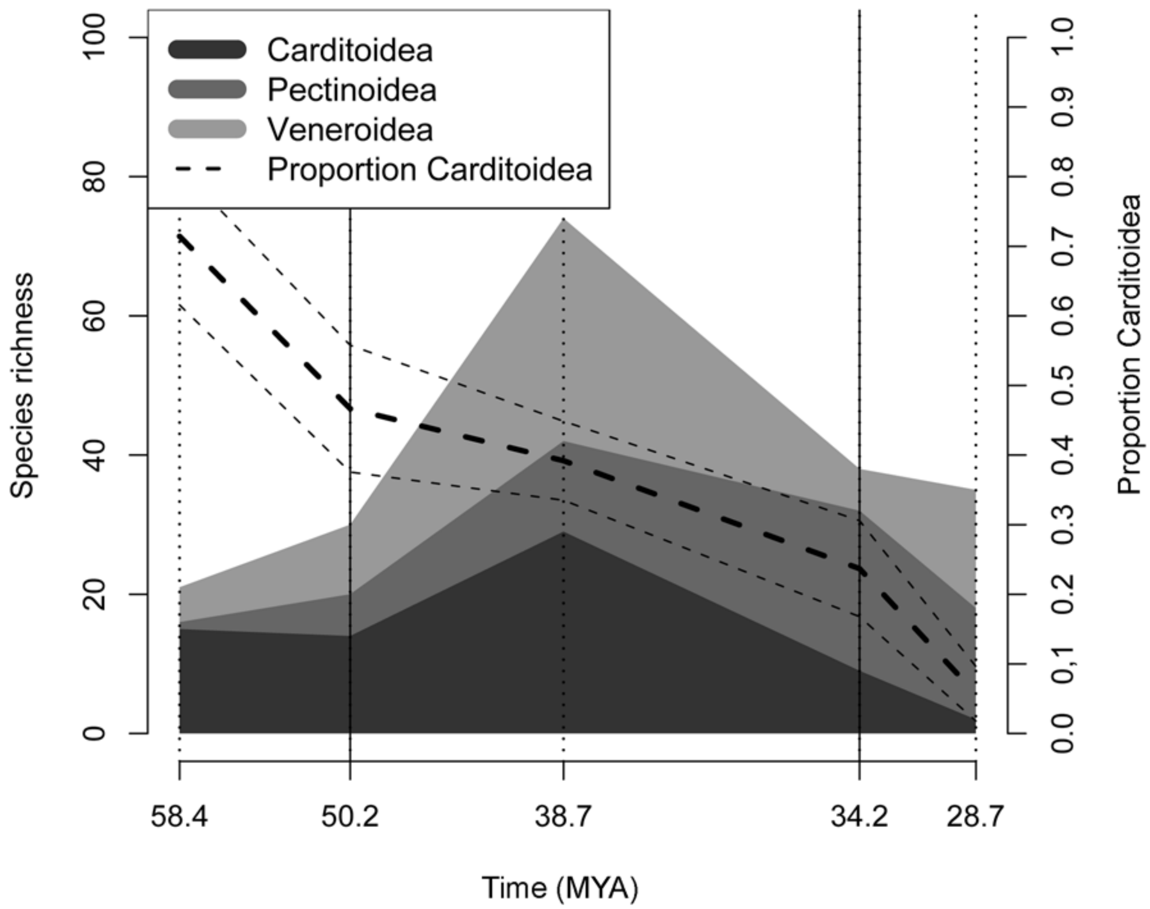

Figure 4.10. Temporal variation in the taxonomic diversity of the Carditoidea, Pectinoidea, and Veneroidea over the Paleogene in the eastern United States. Solid vertical lines denote the boundaries between time bins in the three bin model; vertical dotted lines indicate the additional subdivisions used if stratigraphic groups are the basis for binning. The width of each colored band corresponds to the number of species in that superfamily with last occurrences in that bin. The heavy dashed line is the relative richness of the Carditoidea, with the flanking dashed lines 1 standard error. The relative richness of the Carditoidea declined from the Paleocene to the Eocene, as richness in the Pectinoidea and Veneroidea increased.

Table 4.3. Time-dependent model of extinction selectivity in each superfamily over the Paleogene. Because most species are short-lived and have small geographic ranges, significant effects of selectivity are difficult to detect when species richness is low. The effects of geographic range and body size on duration in each superfamily during the Paleocene-early Eocene (T1) and early Oligocene (T2) were similar to the overall pattern observed when clades were combined (Table 4.2). During the middle-late Eocene (T3), species richness in all three clades is approximately double that of the preceding and subsequent intervals, substantially increasing statistical power, and significant effects of body size and geographic range on duration were observed; significance denoted as: (.) $p < 0.1$; * $p < .05$; ** $p < 0.01$.

	T1			T2		
	Species	Size	Extent	Species	Size	Extent
Carditoidea	29	0.01	0.35	38	0.00	1.91**
Pectinoidea	7	-0.02	0.90	36	-0.04**	1.99**
Veneroidea	15	0.02	0.80	38	0.03**	2.11**

Table 4.3. Continued.

	T3		
	Species	Size	Extent
Carditoidea	2	NA	NA
Pectinoidea	16	-0.01	0.60
Veneroidea	17	0.03	0.94

mutually exclusive, and both may have contributed to the support for time-dependent models observed here. Data for other clades, and/or a longer time-series for these three superfamilies, are needed to further distinguish between temporal and clade effects (Wang and Bush 2008).

CONCLUSIONS

Studies of extinction selectivity in the geologic record fall along a continuum from those that attempt to identify general factors correlated with extinction risk, to others that address the response of a biota to a particular suite of environmental stressors. While the desire for generality is appealing, such generalities may break down when making specific predictions about survivorship at any given point in time. Model-selection methods provide an explicit framework for testing general versus specific predictors of extinction risk in the fossil record. Over geologic time spans comparatively little is held constant, and this variation may mediate the relationships between intrinsic biological factors and extinction risk. Over the early Cenozoic, marine mollusks in the eastern United States experienced variation in extinction intensity, a large-scale shift toward more carbonate-rich depositional environments, and changes in the composition of biotas owing to the differential diversification of clades during the recovery following the end-Cretaceous mass extinction. Despite such variation, geographic range remained a significant predictor of extinction risk. Temporal variation in the strength of selectivity tracked extinction intensity and changes in the taxonomic composition of the biota, not specific environmental drivers.

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APPENDIX A

BIBLIOGRAPHY OF DATA SOURCES

INTRODUCTION

The data sets analyzed in this dissertation were assembled through: (A) field work by the author; (B) the use of existing collections at the Academy of Natural Sciences, Florida Museum of Natural History, National Museum of Natural History, and Paleontological Research Institution; and (C) literature compilation. This section lists the literature sources used in assembling the data sets for Chapters Two, Three, and Four. References are coded as follows: [A] denotes references that provided abundance data; [B] denotes references that provided body size data and/or plates from which measurements were made; [O] denotes references that provided occurrence data.

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APPENDIX B

CHAPTER TWO DATA SETS

INTRODUCTION

This section contains bulk-sample and faunal-list data compiled from the literature for bivalve and gastropod species from three Paleogene localities in the Gulf Coastal Plain. These include the middle Eocene Gosport Formation at Claiborne Bluff, Monroe County, Alabama; the late Eocene Moodys Branch Formation at Fossil Gulch, Hinds County, Mississippi; and the early Oligocene Red Bluff Formation at Mississippi Geological Survey localities MGS-35 and MGS-38, Wayne County, Mississippi. These data were used in Chapter Two to illustrate two methods for estimating the abundance of rare species known from faunal lists at a locality but absent from the current quantitative sample of individuals. Subsets of these data were also included in the database analyzed in Chapters Three and Four.

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama. Data compiled from (CA) CoBabe and Allmon (1994), (S) Swindel (1986), and (H) Harrison (1994). Names in the first column ("Class") are taken from Palmer and Brann (1965; 1966) and the Paleobiology Database. Names in the second column ("Genus…") are taken from Palmer and Brann (1965; 1966) and were not evaluated for congruence with more recent systematic treatments of the genus nor used in any of the analyses presented herein. All genus names are accordingly presented in quotes; Appendix D provides a partially updated working taxonomy for bivalve species in the Carditoidea, Pectinoidea, and Veneroidea. Names in the third column ("Species") are taken from Palmer and Brann (1965; 1966), with additions and modifications from Heaslip (1968). Numbers denote individual bulk samples; columns labeled CBtot are the summed counts of individuals in bulk samples in each study and for the locality as a whole. Sampling and counting protocols are summarized in the Methods section of Chapter Two.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB1_CA	CB2_CA	CB3_CA	CB4_CA	CB5_CA
Bivalvia	"Astarte"	proruta	0	0	0	0	0
Bivalvia	"Barbatia"	rhomboidella	1	0	0	0	0
Bivalvia	"Bathytormus"	protextus	10	11	8	2	1
Bivalvia	"Caestocorbula"	murchisonii	64	27	43	12	49
Bivalvia	"Callista"	aequorea	2	1	2	3	3
Bivalvia	"Callista"	aldrichi	0	0	0	0	0
Bivalvia	"Callista"	mortoni	11	1	5	3	0
Bivalvia	"Callista"	perovata	30	29	20	10	1
Bivalvia	"Calorhadia"	opulenta	0	0	0	0	0
Bivalvia	"Calorhadia"	semen	0	0	0	0	0
Bivalvia	"Caryocorbula"	alabamiensis	96	22	43	29	19
Bivalvia	"Caryocorbula"	densata	0	0	0	0	12
Bivalvia	"Caryocorbula"	deusseni	0	10	0	0	0
Bivalvia	"Chlamys"	deshayesii	1	0	0	0	0
Bivalvia	"Corbis"	undata	0	0	0	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB1_CA	CB2_CA	CB3_CA	CB4_CA	CB5_CA
Bivalvia	“Crenella”	isocardioides	0	0	0	0	0
Bivalvia	“Crenella”	margaritacea	0	0	0	0	0
Bivalvia	“Diplodonta”	ungulina	15	24	16	13	12
Bivalvia	“Egerella”	limatula	0	0	0	0	0
Bivalvia	“Egerella”	subtrigonia	0	0	0	0	0
Bivalvia	“Eomiltha”	pandata	0	0	0	0	0
Bivalvia	“Epilucina”	rotunda	0	0	0	0	0
Bivalvia	“Gari”	eborea	0	0	0	0	0
Bivalvia	“Glycymeris”	idonea	1	0	0	0	0
Bivalvia	“Glycymeris”	staminea	8	13	14	5	8
Bivalvia	“Glycymeris”	trigonella	214	196	196	118	220
Bivalvia	“Gratelupia”	hydana	0	0	0	0	0
Bivalvia	“Hindsiella”	faba	0	0	0	0	0
Bivalvia	“Katherinella”	trigoniata	0	0	0	0	0
Bivalvia	“Linga”	carinifera	0	0	0	0	0
Bivalvia	“Linga”	pomilia	55	68	54	38	23
Bivalvia	“Lirodiscus”	tellinoides	5	2	2	1	1
Bivalvia	“Lucina”	dolabra	3	2	1	1	0
Bivalvia	“Mactropsis”	aequorea	0	0	0	0	0
Bivalvia	“Nucula”	magnifica	5	0	0	0	0
Bivalvia	“Nucula”	ovula	32	7	12	15	1
Bivalvia	“Nuculana”	coelata	7	4	2	5	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB1_CA	CB2_CA	CB3_CA	CB4_CA	CB5_CA
Bivalvia	"Pachecoa"	pectuncularis	0	0	0	0	0
Bivalvia	"Pachecoa"	perplana	0	0	0	0	0
Bivalvia	"Pachecoa"	pulchra	0	0	0	0	0
Bivalvia	"Parmicorbula"	gibbosa	1	14	17	19	15
Bivalvia	"Pitar"	nuttali	11	9	26	5	0
Bivalvia	"Plicatula"	filamentosa	7	3	1	7	0
Bivalvia	"Pteria"	limula	0	0	0	0	0
Bivalvia	"Spisula"	parilis	3	13	8	1	0
Bivalvia	"Sportella"	gregorioi	0	0	0	0	0
Bivalvia	"Tellina"	leana	0	0	0	0	0
Bivalvia	"Tellina"	papyria	94	16	22	27	0
Bivalvia	"Tellina"	raveneli	0	0	0	0	0
Bivalvia	"Trinacria"	cuneus	0	0	0	0	0
Bivalvia	"Venericardia"	aldrichi	0	0	0	0	0
Bivalvia	"Venericardia"	alticostata	11	9	15	17	1
Bivalvia	"Venericardia"	claiboplata	7	10	2	8	1
Bivalvia	"Venericardia"	complexicosta	0	0	0	0	0
Bivalvia	"Venericardia"	parva	65	51	62	38	92
Bivalvia	"Venericardia"	rotunda	58	31	56	16	17
Bivalvia	"Verticordia"	eocensis	0	0	0	0	0
Gastropoda	"Actaeonema"	sulcatum	0	0	0	0	0
Gastropoda	"Agaronia"	alabamensis	8	13	32	6	9

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB1_CA	CB2_CA	CB3_CA	CB4_CA	CB5_CA
Gastropoda	“Agaronia”	bombylis	15	2	19	0	3
Gastropoda	“Ancilla”	staminea	3	4	10	1	6
Gastropoda	“Architectonica”	alveata	0	1	0	0	0
Gastropoda	“Architectonica”	amoena	0	0	0	0	0
Gastropoda	“Architectonica”	elaborata	0	1	2	1	0
Gastropoda	“Architectonica”	fungina	0	2	1	0	0
Gastropoda	“Architectonica”	ornata	0	0	0	0	0
Gastropoda	“Athleta”	petrosus	1	4	1	1	3
Gastropoda	“Athleta”	sayanus	0	0	0	0	0
Gastropoda	“Balcis”	claibornia	0	0	0	0	0
Gastropoda	“Balcis”	notata	0	0	0	0	0
Gastropoda	“Bayania”	secale	0	0	0	0	0
Gastropoda	“Bittium”	elegans	0	0	0	0	0
Gastropoda	“Buccitriton”	sagenum	5	6	15	2	3
Gastropoda	“Bullata”	larvata	0	0	2	0	0
Gastropoda	“Bullata”	semen	6	23	54	8	18
Gastropoda	“Calyptraea”	aperta	0	0	0	0	0
Gastropoda	“Calyptraphorus”	velatus	1	9	7	0	26
Gastropoda	“Caricella”	bolaris	1	0	1	0	1
Gastropoda	“Caricella”	doliata	0	0	0	0	0
Gastropoda	“Caricella”	pyruloides	2	0	6	1	0
Gastropoda	“Cerithiella”	nassula	0	0	0	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB1_CA	CB2_CA	CB3_CA	CB4_CA	CB5_CA
Gastropoda	“Cirsochilus”	lineatum	6	1	0	0	0
Gastropoda	“Cirsotrema”	linteum	0	0	0	0	0
Gastropoda	“Conomitra”	fusoides	0	0	0	0	0
Gastropoda	“Conus”	sauridens	0	0	0	0	0
Gastropoda	“Coronia”	alternata	0	0	0	0	0
Gastropoda	“Crepidula”	dumosa	0	0	4	0	9
Gastropoda	“Crepidula”	lirata	0	20	46	12	28
Gastropoda	“Cryptospira”	silabra	4	0	0	0	0
Gastropoda	“Cyclostremiscus”	exacuus	2	3	1	1	0
Gastropoda	“Diodora”	tenebrosa	3	0	0	3	0
Gastropoda	“Doliocassis”	nupera	0	6	2	0	0
Gastropoda	“Eopleurotoma”	lisboncola	0	0	0	0	0
Gastropoda	“Eopleurotoma”	nupera	0	0	0	0	0
Gastropoda	“Eopleurotoma”	sayi	0	0	0	0	0
Gastropoda	“Exilifusus”	thalloides	0	0	0	0	0
Gastropoda	“Ficopsis”	penita	0	0	0	0	0
Gastropoda	“Fusimitra”	perexilis	0	0	0	0	0
Gastropoda	“Gegania”	antiquata	0	0	0	0	0
Gastropoda	“Hastula”	venusta	0	0	1	0	0
Gastropoda	“Hipponix”	pygmaeus	0	0	0	0	0
Gastropoda	“Lacinia”	alveata	0	0	1	0	0
Gastropoda	“Laevityphis”	gracilis	0	0	0	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB1_CA	CB2_CA	CB3_CA	CB4_CA	CB5_CA
Gastropoda	“Latirus”	extricatus	0	0	0	0	0
Gastropoda	“Levifusus”	irrasus	0	0	0	0	0
Gastropoda	“Levifusus”	mortonii	0	0	1	0	0
Gastropoda	“Levifusus”	trabeatus	0	0	0	0	0
Gastropoda	“Lirofusus”	thoracicus	0	0	0	0	0
Gastropoda	“Marginella”	constricta	4	11	15	5	13
Gastropoda	“Mazzalina”	inaurata	0	2	2	0	0
Gastropoda	“Mesalia”	vetusta	174	181	136	35	376
Gastropoda	“Michela”	trabeatoides	0	0	0	0	0
Gastropoda	“Mitrella”	elevata	0	0	0	0	0
Gastropoda	“Natica”	semilunata	0	12	15	4	0
Gastropoda	“Neverita”	limula	0	2	7	5	9
Gastropoda	“Niso”	umbilicata	0	0	0	0	0
Gastropoda	“Norrisia”	micromphala	0	0	0	0	0
Gastropoda	“Norrisia”	nautiloides	0	0	0	0	0
Gastropoda	“Odostomia”	melanella	0	0	0	0	0
Gastropoda	“Penion”	bellus	13	13	5	1	3
Gastropoda	“Penion”	crebrissimus	0	0	0	0	0
Gastropoda	“Polinices”	eminulus	0	2	4	3	4
Gastropoda	“Pseudoliva”	vetusta	0	2	1	0	1
Gastropoda	“Pyramidella”	perexilis	0	0	0	0	0
Gastropoda	“Ranellina”	maclurii	0	0	5	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB1_CA	CB2_CA	CB3_CA	CB4_CA	CB5_CA
Gastropoda	“Retusa”	galba	117	75	58	30	68
Gastropoda	“Seila”	constricta	0	0	0	0	0
Gastropoda	“Serpulorbis”	major	0	0	0	0	1
Gastropoda	“Serpulorbis”	squamulosus	0	0	0	0	2
Gastropoda	“Sinum”	bilix	0	0	0	0	0
Gastropoda	“Sinum”	declive	7	0	10	0	0
Gastropoda	“Solariella”	cancellata	0	0	0	0	1
Gastropoda	“Solariella”	stalagmium	6	1	0	1	4
Gastropoda	“Solariella”	tricostata	0	0	2	0	0
Gastropoda	“Solariorbis”	depressus	0	0	0	0	0
Gastropoda	“Solariorbis”	rotulus	0	0	0	0	0
Gastropoda	“Sveltella”	parva	0	0	0	0	0
Gastropoda	“Teinostoma”	texanum	0	0	0	0	0
Gastropoda	“Tenagodus”	vitis	0	0	0	0	3
Gastropoda	“Terebra”	mirula	0	0	0	0	0
Gastropoda	“Terebrifusus”	amoenus	0	0	0	0	0
Gastropoda	“Tornatellaea”	lata	0	0	0	0	0
Gastropoda	“Trigonostoma”	gemmatum	8	1	0	0	0
Gastropoda	“Turritella”	apita	1	6	1	0	0
Gastropoda	“Turritella”	carinata	237	133	266	27	197
Gastropoda	“Turritella”	dutexata	0	5	1	13	0
Gastropoda	“Turritella”	ghigna	0	0	0	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB1_CA	CB2_CA	CB3_CA	CB4_CA	CB5_CA
Gastropoda	“Turritella”	nasuta	0	0	0	0	0
Gastropoda	“Turritella”	obruta	3	4	0	4	0
Gastropoda	“Uromitra”	gracilis	4	3	16	1	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB6_CA	CB7_CA	CB1_S	CB2_S	CB3_S
Bivalvia	“Astarte”	proruta	0	0	0	0	0
Bivalvia	“Barbatia”	rhomboidella	0	0	11	9	5
Bivalvia	“Bathytormus”	protextus	2	1	91	127	942
Bivalvia	“Caestocorbula”	murchisonii	20	3	172	39	503
Bivalvia	“Callista”	aequorea	1	0	255	223	5164
Bivalvia	“Callista”	aldrichi	0	0	0	0	0
Bivalvia	“Callista”	mortoni	0	0	22	146	547
Bivalvia	“Callista”	perovata	1	2	45	177	265
Bivalvia	“Calorhadia”	opulenta	0	0	3	0	0
Bivalvia	“Calorhadia”	semen	0	0	3	5	0
Bivalvia	“Caryocorbula”	alabamiensis	3	4	1773	3937	638
Bivalvia	“Caryocorbula”	densata	3	1	0	0	0
Bivalvia	“Caryocorbula”	deusseni	0	0	0	0	0
Bivalvia	“Chlamys”	deshayesii	0	0	0	6	1
Bivalvia	“Corbis”	undata	0	0	12	1	0
Bivalvia	“Crenella”	isocardioides	0	0	11	0	23
Bivalvia	“Crenella”	margaritacea	0	0	78	358	511
Bivalvia	“Diplodonta”	ungulina	6	6	253	196	1285
Bivalvia	“Egerella”	limatula	0	0	0	0	0
Bivalvia	“Egerella”	subtrigonia	0	0	405	1510	39
Bivalvia	“Eomiltha”	pandata	0	0	5	28	4
Bivalvia	“Epilucina”	rotunda	0	0	0	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB6_CA	CB7_CA	CB1_S	CB2_S	CB3_S
Bivalvia	“Gari”	eborea	0	0	1	2	6
Bivalvia	“Glycymeris”	idonea	0	0	0	0	0
Bivalvia	“Glycymeris”	staminea	3	1	76	159	609
Bivalvia	“Glycymeris”	trigonella	79	25	697	306	2824
Bivalvia	“Gratelupia”	hydana	0	0	6	0	0
Bivalvia	“Hindsiella”	faba	0	0	0	0	0
Bivalvia	“Katherinella”	trigoniata	0	0	0	0	28
Bivalvia	“Linga”	carinifera	0	0	98	206	82
Bivalvia	“Linga”	pomilia	6	10	258	617	580
Bivalvia	“Lirodiscus”	tellinoides	0	1	17	30	155
Bivalvia	“Lucina”	dolabra	0	0	11	41	0
Bivalvia	“Mactropsis”	aequorea	0	0	1	99	1
Bivalvia	“Nucula”	magnifica	0	0	96	302	93
Bivalvia	“Nucula”	ovula	0	3	0	0	0
Bivalvia	“Nuculana”	coelata	0	0	26	29	18
Bivalvia	“Pachecoa”	pectuncularis	0	0	6	6	0
Bivalvia	“Pachecoa”	perplana	0	0	493	508	39
Bivalvia	“Pachecoa”	pulchra	0	0	0	0	1
Bivalvia	“Parmicorbula”	gibbosa	3	4	0	0	32
Bivalvia	“Pitar”	nuttali	0	0	0	0	1
Bivalvia	“Plicatula”	filamentosa	0	0	89	24	10
Bivalvia	“Pteria”	limula	0	0	5	4	15

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB6_CA	CB7_CA	CB1_S	CB2_S	CB3_S
Bivalvia	“Spisula”	parilis	0	0	46	98	261
Bivalvia	“Sportella”	gregorioi	0	0	0	2	2
Bivalvia	“Tellina”	leana	0	0	52	116	4
Bivalvia	“Tellina”	papyria	0	0	0	0	0
Bivalvia	“Tellina”	raveneli	0	0	0	0	1
Bivalvia	“Trinacria”	cuneus	0	0	9	8	0
Bivalvia	“Venericardia”	aldrichi	0	0	4	13	0
Bivalvia	“Venericardia”	alticostata	0	10	123	500	53
Bivalvia	“Venericardia”	claiboplata	0	0	0	0	0
Bivalvia	“Venericardia”	complexicosta	0	0	1	3	0
Bivalvia	“Venericardia”	parva	19	9	532	113	7296
Bivalvia	“Venericardia”	rotunda	17	5	141	208	553
Bivalvia	“Verticordia”	eocensis	0	0	3	1	0
Gastropoda	“Actaeonema”	sulcatum	0	0	2	0	16
Gastropoda	“Agaronia”	alabamensis	10	2	3	25	0
Gastropoda	“Agaronia”	bombylis	5	0	111	181	121
Gastropoda	“Ancilla”	staminea	1	0	16	71	50
Gastropoda	“Architectonica”	alveata	0	0	0	0	1
Gastropoda	“Architectonica”	amoena	0	0	4	0	0
Gastropoda	“Architectonica”	elaborata	0	0	0	4	4
Gastropoda	“Architectonica”	fungina	0	0	0	0	0
Gastropoda	“Architectonica”	ornata	0	0	7	10	1

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB6_CA	CB7_CA	CB1_S	CB2_S	CB3_S
Gastropoda	“Athleta”	petrosus	0	2	0	0	0
Gastropoda	“Athleta”	sayanus	0	0	5	9	22
Gastropoda	“Balcis”	clabornia	0	0	0	0	0
Gastropoda	“Balcis”	notata	0	0	40	13	9
Gastropoda	“Bayania”	secale	0	0	1	1	0
Gastropoda	“Bittium”	elegans	0	0	2	0	0
Gastropoda	“Buccitriton”	sagenum	2	1	0	0	0
Gastropoda	“Bullata”	larvata	0	0	2	4	16
Gastropoda	“Bullata”	semen	7	0	56	62	236
Gastropoda	“Calyptraea”	aperta	0	0	19	21	35
Gastropoda	“Calyptraphorus”	velatus	31	7	51	244	389
Gastropoda	“Caricella”	bolaris	0	0	0	0	0
Gastropoda	“Caricella”	doliata	0	0	0	5	0
Gastropoda	“Caricella”	pyruloides	0	0	1	33	70
Gastropoda	“Cerithiella”	nassula	0	0	0	0	0
Gastropoda	“Cirsochilus”	lineatum	0	0	1	0	0
Gastropoda	“Cirsotrema”	linteum	0	0	0	1	38
Gastropoda	“Conomitra”	fusoides	0	0	49	78	95
Gastropoda	“Conus”	sauridens	0	0	0	0	2
Gastropoda	“Coronia”	alternata	0	0	3	0	0
Gastropoda	“Crepidula”	dumosa	4	6	0	0	0
Gastropoda	“Crepidula”	lirata	39	0	150	224	215

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB6_CA	CB7_CA	CB1_S	CB2_S	CB3_S
Gastropoda	“Cryptospira”	silabra	1	0	7	26	38
Gastropoda	“Cyclostremiscus”	exacuus	0	0	17	12	4
Gastropoda	“Diodora”	tenebrosa	0	0	5	8	0
Gastropoda	“Doliocassis”	nupera	0	0	22	55	10
Gastropoda	“Eopleurotoma”	lisboncola	0	0	23	10	52
Gastropoda	“Eopleurotoma”	nupera	0	0	17	38	109
Gastropoda	“Eopleurotoma”	sayi	0	1	47	24	44
Gastropoda	“Exilifusus”	thalloides	0	0	2	4	5
Gastropoda	“Ficopsis”	penita	0	0	9	44	10
Gastropoda	“Fusimitra”	perexilis	0	0	0	2	0
Gastropoda	“Gegania”	antiquata	0	0	2	2	0
Gastropoda	“Hastula”	venusta	0	0	0	0	0
Gastropoda	“Hipponix”	pygmaeus	0	0	178	90	72
Gastropoda	“Lacinia”	alveata	1	0	0	2	0
Gastropoda	“Laevityphis”	gracilis	0	0	0	1	13
Gastropoda	“Latirus”	extricatus	0	0	0	0	0
Gastropoda	“Levifusus”	irrasus	0	0	0	1	0
Gastropoda	“Levifusus”	mortonii	0	0	0	1	0
Gastropoda	“Levifusus”	trabeatus	0	0	0	1	0
Gastropoda	“Lirofusus”	thoracicus	0	0	11	41	14
Gastropoda	“Marginella”	constricta	7	0	0	0	0
Gastropoda	“Mazzalina”	inaurata	0	0	4	0	5

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB6_CA	CB7_CA	CB1_S	CB2_S	CB3_S
Gastropoda	"Mesalia"	vetusta	252	56	727	827	4218
Gastropoda	"Michela"	trabeatoides	0	0	1	0	0
Gastropoda	"Mitrella"	elevata	0	0	1	0	31
Gastropoda	"Natica"	semilunata	0	0	64	79	13
Gastropoda	"Neverita"	limula	3	0	12	34	10
Gastropoda	"Niso"	umbilicata	0	0	2	0	0
Gastropoda	"Norrisia"	micromphala	0	0	0	0	0
Gastropoda	"Norrisia"	nautiloides	0	0	0	1	0
Gastropoda	"Odostomia"	melanella	0	0	3	17	0
Gastropoda	"Penion"	bellus	5	0	28	114	55
Gastropoda	"Penion"	crebrissimus	0	0	0	2	46
Gastropoda	"Polinices"	eminulus	1	0	2	0	2
Gastropoda	"Pseudoliva"	vetusta	2	0	1	1	1
Gastropoda	"Pyramidella"	perexilis	0	0	0	0	12
Gastropoda	"Ranellina"	maclurii	0	0	0	0	0
Gastropoda	"Retusa"	galba	27	10	286	709	618
Gastropoda	"Seila"	constricta	0	0	3	0	0
Gastropoda	"Serpulorbis"	major	5	0	0	0	6
Gastropoda	"Serpulorbis"	squamulosus	0	5	0	0	0
Gastropoda	"Sinum"	bilix	0	0	4	14	5
Gastropoda	"Sinum"	declive	0	0	0	0	0
Gastropoda	"Solariella"	cancellata	0	0	1	3	8

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB6_CA	CB7_CA	CB1_S	CB2_S	CB3_S
Gastropoda	"Solariella"	stalagmium	0	0	0	3	12
Gastropoda	"Solariella"	tricostata	0	0	6	57	0
Gastropoda	"Solariorbis"	depressus	0	0	0	1	1
Gastropoda	"Solariorbis"	rotulus	0	0	0	1	0
Gastropoda	"Sveltella"	parva	0	0	0	1	20
Gastropoda	"Teinostoma"	texanum	0	0	0	1	0
Gastropoda	"Tenagodus"	vitis	4	4	32	75	8
Gastropoda	"Terebra"	mirula	0	0	7	3	12
Gastropoda	"Terebrifusus"	amoenus	0	0	0	8	0
Gastropoda	"Tornatellaea"	lata	0	0	7	4	7
Gastropoda	"Trigonostoma"	gemmatum	0	0	0	0	0
Gastropoda	"Turritella"	apita	0	0	24	28	0
Gastropoda	"Turritella"	carinata	169	47	46	809	38
Gastropoda	"Turritella"	dutexata	0	0	0	0	0
Gastropoda	"Turritella"	ghigna	0	0	344	1538	9646
Gastropoda	"Turritella"	nasuta	0	0	0	0	0
Gastropoda	"Turritella"	obruta	0	0	57	124	29
Gastropoda	"Uromitra"	gracilis	0	0	0	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB6_H	CB7_H	CB8_H	CB9_H	CB10_H	CB11_H
Bivalvia	"Astarte"	proruta	0	0	0	0	0	0
Bivalvia	"Barbatia"	rhomboidella	2	0	0	0	0	0
Bivalvia	"Bathytormus"	protextus	19	0	21	15	3	2
Bivalvia	"Caestocorbula"	murchisonii	0	28	0	0	0	0
Bivalvia	"Callista"	aequorea	0	53	0	0	0	0
Bivalvia	"Callista"	aldrichi	3	0	2	3	5	5
Bivalvia	"Callista"	mortoni	0	0	0	0	0	0
Bivalvia	"Callista"	perovata	187	0	112	125	42	99
Bivalvia	"Calorhadia"	opulenta	22	0	2	9	5	0
Bivalvia	"Calorhadia"	semen	0	0	0	0	0	0
Bivalvia	"Caryocorbula"	alabamiensis	192	18	43	85	57	38
Bivalvia	"Caryocorbula"	densata	0	0	0	0	0	0
Bivalvia	"Caryocorbula"	deusseni	0	0	0	0	0	23
Bivalvia	"Chlamys"	deshayesii	0	0	19	0	0	0
Bivalvia	"Corbis"	undata	0	0	0	0	0	0
Bivalvia	"Crenella"	isocardioides	0	0	0	0	0	0
Bivalvia	"Crenella"	margaritacea	0	0	0	0	0	0
Bivalvia	"Diplodonta"	ungulina	0	41	0	0	0	0
Bivalvia	"Egerella"	limatula	13	0	7	3	10	0
Bivalvia	"Egerella"	subtrigonia	0	0	0	0	0	0
Bivalvia	"Eomiltha"	pandata	0	0	0	0	0	0
Bivalvia	"Epilucina"	rotunda	0	0	0	0	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB6_H	CB7_H	CB8_H	CB9_H	CB10_H	CB11_H
Bivalvia	“Gari”	eborea	0	0	0	0	0	0
Bivalvia	“Glycymeris”	idonea	1	0	6	1	0	0
Bivalvia	“Glycymeris”	staminea	1	9	0	0	0	0
Bivalvia	“Glycymeris”	trigonella	92	216	106	157	68	288
Bivalvia	“Gratelupia”	hydana	351	0	312	261	177	168
Bivalvia	“Hindsiella”	faba	28	0	0	18	13	0
Bivalvia	“Katherinella”	trigoniata	0	0	0	0	0	0
Bivalvia	“Linga”	carinifera	0	0	0	0	0	0
Bivalvia	“Linga”	pomilia	71	33	121	86	58	66
Bivalvia	“Lirodiscus”	tellinoides	9	0	4	3	1	2
Bivalvia	“Lucina”	dolabra	5	0	4	2	1	0
Bivalvia	“Mactropsis”	aequorea	0	0	0	0	0	0
Bivalvia	“Nucula”	magnifica	1	0	28	34	38	30
Bivalvia	“Nucula”	ovula	6	0	23	54	8	18
Bivalvia	“Nuculana”	coelata	10	0	0	0	0	0
Bivalvia	“Pachecoa”	pectuncularis	0	0	0	0	0	0
Bivalvia	“Pachecoa”	perplana	0	0	0	0	0	0
Bivalvia	“Pachecoa”	pulchra	0	0	0	0	0	0
Bivalvia	“Parmicorbula”	gibbosa	3	0	4	0	4	0
Bivalvia	“Pitar”	nuttali	21	0	18	51	9	0
Bivalvia	“Plicatula”	filamentosa	13	0	5	1	14	0
Bivalvia	“Pteria”	limula	0	0	3	1	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB6_H	CB7_H	CB8_H	CB9_H	CB10_H	CB11_H
Bivalvia	“Spisula”	parilis	6	0	25	15	2	0
Bivalvia	“Sportella”	gregorioi	0	0	0	0	0	0
Bivalvia	“Tellina”	leana	0	0	0	0	0	0
Bivalvia	“Tellina”	papyria	188	0	31	43	54	0
Bivalvia	“Tellina”	raveneli	0	0	0	0	0	0
Bivalvia	“Trinacria”	cuneus	0	0	0	0	0	0
Bivalvia	“Venericardia”	aldrichi	0	0	0	0	0	0
Bivalvia	“Venericardia”	alticostata	21	0	18	30	34	1
Bivalvia	“Venericardia”	claiboplata	13	0	19	4	16	1
Bivalvia	“Venericardia”	complexicosta	0	0	0	0	0	0
Bivalvia	“Venericardia”	parva	129	397	102	124	76	184
Bivalvia	“Venericardia”	rotunda	116	0	62	111	32	34
Bivalvia	“Verticordia”	eocensis	0	0	0	0	0	0
Gastropoda	“Actaeonema”	sulcatum	0	0	0	0	0	0
Gastropoda	“Agaronia”	alabamensis	8	0	13	32	6	9
Gastropoda	“Agaronia”	bombylis	15	0	2	19	0	3
Gastropoda	“Ancilla”	staminea	3	2	4	10	1	6
Gastropoda	“Architectonica”	alveata	0	0	1	0	0	0
Gastropoda	“Architectonica”	amoena	0	0	0	0	0	0
Gastropoda	“Architectonica”	elaborata	0	0	1	2	1	0
Gastropoda	“Architectonica”	fungina	0	0	2	1	0	0
Gastropoda	“Architectonica”	ornata	0	0	0	0	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB6_H	CB7_H	CB8_H	CB9_H	CB10_H	CB11_H
Gastropoda	"Athleta"	petrosus	1	0	4	1	1	3
Gastropoda	"Athleta"	sayanus	0	0	0	0	0	0
Gastropoda	"Balcis"	claibornia	0	0	0	0	0	0
Gastropoda	"Balcis"	notata	0	0	0	0	0	0
Gastropoda	"Bayania"	secale	0	0	0	0	0	0
Gastropoda	"Bittium"	elegans	0	0	0	0	0	0
Gastropoda	"Buccitriton"	sagenum	5	0	6	15	2	3
Gastropoda	"Bullata"	larvata	0	0	0	2	0	0
Gastropoda	"Bullata"	semen	0	0	0	0	0	0
Gastropoda	"Calyptraea"	aperta	0	0	0	0	0	0
Gastropoda	"Calyptraphorus"	velatus	1	0	9	7	0	26
Gastropoda	"Caricella"	bolaris	1	0	0	1	0	1
Gastropoda	"Caricella"	doliata	0	0	0	0	0	0
Gastropoda	"Caricella"	pyruloides	2	0	0	6	1	0
Gastropoda	"Cerithiella"	nassula	6	0	1	0	0	0
Gastropoda	"Cirsochilus"	lineatum	0	0	0	0	0	0
Gastropoda	"Cirsotrema"	linteum	0	0	0	0	0	0
Gastropoda	"Conomitra"	fusoides	0	0	0	0	0	0
Gastropoda	"Conus"	sauridens	0	0	0	0	0	0
Gastropoda	"Coronia"	alternata	0	0	0	0	0	0
Gastropoda	"Crepidula"	dumosa	0	0	0	4	0	9
Gastropoda	"Crepidula"	lirata	30	0	48	31	26	24

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB6_H	CB7_H	CB8_H	CB9_H	CB10_H	CB11_H
Gastropoda	“Cryptospira”	silabra	4	0	0	0	0	0
Gastropoda	“Cyclostremiscus”	exacuus	2	0	3	1	1	0
Gastropoda	“Diodora”	tenebrosa	3	0	0	0	3	0
Gastropoda	“Doliocassis”	nupera	0	0	6	2	0	0
Gastropoda	“Eopleurotoma”	lisboncola	0	0	0	0	0	0
Gastropoda	“Eopleurotoma”	nupera	0	0	0	0	0	0
Gastropoda	“Eopleurotoma”	sayi	0	0	0	0	0	0
Gastropoda	“Exilifusus”	thalloides	0	0	0	0	0	0
Gastropoda	“Ficopsis”	penita	0	0	0	0	0	0
Gastropoda	“Fusimitra”	perexilis	0	0	0	0	0	0
Gastropoda	“Gegania”	antiquata	0	0	0	0	0	0
Gastropoda	“Hastula”	venusta	0	0	0	1	0	0
Gastropoda	“Hipponix”	pygmaeus	0	0	0	1	0	0
Gastropoda	“Lacinia”	alveata	1	0	0	1	0	0
Gastropoda	“Laevityphis”	gracilis	0	0	0	0	0	0
Gastropoda	“Latirus”	extricatus	0	0	0	0	0	0
Gastropoda	“Levifusus”	irrasus	0	0	0	0	0	0
Gastropoda	“Levifusus”	mortonii	0	0	0	1	0	0
Gastropoda	“Levifusus”	trabeatus	0	0	0	0	0	0
Gastropoda	“Lirofusus”	thoracicus	0	0	0	0	0	0
Gastropoda	“Marginella”	constricta	4	0	11	15	5	13
Gastropoda	“Mazzalina”	inaurata	0	0	2	2	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB6_H	CB7_H	CB8_H	CB9_H	CB10_H	CB11_H
Gastropoda	"Mesalia"	vetusta	174	11	181	136	35	376
Gastropoda	"Michela"	trabeatoides	0	0	0	0	0	0
Gastropoda	"Mitrella"	elevata	0	0	0	0	0	0
Gastropoda	"Natica"	semilunata	0	0	12	15	4	0
Gastropoda	"Neverita"	limula	0	0	2	7	5	9
Gastropoda	"Niso"	umbilicata	0	0	0	0	0	0
Gastropoda	"Norrisia"	micromphala	0	0	0	0	0	0
Gastropoda	"Norrisia"	nautiloides	0	0	0	0	0	0
Gastropoda	"Odostomia"	melanella	0	0	0	0	0	0
Gastropoda	"Penion"	bellus	13	0	13	5	1	3
Gastropoda	"Penion"	crebrissimus	0	0	0	0	0	0
Gastropoda	"Polinices"	eminulus	0	0	2	4	3	4
Gastropoda	"Pseudoliva"	vetusta	0	0	2	1	0	1
Gastropoda	"Pyramidella"	perexilis	0	0	0	0	0	0
Gastropoda	"Ranellina"	maclurii	0	0	0	5	0	0
Gastropoda	"Retusa"	galba	117	13	75	58	30	68
Gastropoda	"Seila"	constricta	0	0	0	0	0	0
Gastropoda	"Serpulorbis"	major	0	0	0	0	0	1
Gastropoda	"Serpulorbis"	squamulosus	0	0	0	0	0	2
Gastropoda	"Sinum"	bilix	0	0	0	0	0	0
Gastropoda	"Sinum"	declive	7	0	0	10	0	0
Gastropoda	"Solariella"	cancellata	0	0	0	0	0	1

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB6_H	CB7_H	CB8_H	CB9_H	CB10_H	CB11_H
Gastropoda	"Solariella"	stalagmium	6	0	1	0	1	4
Gastropoda	"Solariella"	tricostata	0	0	0	2	0	0
Gastropoda	"Solariorbis"	depressus	0	0	0	0	0	0
Gastropoda	"Solariorbis"	rotulus	0	0	0	0	0	0
Gastropoda	"Sveltella"	parva	0	0	0	0	0	0
Gastropoda	"Teinostoma"	texanum	0	0	0	0	0	0
Gastropoda	"Tenagodus"	vitis	0	0	0	0	0	3
Gastropoda	"Terebra"	mirula	0	0	0	0	0	0
Gastropoda	"Terebrifusus"	amoenus	0	0	0	0	0	0
Gastropoda	"Tornatellaea"	lata	0	0	0	0	0	0
Gastropoda	"Trigonostoma"	gemmatum	8	0	1	0	0	0
Gastropoda	"Turritella"	apita	0	0	0	0	0	0
Gastropoda	"Turritella"	carinata	237	94	133	266	27	197
Gastropoda	"Turritella"	dutexata	0	0	5	1	13	0
Gastropoda	"Turritella"	ghigna	0	0	0	0	0	0
Gastropoda	"Turritella"	nasuta	0	0	0	0	0	0
Gastropoda	"Turritella"	obruta	64	0	14	24	30	2
Gastropoda	"Uromitra"	gracilis	4	0	3	16	1	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB12_H	CB13_H	CB14_H	CB15_H	CB16_H	CB17_H	CB18_H
Bivalvia	“Astarte”	proruta	0	7	0	0	3	0	0
Bivalvia	“Barbatia”	rhomboidella	0	2	0	0	0	0	0
Bivalvia	“Bathytormus”	protextus	4	8	0	0	8	2	0
Bivalvia	“Caestocorbula”	murchisonii	0	19	101	32	0	0	32
Bivalvia	“Callista”	aequorea	0	63	264	86	63	0	39
Bivalvia	“Callista”	aldrichi	2	0	0	0	0	0	0
Bivalvia	“Callista”	mortoni	0	0	0	0	0	0	0
Bivalvia	“Callista”	perovata	40	0	0	0	0	9	0
Bivalvia	“Calorhadia”	opulenta	0	0	0	0	0	0	0
Bivalvia	“Calorhadia”	semen	0	0	0	0	0	0	0
Bivalvia	“Caryocorbula”	alabamiensis	5	28	0	28	0	7	38
Bivalvia	“Caryocorbula”	densata	0	0	0	0	0	0	0
Bivalvia	“Caryocorbula”	deusseni	6	0	0	0	0	2	0
Bivalvia	“Chlamys”	deshayesii	0	0	6	0	0	0	0
Bivalvia	“Corbis”	undata	0	0	0	0	0	0	0
Bivalvia	“Crenella”	isocardioides	0	0	0	0	0	0	0
Bivalvia	“Crenella”	margaritacea	0	0	0	0	0	0	0
Bivalvia	“Diplodonta”	ungulina	0	19	93	38	16	0	28
Bivalvia	“Egerella”	limatula	0	1	26	103	3	0	0
Bivalvia	“Egerella”	subtrigonia	0	0	0	0	0	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB12_H	CB13_H	CB14_H	CB15_H	CB16_H	CB17_H	CB18_H
Bivalvia	“Eomiltha”	pandata	0	0	0	0	0	0	0
Bivalvia	“Epilucina”	rotunda	0	0	0	0	0	0	0
Bivalvia	“Gari”	eborea	0	0	0	0	0	0	0
Bivalvia	“Glycymeris”	idonea	0	0	0	0	0	0	103
Bivalvia	“Glycymeris”	staminea	0	15	14	4	0	0	167
Bivalvia	“Glycymeris”	trigonella	63	110	71	0	201	21	0
Bivalvia	“Gratelupia”	hydana	101	20	0	57	0	29	0
Bivalvia	“Hindsiella”	faba	0	0	0	0	0	0	0
Bivalvia	“Katherinella”	trigoniata	0	0	0	0	0	0	0
Bivalvia	“Linga”	carinifera	0	0	0	0	0	0	0
Bivalvia	“Linga”	pomilia	44	95	47	36	11	16	56
Bivalvia	“Lirodiscus”	tellinoides	0	5	32	0	0	1	0
Bivalvia	“Lucina”	dolabra	0	0	0	0	0	0	0
Bivalvia	“Mactropsis”	aequorea	0	0	0	0	0	0	0
Bivalvia	“Nucula”	magnifica	6	0	0	0	0	8	0
Bivalvia	“Nucula”	ovula	7	2	0	0	0	0	0
Bivalvia	“Nuculana”	coelata	0	46	53	3	5	0	0
Bivalvia	“Pachecoa”	pectuncularis	0	0	0	0	0	0	0
Bivalvia	“Pachecoa”	perplana	0	0	0	0	0	0	0
Bivalvia	“Pachecoa”	pulchra	0	0	0	0	0	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB12_H	CB13_H	CB14_H	CB15_H	CB16_H	CB17_H	CB18_H
Bivalvia	"Parmicorbula"	gibbosa	0	0	0	138	0	0	0
Bivalvia	"Pitar"	nuttali	0	0	0	0	0	0	0
Bivalvia	"Plicatula"	filamentosa	0	0	0	0	0	0	14
Bivalvia	"Pteria"	limula	0	0	0	0	0	0	0
Bivalvia	"Spisula"	parilis	0	144	66	2	0	0	36
Bivalvia	"Sportella"	gregorioi	0	0	0	0	0	0	0
Bivalvia	"Tellina"	leana	0	0	0	0	0	0	0
Bivalvia	"Tellina"	papyria	0	0	0	0	0	0	0
Bivalvia	"Tellina"	raveneli	0	0	0	0	0	0	0
Bivalvia	"Trinacria"	cuneus	0	0	0	0	0	0	0
Bivalvia	"Venericardia"	aldrichi	0	0	0	0	0	0	0
Bivalvia	"Venericardia"	alticostata	0	74	8	7	23	19	14
Bivalvia	"Venericardia"	claiboplata	0	0	0	7	2	0	0
Bivalvia	"Venericardia"	complexicosta	0	0	0	0	0	0	0
Bivalvia	"Venericardia"	parva	37	32	91	7	42	17	74
Bivalvia	"Venericardia"	rotunda	33	10	17	122	38	9	26
Bivalvia	"Verticordia"	eocensis	0	0	0	0	0	0	0
Gastropoda	"Actaeonema"	sulcatum	0	0	0	0	0	0	0
Gastropoda	"Agaronia"	alabamensis	10	4	1	8	2	2	0
Gastropoda	"Agaronia"	bombylis	5	0	10	0	5	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB12_H	CB13_H	CB14_H	CB15_H	CB16_H	CB17_H	CB18_H
Gastropoda	“Ancilla”	staminea	1	2	3	8	1	0	0
Gastropoda	“Architectonica”	alveata	0	0	0	0	0	0	0
Gastropoda	“Architectonica”	amoena	0	0	0	0	0	0	0
Gastropoda	“Architectonica”	elaborata	0	0	0	0	0	0	0
Gastropoda	“Architectonica”	fungina	0	0	16	0	0	0	0
Gastropoda	“Architectonica”	ornata	0	1	0	0	1	0	0
Gastropoda	“Athleta”	petrosus	0	0	0	0	0	2	0
Gastropoda	“Athleta”	sayanus	0	0	0	6	5	0	0
Gastropoda	“Balcis”	claibornia	0	0	0	0	0	0	12
Gastropoda	“Balcis”	notata	0	0	0	0	0	0	0
Gastropoda	“Bayania”	secale	0	0	0	0	0	0	0
Gastropoda	“Bittium”	elegans	0	0	0	0	0	0	0
Gastropoda	“Buccitriton”	sagenum	2	0	0	0	0	1	0
Gastropoda	“Bullata”	larvata	0	4	3	0	0	0	0
Gastropoda	“Bullata”	semen	0	0	0	0	0	0	0
Gastropoda	“Calyptraea”	aperta	0	0	0	0	0	0	0
Gastropoda	“Calyptraphorus”	velatus	31	7	0	16	3	7	0
Gastropoda	“Caricella”	bolaris	0	0	0	0	0	0	0
Gastropoda	“Caricella”	doliata	0	0	0	0	0	0	0
Gastropoda	“Caricella”	pyruloides	0	0	0	0	0	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB12_H	CB13_H	CB14_H	CB15_H	CB16_H	CB17_H	CB18_H
Gastropoda	“Cerithiella”	nassula	0	0	0	0	0	0	0
Gastropoda	“Cirsochilus”	lineatum	0	0	0	0	0	0	0
Gastropoda	“Cirsotrema”	linteum	0	0	0	0	0	0	0
Gastropoda	“Conomitra”	fusoides	0	0	0	0	0	0	0
Gastropoda	“Conus”	sauridens	0	0	0	0	0	0	0
Gastropoda	“Coronia”	alternata	0	0	0	0	0	0	0
Gastropoda	“Crepidula”	dumosa	4	5	0	0	5	6	0
Gastropoda	“Crepidula”	lirata	11	0	0	0	0	11	0
Gastropoda	“Cryptospira”	silabra	1	2	0	0	0	0	0
Gastropoda	“Cyclostremiscus”	exacuus	0	0	0	0	0	0	0
Gastropoda	“Diodora”	tenebrosa	0	0	0	0	0	0	0
Gastropoda	“Doliocassis”	nupera	0	0	0	0	0	0	0
Gastropoda	“Eopleurotoma”	lisboncola	0	0	0	0	0	0	0
Gastropoda	“Eopleurotoma”	nupera	0	0	0	0	0	0	0
Gastropoda	“Eopleurotoma”	sayi	0	0	0	0	0	1	0
Gastropoda	“Exilifusus”	thalloides	0	0	0	0	0	0	0
Gastropoda	“Ficopsis”	penita	0	0	0	0	0	0	0
Gastropoda	“Fusimitra”	perexilis	0	0	0	0	0	0	0
Gastropoda	“Gegania”	antiquata	0	0	0	0	0	0	0
Gastropoda	“Hastula”	venusta	0	0	0	0	0	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB12_H	CB13_H	CB14_H	CB15_H	CB16_H	CB17_H	CB18_H
Gastropoda	“Hipponix”	pygmaeus	0	0	0	0	0	0	0
Gastropoda	“Lacinia”	alveata	0	0	0	0	0	0	0
Gastropoda	“Laevityphis”	gracilis	0	0	0	0	0	0	0
Gastropoda	“Latirus”	extricatus	0	0	0	0	0	0	0
Gastropoda	“Levifusus”	irrasus	0	0	0	0	0	0	0
Gastropoda	“Levifusus”	mortonii	1	0	0	0	0	0	0
Gastropoda	“Levifusus”	trabeatus	0	0	0	0	0	0	0
Gastropoda	“Lirofusus”	thoracicus	0	0	0	0	0	0	0
Gastropoda	“Marginella”	constricta	7	0	0	0	0	0	0
Gastropoda	“Mazzalina”	inaurata	0	0	0	0	0	0	0
Gastropoda	“Mesalia”	vetusta	252	0	0	13	0	56	0
Gastropoda	“Michela”	trabeatoides	0	0	0	0	0	0	0
Gastropoda	“Mitrella”	elevata	0	0	0	0	0	0	0
Gastropoda	“Natica”	semilunata	0	0	0	0	0	0	0
Gastropoda	“Neverita”	limula	3	18	0	4	7	0	15
Gastropoda	“Niso”	umbilicata	0	0	0	0	0	0	0
Gastropoda	“Norrisia”	micromphala	0	0	0	0	0	0	0
Gastropoda	“Norrisia”	nautiloides	0	0	0	0	0	0	0
Gastropoda	“Odostomia”	melanella	0	0	0	0	0	0	0
Gastropoda	“Penion”	bellus	5	0	0	0	0	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB12_H	CB13_H	CB14_H	CB15_H	CB16_H	CB17_H	CB18_H
Gastropoda	"Penion"	crebrissimus	0	0	0	0	0	0	0
Gastropoda	"Polinices"	eminulus	1	0	0	0	0	0	0
Gastropoda	"Pseudoliva"	vetusta	2	0	0	0	0	0	0
Gastropoda	"Pyramidella"	perexilis	0	0	0	0	0	0	0
Gastropoda	"Ranellina"	maclurii	0	0	0	0	0	0	0
Gastropoda	"Retusa"	galba	27	19	6	43	11	10	25
Gastropoda	"Seila"	constricta	0	0	0	0	0	0	0
Gastropoda	"Serpulorbis"	major	5	0	0	0	0	0	0
Gastropoda	"Serpulorbis"	squamulosus	0	0	0	0	0	5	0
Gastropoda	"Sinum"	bilix	0	0	0	0	0	0	0
Gastropoda	"Sinum"	declive	0	0	0	0	0	0	0
Gastropoda	"Solariella"	cancellata	0	0	0	0	0	0	0
Gastropoda	"Solariella"	stalagmium	0	0	0	0	0	0	0
Gastropoda	"Solariella"	tricostata	0	0	0	0	0	0	0
Gastropoda	"Solariorbis"	depressus	0	0	0	0	0	0	0
Gastropoda	"Solariorbis"	rotulus	0	0	0	0	0	0	0
Gastropoda	"Sveltella"	parva	0	0	0	0	0	0	0
Gastropoda	"Teinostoma"	texanum	0	0	0	0	0	0	0
Gastropoda	"Tenagodus"	vitis	4	0	0	0	0	4	0
Gastropoda	"Terebra"	mirula	0	0	0	0	0	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB12_H	CB13_H	CB14_H	CB15_H	CB16_H	CB17_H	CB18_H
Gastropoda	"Terebrifusus"	amoenus	0	0	0	0	0	0	0
Gastropoda	"Tornatellaea"	lata	0	0	0	0	0	0	0
Gastropoda	"Trigonostoma"	gemmatum	0	0	0	0	0	0	0
Gastropoda	"Turritella"	apita	0	0	0	0	0	0	0
Gastropoda	"Turritella"	carinata	169	67	11	32	0	47	0
Gastropoda	"Turritella"	dutexata	0	0	0	0	0	0	0
Gastropoda	"Turritella"	ghigna	0	0	0	0	0	0	0
Gastropoda	"Turritella"	nasuta	0	0	0	0	0	0	0
Gastropoda	"Turritella"	obruta	0	0	0	0	0	5	0
Gastropoda	"Uromitra"	gracilis	0	0	0	0	0	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB19_H	CB20_H	CB21_H	CB22_H	CB23_H
Bivalvia	“Astarte”	proruta	33	0	0	0	0
Bivalvia	“Barbatia”	rhomboidella	1	0	0	0	0
Bivalvia	“Bathytormus”	protextus	0	0	0	0	0
Bivalvia	“Caestocorbula”	murchisonii	60	35	18	4	0
Bivalvia	“Callista”	aequorea	43	16	13	2	0
Bivalvia	“Callista”	aldrichi	0	0	0	0	0
Bivalvia	“Callista”	mortoni	0	0	0	0	0
Bivalvia	“Callista”	perovata	0	0	0	0	0
Bivalvia	“Calorhadia”	opulenta	0	0	0	0	0
Bivalvia	“Calorhadia”	semen	0	0	0	0	0
Bivalvia	“Caryocorbula”	alabamiensis	43	45	33	20	0
Bivalvia	“Caryocorbula”	densata	0	0	0	0	0
Bivalvia	“Caryocorbula”	deusseni	0	0	0	0	0
Bivalvia	“Chlamys”	deshayesii	2	0	0	0	0
Bivalvia	“Corbis”	undata	0	0	0	0	0
Bivalvia	“Crenella”	isocardioides	0	0	0	0	0
Bivalvia	“Crenella”	margaritacea	0	0	0	0	0
Bivalvia	“Diplodonta”	ungulina	46	24	8	2	5
Bivalvia	“Egerella”	limatula	6	0	1	0	0
Bivalvia	“Egerella”	subtrigonia	0	0	0	0	0
Bivalvia	“Eomiltha”	pandata	1	0	0	0	0
Bivalvia	“Epilucina”	rotunda	0	0	24	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB19_H	CB20_H	CB21_H	CB22_H	CB23_H
Bivalvia	“Gari”	eborea	0	0	0	0	0
Bivalvia	“Glycymeris”	idonea	0	0	0	0	0
Bivalvia	“Glycymeris”	staminea	13	13	4	0	1
Bivalvia	“Glycymeris”	trigonella	321	240	107	56	39
Bivalvia	“Gratelupia”	hydana	0	0	1	0	0
Bivalvia	“Hindsiella”	faba	0	0	0	0	0
Bivalvia	“Katherinella”	trigoniata	0	0	0	0	0
Bivalvia	“Linga”	carinifera	0	0	0	0	0
Bivalvia	“Linga”	pomilia	68	73	39	31	27
Bivalvia	“Lirodiscus”	tellinoides	9	0	1	0	0
Bivalvia	“Lucina”	dolabra	0	0	0	0	0
Bivalvia	“Mactropsis”	aequorea	0	0	0	0	0
Bivalvia	“Nucula”	magnifica	0	0	0	5	0
Bivalvia	“Nucula”	ovula	3	0	1	0	0
Bivalvia	“Nuculana”	coelata	8	15	7	9	2
Bivalvia	“Pachecoa”	pectuncularis	0	0	0	0	0
Bivalvia	“Pachecoa”	perplana	0	0	0	0	0
Bivalvia	“Pachecoa”	pulchra	0	0	0	0	0
Bivalvia	“Parmicorbula”	gibbosa	0	0	1	0	0
Bivalvia	“Pitar”	nuttali	0	0	0	0	0
Bivalvia	“Plicatula”	filamentosa	0	29	2	0	0
Bivalvia	“Pteria”	limula	0	0	0	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB19_H	CB20_H	CB21_H	CB22_H	CB23_H
Bivalvia	“Spisula”	parilis	42	44	26	8	5
Bivalvia	“Sportella”	gregorioi	0	0	0	0	0
Bivalvia	“Tellina”	leana	0	0	0	0	0
Bivalvia	“Tellina”	papyria	0	0	0	0	0
Bivalvia	“Tellina”	raveneli	0	0	0	0	0
Bivalvia	“Trinacria”	cuneus	0	0	0	0	0
Bivalvia	“Venericardia”	aldrichi	0	0	0	0	0
Bivalvia	“Venericardia”	alticostata	13	3	13	1	0
Bivalvia	“Venericardia”	claiboplata	0	0	0	0	0
Bivalvia	“Venericardia”	complexicosta	0	0	0	0	0
Bivalvia	“Venericardia”	parva	11	79	51	25	19
Bivalvia	“Venericardia”	rotunda	32	21	5	9	0
Bivalvia	“Verticordia”	eocensis	0	0	0	0	0
Gastropoda	“Actaeonema”	sulcatum	0	0	0	0	0
Gastropoda	“Agaronia”	alabamensis	0	0	3	0	0
Gastropoda	“Agaronia”	bombylis	17	0	3	1	0
Gastropoda	“Ancilla”	staminea	5	0	1	0	0
Gastropoda	“Architectonica”	alveata	0	0	0	0	0
Gastropoda	“Architectonica”	amoena	0	0	0	0	0
Gastropoda	“Architectonica”	elaborata	0	0	0	0	0
Gastropoda	“Architectonica”	fungina	0	0	0	0	0
Gastropoda	“Architectonica”	ornata	3	0	0	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB19_H	CB20_H	CB21_H	CB22_H	CB23_H
Gastropoda	“Athleta”	petrosus	0	0	0	0	0
Gastropoda	“Athleta”	sayanus	4	0	0	0	0
Gastropoda	“Balcis”	claibornia	0	0	0	0	0
Gastropoda	“Balcis”	notata	0	0	0	0	0
Gastropoda	“Bayania”	secale	0	0	0	0	0
Gastropoda	“Bittium”	elegans	0	0	0	0	0
Gastropoda	“Buccitriton”	sagenum	2	0	0	0	0
Gastropoda	“Bullata”	larvata	11	0	0	0	2
Gastropoda	“Bullata”	semen	0	0	60	37	22
Gastropoda	“Calyptraea”	aperta	0	0	0	0	0
Gastropoda	“Calyptraphorus”	velatus	0	0	0	0	0
Gastropoda	“Caricella”	bolaris	7	0	0	0	0
Gastropoda	“Caricella”	doliata	0	0	0	0	0
Gastropoda	“Caricella”	pyruloides	0	0	0	0	0
Gastropoda	“Cerithiella”	nassula	0	0	0	0	0
Gastropoda	“Cirsochilus”	lineatum	0	0	0	0	0
Gastropoda	“Cirsotrema”	linteum	0	0	0	0	0
Gastropoda	“Conomitra”	fusoides	0	0	1	1	1
Gastropoda	“Conus”	sauridens	0	0	0	0	0
Gastropoda	“Coronia”	alternata	0	0	0	0	0
Gastropoda	“Crepidula”	dumosa	6	0	0	0	0
Gastropoda	“Crepidula”	lirata	0	0	0	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB19_H	CB20_H	CB21_H	CB22_H	CB23_H
Gastropoda	“Cryptospira”	silabra	0	0	0	0	0
Gastropoda	“Cyclostremiscus”	exacuus	0	0	0	0	0
Gastropoda	“Diodora”	tenebrosa	0	0	0	0	0
Gastropoda	“Doliocassis”	nupera	0	0	0	0	0
Gastropoda	“Eopleurotoma”	lisboncola	0	0	0	0	0
Gastropoda	“Eopleurotoma”	nupera	0	0	0	0	0
Gastropoda	“Eopleurotoma”	sayi	0	0	1	0	0
Gastropoda	“Exilifusus”	thalloides	0	0	0	0	0
Gastropoda	“Ficopsis”	penita	0	0	0	0	0
Gastropoda	“Fusimitra”	perexilis	0	0	0	0	0
Gastropoda	“Gegania”	antiquata	0	0	0	0	0
Gastropoda	“Hastula”	venusta	0	0	0	0	0
Gastropoda	“Hipponix”	pygmaeus	0	0	0	0	0
Gastropoda	“Lacinia”	alveata	0	0	0	0	0
Gastropoda	“Laevityphis”	gracilis	0	0	0	0	0
Gastropoda	“Latirus”	extricatus	0	0	0	1	0
Gastropoda	“Levifusus”	irrasus	0	0	0	0	0
Gastropoda	“Levifusus”	mortonii	0	0	1	0	0
Gastropoda	“Levifusus”	trabeatus	0	2	0	0	0
Gastropoda	“Lirofusus”	thoracicus	0	0	0	0	0
Gastropoda	“Marginella”	constricta	0	0	0	0	0
Gastropoda	“Mazzalina”	inaurata	0	0	0	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB19_H	CB20_H	CB21_H	CB22_H	CB23_H
Gastropoda	“Mesalia”	vetusta	12	0	24	12	0
Gastropoda	“Michela”	trabeatoides	0	0	0	0	0
Gastropoda	“Mitrella”	elevata	0	0	0	0	0
Gastropoda	“Natica”	semilunata	0	0	0	0	0
Gastropoda	“Neverita”	limula	17	0	8	4	2
Gastropoda	“Niso”	umbilicata	0	0	0	0	0
Gastropoda	“Norrisia”	micromphala	1	0	0	0	0
Gastropoda	“Norrisia”	nautiloides	0	0	0	0	0
Gastropoda	“Odostomia”	melanella	0	0	0	0	0
Gastropoda	“Penion”	bellus	0	0	0	0	0
Gastropoda	“Penion”	crebrissimus	0	0	0	0	0
Gastropoda	“Polinices”	eminulus	0	0	0	0	0
Gastropoda	“Pseudoliva”	vetusta	0	0	0	0	0
Gastropoda	“Pyramidella”	perexilis	0	0	0	0	0
Gastropoda	“Ranellina”	maclurii	0	0	0	0	0
Gastropoda	“Retusa”	galba	43	15	7	1	0
Gastropoda	“Seila”	constricta	0	0	0	0	0
Gastropoda	“Serpulorbis”	major	0	0	0	0	0
Gastropoda	“Serpulorbis”	squamulosus	0	0	1	0	0
Gastropoda	“Sinum”	bilix	0	0	0	0	0
Gastropoda	“Sinum”	declive	0	0	0	0	0
Gastropoda	“Solariella”	cancellata	0	0	0	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CB19_H	CB20_H	CB21_H	CB22_H	CB23_H
Gastropoda	“Solariella”	stalagmium	0	0	0	0	0
Gastropoda	“Solariella”	tricostata	0	0	0	0	0
Gastropoda	“Solariorbis”	depressus	0	0	0	0	0
Gastropoda	“Solariorbis”	rotulus	0	0	0	0	0
Gastropoda	“Sveltella”	parva	0	0	0	0	0
Gastropoda	“Teinostoma”	texanum	0	0	0	0	0
Gastropoda	“Tenagodus”	vitis	0	0	2	0	2
Gastropoda	“Terebra”	mirula	0	0	0	0	0
Gastropoda	“Terebrifusus”	amoenus	0	0	0	0	0
Gastropoda	“Tornatellaea”	lata	0	0	0	0	0
Gastropoda	“Trigonostoma”	gemmatum	0	0	0	0	0
Gastropoda	“Turritella”	apita	0	0	0	0	0
Gastropoda	“Turritella”	carinata	186	57	3	0	0
Gastropoda	“Turritella”	dutexata	0	0	0	0	0
Gastropoda	“Turritella”	ghigna	0	0	0	0	0
Gastropoda	“Turritella”	nasuta	0	0	2	0	0
Gastropoda	“Turritella”	obruta	0	0	2	0	0
Gastropoda	“Uromitra”	gracilis	0	0	0	0	0

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CBtot_CA	CBtot_S	CBtot_H	CBtot
Bivalvia	"Astarte"	proruta	0	0	43	43
Bivalvia	"Barbatia"	rhomboidella	1	25	5	31
Bivalvia	"Bathytormus"	protextus	35	1160	82	1277
Bivalvia	"Caestocorbula"	murchisonii	218	714	329	1261
Bivalvia	"Callista"	aequorea	12	5642	642	6296
Bivalvia	"Callista"	aldrichi	0	0	20	20
Bivalvia	"Callista"	mortoni	20	715	0	735
Bivalvia	"Callista"	perovata	93	487	614	1194
Bivalvia	"Calorhadia"	opulenta	0	3	38	41
Bivalvia	"Calorhadia"	semen	0	8	0	8
Bivalvia	"Caryocorbula"	alabamiensis	216	6348	680	7244
Bivalvia	"Caryocorbula"	densata	16	0	0	16
Bivalvia	"Caryocorbula"	deusseni	10	0	31	41
Bivalvia	"Chlamys"	deshayesii	1	7	27	35
Bivalvia	"Corbis"	undata	0	13	0	13
Bivalvia	"Crenella"	isocardioides	0	34	0	34
Bivalvia	"Crenella"	margaritacea	0	947	0	947
Bivalvia	"Diplodonta"	ungulina	92	1734	320	2146
Bivalvia	"Egerella"	limatula	0	0	173	173
Bivalvia	"Egerella"	subtrigonia	0	1954	0	1954
Bivalvia	"Eomiltha"	pandata	0	37	1	38
Bivalvia	"Epilucina"	rotunda	0	0	24	24

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CBtot_CA	CBtot_S	CBtot_H	CBtot
Bivalvia	"Gari"	eborea	0	9	0	9
Bivalvia	"Glycymeris"	idonea	1	0	111	112
Bivalvia	"Glycymeris"	staminea	52	844	241	1137
Bivalvia	"Glycymeris"	trigonella	1048	3827	2156	7031
Bivalvia	"Gratelupia"	hydana	0	6	1477	1483
Bivalvia	"Hindsiella"	faba	0	0	59	59
Bivalvia	"Katherinella"	trigoniata	0	28	0	28
Bivalvia	"Linga"	carinifera	0	386	0	386
Bivalvia	"Linga"	pomilia	254	1455	978	2687
Bivalvia	"Lirodiscus"	tellinoides	12	202	67	281
Bivalvia	"Lucina"	dolabra	7	52	12	71
Bivalvia	"Mactropsis"	aequorea	0	101	0	101
Bivalvia	"Nucula"	magnifica	5	491	150	646
Bivalvia	"Nucula"	ovula	70	0	122	192
Bivalvia	"Nuculana"	coelata	18	73	158	249
Bivalvia	"Pachecoa"	pectuncularis	0	12	0	12
Bivalvia	"Pachecoa"	perplana	0	1040	0	1040
Bivalvia	"Pachecoa"	pulchra	0	1	0	1
Bivalvia	"Parmicorbula"	gibbosa	73	32	150	255
Bivalvia	"Pitar"	nuttali	51	1	99	151
Bivalvia	"Plicatula"	filamentosa	18	123	78	219
Bivalvia	"Pteria"	limula	0	24	4	28

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CBtot_CA	CBtot_S	CBtot_H	CBtot
Bivalvia	“Spisula”	parilis	25	405	421	851
Bivalvia	“Sportella”	gregorioi	0	4	0	4
Bivalvia	“Tellina”	leana	0	172	0	172
Bivalvia	“Tellina”	papyria	159	0	316	475
Bivalvia	“Tellina”	raveneli	0	1	0	1
Bivalvia	“Trinacria”	cuneus	0	17	0	17
Bivalvia	“Venericardia”	aldrichi	0	17	0	17
Bivalvia	“Venericardia”	alticostata	63	676	279	1018
Bivalvia	“Venericardia”	claiboplata	28	0	62	90
Bivalvia	“Venericardia”	complexicosta	0	4	0	4
Bivalvia	“Venericardia”	parva	336	7941	1497	9774
Bivalvia	“Venericardia”	rotunda	200	902	677	1779
Bivalvia	“Verticordia”	eocensis	0	4	0	4
Gastropoda	“Actaeonema”	sulcatum	0	18	0	18
Gastropoda	“Agaronia”	alabamensis	80	28	98	206
Gastropoda	“Agaronia”	bombylis	44	413	80	537
Gastropoda	“Ancilla”	staminea	25	137	47	209
Gastropoda	“Architectonica”	alveata	1	1	1	3
Gastropoda	“Architectonica”	amoena	0	4	0	4
Gastropoda	“Architectonica”	elaborata	4	8	4	16
Gastropoda	“Architectonica”	fungina	3	0	19	22
Gastropoda	“Architectonica”	ornata	0	18	5	23

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CBtot_CA	CBtot_S	CBtot_H	CBtot
Gastropoda	“Athleta”	petrosus	12	0	12	24
Gastropoda	“Athleta”	sayanus	0	36	15	51
Gastropoda	“Balcis”	claibornia	0	0	12	12
Gastropoda	“Balcis”	notata	0	62	0	62
Gastropoda	“Bayania”	secale	0	2	0	2
Gastropoda	“Bittium”	elegans	0	2	0	2
Gastropoda	“Buccitriton”	sagenum	34	0	36	70
Gastropoda	“Bullata”	larvata	2	22	22	46
Gastropoda	“Bullata”	semen	116	354	119	589
Gastropoda	“Calyptraea”	aperta	0	75	0	75
Gastropoda	“Calyptraphorus”	velatus	81	684	107	872
Gastropoda	“Caricella”	bolaris	3	0	10	13
Gastropoda	“Caricella”	doliata	0	5	0	5
Gastropoda	“Caricella”	pyruloides	9	104	9	122
Gastropoda	“Cerithiella”	nassula	0	0	7	7
Gastropoda	“Cirsochilus”	lineatum	7	1	0	8
Gastropoda	“Cirsotrema”	linteum	0	39	0	39
Gastropoda	“Conomitra”	fusoides	0	222	3	225
Gastropoda	“Conus”	sauridens	0	2	0	2
Gastropoda	“Coronia”	alternata	0	3	0	3
Gastropoda	“Crepidula”	dumosa	23	0	39	62
Gastropoda	“Crepidula”	lirata	145	589	181	915

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CBtot_CA	CBtot_S	CBtot_H	CBtot
Gastropoda	“Cryptospira”	silabra	5	71	7	83
Gastropoda	“Cyclostremiscus”	exacuus	7	33	7	47
Gastropoda	“Diodora”	tenebrosa	6	13	6	25
Gastropoda	“Doliocassis”	nupera	8	87	8	103
Gastropoda	“Eopleurotoma”	lisboncola	0	85	0	85
Gastropoda	“Eopleurotoma”	nupera	0	164	0	164
Gastropoda	“Eopleurotoma”	sayi	1	115	2	118
Gastropoda	“Exilifusus”	thalloides	0	11	0	11
Gastropoda	“Ficopsis”	penita	0	63	0	63
Gastropoda	“Fusimitra”	perexilis	0	2	0	2
Gastropoda	“Gegania”	antiquata	0	4	0	4
Gastropoda	“Hastula”	venusta	1	0	1	2
Gastropoda	“Hipponix”	pygmaeus	0	340	1	341
Gastropoda	“Lacinia”	alveata	2	2	2	6
Gastropoda	“Laevityphis”	gracilis	0	14	0	14
Gastropoda	“Latirus”	extricatus	0	0	1	1
Gastropoda	“Levifusus”	irrasus	0	1	0	1
Gastropoda	“Levifusus”	mortonii	1	1	3	5
Gastropoda	“Levifusus”	trabeatus	0	1	2	3
Gastropoda	“Lirofusus”	thoracicus	0	66	0	66
Gastropoda	“Marginella”	constricta	55	0	55	110
Gastropoda	“Mazzalina”	inaurata	4	9	4	17

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CBtot_CA	CBtot_S	CBtot_H	CBtot
Gastropoda	“Mesalia”	vetusta	1210	5772	1282	8264
Gastropoda	“Michela”	trabeatoides	0	1	0	1
Gastropoda	“Mitrella”	elevata	0	32	0	32
Gastropoda	“Natica”	semilunata	31	156	31	218
Gastropoda	“Neverita”	limula	26	56	101	183
Gastropoda	“Niso”	umbilicata	0	2	0	2
Gastropoda	“Norrisia”	micromphala	0	0	1	1
Gastropoda	“Norrisia”	nautiloides	0	1	0	1
Gastropoda	“Odostomia”	melanella	0	20	0	20
Gastropoda	“Penion”	bellus	40	197	40	277
Gastropoda	“Penion”	crebrissimus	0	48	0	48
Gastropoda	“Polinices”	eminulus	14	4	14	32
Gastropoda	“Pseudoliva”	vetusta	6	3	6	15
Gastropoda	“Pyramidella”	perexilis	0	12	0	12
Gastropoda	“Ranellina”	maclurii	5	0	5	10
Gastropoda	“Retusa”	galba	385	1613	568	2566
Gastropoda	“Seila”	constricta	0	3	0	3
Gastropoda	“Serpulorbis”	major	6	6	6	18
Gastropoda	“Serpulorbis”	squamulosus	7	0	8	15
Gastropoda	“Sinum”	bilix	0	23	0	23
Gastropoda	“Sinum”	declive	17	0	17	34
Gastropoda	“Solariella”	cancellata	1	12	1	14

Table B.1. Quantitative abundance data for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	CBtot_CA	CBtot_S	CBtot_H	CBtot
Gastropoda	“Solariella”	stalagmium	12	15	12	39
Gastropoda	“Solariella”	tricostata	2	63	2	67
Gastropoda	“Solariorbis”	depressus	0	2	0	2
Gastropoda	“Solariorbis”	rotulus	0	1	0	1
Gastropoda	“Sveltella”	parva	0	21	0	21
Gastropoda	“Teinostoma”	texanum	0	1	0	1
Gastropoda	“Tenagodus”	vitis	11	115	15	141
Gastropoda	“Terebra”	mirula	0	22	0	22
Gastropoda	“Terebrifusus”	amoenus	0	8	0	8
Gastropoda	“Tornatellaea”	lata	0	18	0	18
Gastropoda	“Trigonostoma”	gemmatum	9	0	9	18
Gastropoda	“Turritella”	apita	8	52	0	60
Gastropoda	“Turritella”	carinata	1076	893	1526	3495
Gastropoda	“Turritella”	dutexata	19	0	19	38
Gastropoda	“Turritella”	ghigna	0	11528	0	11528
Gastropoda	“Turritella”	nasuta	0	0	2	2
Gastropoda	“Turritella”	obruta	11	210	141	362
Gastropoda	“Uromitra”	gracilis	24	0	24	48

Table B.2. Faunal list for the Gosport Formation, Claiborne Bluff (CB), Monroe County, Alabama. Data compiled from Palmer and Brann (1965; 1966), CoBabe and Allmon (1994), Swindel (1986), and Harrison (1994). "Bulk-only" refers to taxa recovered in bulk samples that were not previously known to occur in the Gosport Formation at Claiborne Bluff. Names in the first column (“Class”) are taken from Palmer and Brann (1965; 1966) and the Paleobiology Database. Names in the second column (“Genus…”) are taken from Palmer and Brann (1965; 1966) and were not evaluated for congruence with more recent systematic treatments of the genus nor used in any of the analyses presented herein. All genus names are accordingly presented in quotes; Appendix D provides a partially updated working taxonomy for bivalve species in the Carditoidea, Pectinoidea, and Veneroidea. Names in the third column (“Species”) are taken from Palmer and Brann (1965; 1966), with additions and modifications from Heaslip (1968).

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	Note
Bivalvia	“Abra”	nitens	
Bivalvia	“Agnocardia”	claibornensis	
Bivalvia	“Alveinus”	minutus	
Bivalvia	“Astarte”	callosa	
Bivalvia	“Astarte”	proruta	
Bivalvia	“Barbatia”	rhomboidella	
Bivalvia	“Bathytormus”	protextus	
Bivalvia	“Bornia”	plectopygia	
Bivalvia	“Bornia”	scintillata	
Bivalvia	“Caestocorbula”	fossata	
Bivalvia	“Caestocorbula”	murchisonii	
Bivalvia	“Callista”	aequorea	
Bivalvia	“Callista”	aldrichi	
Bivalvia	“Callista”	mortoni	
Bivalvia	“Callista”	perovata	
Bivalvia	“Calorhadia”	bella	
Bivalvia	“Calorhadia”	equalis	
Bivalvia	“Calorhadia”	opulenta	
Bivalvia	“Calorhadia”	pistorupes	bulk-only
Bivalvia	“Calorhadia”	semen	
Bivalvia	“Caryocorbula”	alabamiensis	
Bivalvia	“Caryocorbula”	densata	
Bivalvia	“Caryocorbula”	deusseni	bulk-only
Bivalvia	“Chlamys”	deshayesii	
Bivalvia	“Corbis”	lirata	
Bivalvia	“Corbis”	undata	
Bivalvia	“Corbula”	compressa	
Bivalvia	“Crassatella”	alta	

Table B.2. Faunal list for the Gosport Formation, Claiborne Bluff, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	Note
Bivalvia	“Crassinella”	minor	
Bivalvia	“Crassostrea”	alabamiensis	
Bivalvia	“Crenella”	isocardioides	
Bivalvia	“Crenella”	latifrons	
Bivalvia	“Crenella”	margaritacea	
Bivalvia	“Cubitostrea”	sellaeformis	
Bivalvia	“Cucullaria”	aldrichi	
Bivalvia	“Cultellus”	conradi	
Bivalvia	“Cuna”	monroensis	
Bivalvia	“Cuna”	parva	
Bivalvia	“Diplodonta”	corbiscula	
Bivalvia	“Diplodonta”	inflata	
Bivalvia	“Diplodonta”	ungulina	
Bivalvia	“Egerella”	limatula	
Bivalvia	“Egerella”	subtrigonia	
Bivalvia	“Eomiltha”	pandata	
Bivalvia	“Eophysema”	subvexa	
Bivalvia	“Epilucina”	rotunda	
Bivalvia	“Ervilia”	lignitica	
Bivalvia	“Ervilia”	meyeri	
Bivalvia	“Erycina”	plicatula	
Bivalvia	“Erycina”	whitfieldi	
Bivalvia	“Gari”	blainvillii	
Bivalvia	“Gari”	eborea	
Bivalvia	“Garum”	claibornense	
Bivalvia	“Garum”	filosum	
Bivalvia	“Gastrochaena”	larva	
Bivalvia	“Glycymeris”	idonea	
Bivalvia	“Glycymeris”	staminea	
Bivalvia	“Glycymeris”	trigonella	
Bivalvia	“Gratelupia”	hydana	
Bivalvia	“Hindsiella”	faba	
Bivalvia	“Katherinella”	trigoniata	
Bivalvia	“Limopsis”	aviculoides	
Bivalvia	“Linga”	carinifera	
Bivalvia	“Linga”	pomilia	

Table B.2. Faunal list for the Gosport Formation, Claiborne Bluff, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	Note
Bivalvia	“Lirodiscus”	tellinoides	
Bivalvia	“Lithophaga”	claibornensis	
Bivalvia	“Lithophaga”	petricoloides	
Bivalvia	“Lucina”	bisculpta	
Bivalvia	“Lucina”	dolabra	
Bivalvia	“Lucina”	papyracea	
Bivalvia	“Macoma”	danai	
Bivalvia	“Macoma”	scandula	
Bivalvia	“Macoma”	sillimani	
Bivalvia	“Mactropsis”	aequorea	
Bivalvia	“Mactropsis”	rectilinearis	
Bivalvia	“Micromeris”	minutissima	
Bivalvia	“Microstagon”	nana	
Bivalvia	“Montacuta”	claiborniana	
Bivalvia	“Mysella”	dalli	
Bivalvia	“Nanohalus”	cossmanni	
Bivalvia	“Nucula”	magnifica	
Bivalvia	“Nucula”	ovula	
Bivalvia	“Nuculana”	coelata	
Bivalvia	“Nuculana”	magna	
Bivalvia	“Nuculana”	plana	
Bivalvia	“Oryctomya”	claibornensis	
Bivalvia	“Pachecoa”	decisa	
Bivalvia	“Pachecoa”	ellipsis	
Bivalvia	“Pachecoa”	ledoides	
Bivalvia	“Pachecoa”	pectuncularis	
Bivalvia	“Pachecoa”	perplana	
Bivalvia	“Pachecoa”	pulchra	bulk-only
Bivalvia	“Parmicorbula”	gibbosa	
Bivalvia	“Periploma”	claibornense	
Bivalvia	“Periploma”	complicatum	
Bivalvia	“Petricola”	claibornensis	
Bivalvia	“Pitar”	cornelli	
Bivalvia	“Pitar”	exiguus	
Bivalvia	“Pitar”	nuttali	
Bivalvia	“Pitar”	poulsoni	

Table B.2. Faunal list for the Gosport Formation, Claiborne Bluff, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	Note
Bivalvia	“Plicatula”	filamentosa	
Bivalvia	“Pteria”	limula	
Bivalvia	“Pteropsella”	papyria	
Bivalvia	“Rhabdopitaria”	discoidalis	
Bivalvia	“Rhabdopitaria”	subcrassa	
Bivalvia	“Scintilla”	alabamiensis	
Bivalvia	“Semele”	linosa	
Bivalvia	“Semele”	profunda	
Bivalvia	“Spisula”	decisa	
Bivalvia	“Spisula”	parilis	
Bivalvia	“Spisula”	praetenuis	
Bivalvia	“Sportella”	gregorioi	
Bivalvia	“Striarca”	harrisi	
Bivalvia	“Tellina”	alta	
Bivalvia	“Tellina”	cossmanni	
Bivalvia	“Tellina”	cynoglossula	bulk-only
Bivalvia	“Tellina”	entaenia	
Bivalvia	“Tellina”	leana	
Bivalvia	“Tellina”	papyria	bulk-only
Bivalvia	“Tellina”	plana	
Bivalvia	“Tellina”	prolenta	
Bivalvia	“Tellina”	raveneli	bulk-only
Bivalvia	“Teredo”	simplex	
Bivalvia	“Teredo”	simplexopsis	
Bivalvia	“Textivenus”	retisculpta	
Bivalvia	“Trapezium”	claibornense	
Bivalvia	“Trinacria”	cuneus	
Bivalvia	“Venericardia”	aldrichi	
Bivalvia	“Venericardia”	alticostata	
Bivalvia	“Venericardia”	claiboplata	
Bivalvia	“Venericardia”	complexicosta	bulk-only
Bivalvia	“Venericardia”	diversidentata	
Bivalvia	“Venericardia”	inflatior	
Bivalvia	“Venericardia”	parva	
Bivalvia	“Venericardia”	rotunda	
Bivalvia	“Venericardia”	sillimani	

Table B.2. Faunal list for the Gosport Formation, Claiborne Bluff, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	Note
Bivalvia	“Venericardia”	tortidens	
Bivalvia	“Verticordia”	eocensis	
Gastropoda	“Abderospira”	aldrichi	bulk-only
Gastropoda	“Abderospira”	meyeri	
Gastropoda	“Acirsa”	gracilior	
Gastropoda	“Aclis”	modesta	
Gastropoda	“Acrocoelum”	cancellatum	
Gastropoda	“Actaeonema”	sulcatum	
Gastropoda	“Acteocina”	commixta	
Gastropoda	“Acteon”	claibornicola	
Gastropoda	“Acteon”	costellatus	
Gastropoda	“Acteon”	idoneus	
Gastropoda	“Acteon”	pomilius	
Gastropoda	“Adeorbis”	incertus	
Gastropoda	“Adeorbis”	punctiformis	
Gastropoda	“Agaronia”	alabamensis	
Gastropoda	“Agaronia”	bombylis	
Gastropoda	“Alaba”	plicatovaricosa	
Gastropoda	“Alaba”	varicifer	
Gastropoda	“Ancilla”	staminea	
Gastropoda	“Architectonica”	alveata	
Gastropoda	“Architectonica”	amoena	
Gastropoda	“Architectonica”	antrosa	
Gastropoda	“Architectonica”	cossmanni	
Gastropoda	“Architectonica”	elaborata	
Gastropoda	“Architectonica”	fungina	
Gastropoda	“Architectonica”	johnsoni	
Gastropoda	“Architectonica”	ornata	
Gastropoda	“Architectonica”	scrobiculata	
Gastropoda	“Astyris”	crassus	
Gastropoda	“Athleta”	petrosus	
Gastropoda	“Athleta”	sayanus	
Gastropoda	“Atys”	claibornensis	
Gastropoda	“Balcis”	aciculata	
Gastropoda	“Balcis”	claibornia	
Gastropoda	“Balcis”	notata	

Table B.2. Faunal list for the Gosport Formation, Claiborne Bluff, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	Note
Gastropoda	“Bathytoma”	congesta	
Gastropoda	“Bayania”	claibornensis	
Gastropoda	“Bayania”	secale	
Gastropoda	“Bittium”	elegans	
Gastropoda	“Bonellitia”	elevata	
Gastropoda	“Buccinanops”	priamopse	
Gastropoda	“Buccitriton”	mangonizatum	
Gastropoda	“Buccitriton”	sagenum	
Gastropoda	“Bullata”	larvata	
Gastropoda	“Bullata”	plicata	
Gastropoda	“Bullata”	semen	
Gastropoda	“Bullia”	altilis	
Gastropoda	“Bullia”	scamba	
Gastropoda	“Bullia”	tenera	
Gastropoda	“Calliostoma”	claibornianum	
Gastropoda	“Calyptraea”	aperta	bulk-only
Gastropoda	“Calyptraphorus”	velatus	
Gastropoda	“Caricella”	bolaris	
Gastropoda	“Caricella”	claibornensis	
Gastropoda	“Caricella”	doliata	
Gastropoda	“Caricella”	praetenuis	
Gastropoda	“Caricella”	pyruloides	
Gastropoda	“Cerithiella”	nassula	
Gastropoda	“Cerithiella”	preconica	
Gastropoda	“Cerithioderma”	primum	
Gastropoda	“Cerithiopsis”	solitaria	
Gastropoda	“Cerithium”	agnotum	
Gastropoda	“Cerithium”	claibornense	
Gastropoda	“Cirsochilus”	claibornense	
Gastropoda	“Cirsochilus”	lineatum	
Gastropoda	“Cirsotrema”	claibornense	
Gastropoda	“Cirsotrema”	linteum	
Gastropoda	“Cirsotrema”	linteum	bulk-only
Gastropoda	“Cirsotrema”	nassulum	
Gastropoda	“Clavilithes”	pachyleurus	
Gastropoda	“Clavilithes”	protextus	

Table B.2. Faunal list for the Gosport Formation, Claiborne Bluff, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	Note
Gastropoda	“Clavilithes”	raphanoides	
Gastropoda	“Cochlespirella”	nana	
Gastropoda	“Conomitra”	fusoides	
Gastropoda	“Conorbis”	conoides	
Gastropoda	“Conus”	granopsis	
Gastropoda	“Conus”	improvidus	
Gastropoda	“Conus”	sauridens	
Gastropoda	“Cornulina”	armigera	
Gastropoda	“Coronia”	alternata	
Gastropoda	“Coronia”	casteri	
Gastropoda	“Coronia”	childreni	
Gastropoda	“Coronia”	lerchi	
Gastropoda	“Crepidula”	dumosa	
Gastropoda	“Crepidula”	lirata	
Gastropoda	“Crommium”	perovatum	
Gastropoda	“Cryptospira”	silabra	
Gastropoda	“Cyclostremiscus”	exacuus	
Gastropoda	“Cylichna”	acrotoma	
Gastropoda	“Cypraedia”	gilberti	
Gastropoda	“Cypraeorbis”	alabamensis	
Gastropoda	“Daphnella”	gregorioi	
Gastropoda	“Delphinula”	concionaria	
Gastropoda	“Dentiterebra”	prima	
Gastropoda	“Diodora”	tenebrosa	
Gastropoda	“Dirocerithium”	whitfieldi	
Gastropoda	“Doliocassis”	nupera	
Gastropoda	“Dorsanum”	bellaliratum	
Gastropoda	“Drillia”	pulchreconcha	
Gastropoda	“Drillia”	solitariuscula	
Gastropoda	“Ectinochilus”	laqueatum	
Gastropoda	“Emarginula”	arata	
Gastropoda	“Eoclathurella”	meridionalis	
Gastropoda	“Eodrillia”	depygis	
Gastropoda	“Eodrillia”	lonsdalii	
Gastropoda	“Eopleurotoma”	cainei	
Gastropoda	“Eopleurotoma”	cochlea	

Table B.2. Faunal list for the Gosport Formation, Claiborne Bluff, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	Note
Gastropoda	“Eopleurotoma”	desnoyersii	
Gastropoda	“Eopleurotoma”	hoeninghausii	
Gastropoda	“Eopleurotoma”	lisboncola	bulk-only
Gastropoda	“Eopleurotoma”	nupera	
Gastropoda	“Eopleurotoma”	rugatina	
Gastropoda	“Eopleurotoma”	rugosa	
Gastropoda	“Eopleurotoma”	sayi	
Gastropoda	“Eosurcula”	beaumontii	
Gastropoda	“Eosurcula”	leseurii	
Gastropoda	“Eosurcula”	pulcherrima	
Gastropoda	“Eosurcula”	tardereperta	
Gastropoda	“Eulima”	extremis	
Gastropoda	“Euspira”	leana	
Gastropoda	“Exilifusus”	thalloides	
Gastropoda	“Falsifusus”	subfilosus	
Gastropoda	“Ficopsis”	penita	
Gastropoda	“Fusimitra”	perexilis	
Gastropoda	“Fusus”	decisus	
Gastropoda	“Fusus”	explicatus	
Gastropoda	“Fusus”	symmetricus	
Gastropoda	“Gegania”	antiquata	
Gastropoda	“Hastula”	venusta	
Gastropoda	“Hipponix”	pygmaeus	
Gastropoda	“Hipponix”	vagus	
Gastropoda	“Lacinia”	alveata	
Gastropoda	“Lacinia”	claibornensis	
Gastropoda	“Laevibuccinum”	prorsum	
Gastropoda	“Laevityphis”	gracilis	
Gastropoda	“Lapparia”	pactilis	
Gastropoda	“Latirus”	extricatus	
Gastropoda	“Latirus”	plicatus	
Gastropoda	“Leiorhinus”	prorutus	
Gastropoda	“Levifusus”	irrasus	
Gastropoda	“Levifusus”	mortonii	
Gastropoda	“Levifusus”	trabeatus	
Gastropoda	“Lirofusus”	thoracicus	

Table B.2. Faunal list for the Gosport Formation, Claiborne Bluff, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	Note
Gastropoda	“Lyrosurcula”	dalli	
Gastropoda	“Lyrosurcula”	funiculigera	
Gastropoda	“Lyrosurcula”	sexvaricosa	
Gastropoda	“Lyrosurcula”	shaleri	
Gastropoda	“Marginella”	constricta	
Gastropoda	“Mathilda”	claibornensis	
Gastropoda	“Mazzalina”	inaurata	
Gastropoda	“Mesalia”	persa	
Gastropoda	“Mesalia”	vetusta	
Gastropoda	“Michela”	trabeatoides	bulk-only
Gastropoda	“Mitrella”	bucciniformis	
Gastropoda	“Mitrella”	elevata	
Gastropoda	“Mitrella”	parva	
Gastropoda	“Mitrolumna”	eocenensis	
Gastropoda	“Mnestia”	dekayi	
Gastropoda	“Monoptygma”	curtum	
Gastropoda	“Monoptygma”	lymneoides	
Gastropoda	“Murex”	engonatus	
Gastropoda	“Murex”	gosportensis	
Gastropoda	“Murex”	mantelli	
Gastropoda	“Murex”	migus	
Gastropoda	“Murex”	septemnarius	
Gastropoda	“Murex”	vanuxemi	
Gastropoda	“Murotriton”	grassator	
Gastropoda	“Natica”	magnoumbilicata	
Gastropoda	“Natica”	promovens	
Gastropoda	“Natica”	propeconica	
Gastropoda	“Natica”	semilunata	
Gastropoda	“Neverita”	limula	
Gastropoda	“Niso”	umbilicata	
Gastropoda	“Norrisia”	micromphala	
Gastropoda	“Norrisia”	nautiloides	
Gastropoda	“Norrisia”	nitens	
Gastropoda	“Norrisia”	parva	
Gastropoda	“Nucleopsis”	subvaricata	
Gastropoda	“Odostomia”	claibornensis	

Table B.2. Faunal list for the Gosport Formation, Claiborne Bluff, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	Note
Gastropoda	“Odostomia”	laevis	
Gastropoda	“Odostomia”	melanella	
Gastropoda	“Oliva”	platonica	
Gastropoda	“Ovulactaeon”	aldrichi	
Gastropoda	“Papillina”	altilis	
Gastropoda	“Papillina”	cooperi	
Gastropoda	“Papillina”	papillata	
Gastropoda	“Papillina”	staminea	
Gastropoda	“Pasithea”	striata	
Gastropoda	“Pasitheola”	claibornensis	
Gastropoda	“Pasitheola”	guttula	
Gastropoda	“Pasitheola”	tornatelloides	
Gastropoda	“Penion”	bellus	
Gastropoda	“Penion”	crebrissimus	
Gastropoda	“Penion”	delabechii	
Gastropoda	“Phalium”	taitii	
Gastropoda	“Planaria”	nitens	
Gastropoda	“Pleurofusia”	claibarena	
Gastropoda	“Pleurotoma”	tupis	
Gastropoda	“Polinices”	aratus	bulk-only
Gastropoda	“Polinices”	eminulus	
Gastropoda	“Prunum”	columba	
Gastropoda	“Pseudoliva”	vetusta	
Gastropoda	“Pseudomalaxis”	rotella	
Gastropoda	“Pseudomalaxis”	tipa	
Gastropoda	“Pyramidella”	chavani	
Gastropoda	“Pyramidella”	cossmanni	
Gastropoda	“Pyramidella”	dalli	
Gastropoda	“Pyramidella”	larvata	
Gastropoda	“Pyramidella”	perexilis	
Gastropoda	“Pyramidella”	propeacicula	
Gastropoda	“Pyramidella”	pseudopygmaea	
Gastropoda	“Pyramimitra”	olssoni	
Gastropoda	“Pyramimitra”	terebraeformis	
Gastropoda	“Ranellina”	maclurii	
Gastropoda	“Raphitoma”	pannekoekae	

Table B.2. Faunal list for the Gosport Formation, Claiborne Bluff, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	Note
Gastropoda	“Raphitoma”	venusta	
Gastropoda	“Retusa”	galba	
Gastropoda	“Rhizorus”	subradius	
Gastropoda	“Ringicula”	biplicata	
Gastropoda	“Ringicula”	claibornensis	
Gastropoda	“Rissoina”	cossmanni	
Gastropoda	“Rudiscala”	sessilis	
Gastropoda	“Scalaria”	quinquefasciata	
Gastropoda	“Scalina”	staminea	
Gastropoda	“Scobinella”	elaborata	
Gastropoda	“Scobinella”	sativa	
Gastropoda	“Seila”	constricta	
Gastropoda	“Serpulorbis”	major	
Gastropoda	“Serpulorbis”	squamulosus	
Gastropoda	“Sinum”	arctatum	
Gastropoda	“Sinum”	beatricae	
Gastropoda	“Sinum”	bilix	
Gastropoda	“Sinum”	declive	
Gastropoda	“Siphonalia”	perlata	
Gastropoda	“Skenea”	pignus	
Gastropoda	“Solariella”	cancellata	
Gastropoda	“Solariella”	fungina	
Gastropoda	“Solariella”	stalagmium	
Gastropoda	“Solariella”	tricostata	
Gastropoda	“Solariorbis”	depressus	
Gastropoda	“Solariorbis”	planulatus	
Gastropoda	“Solariorbis”	rotulus	
Gastropoda	“Streptochetus”	conybearii	
Gastropoda	“Streptochetus”	limulus	
Gastropoda	“Surculoma”	calantica	
Gastropoda	“Surculoma”	subequalis	
Gastropoda	“Surculoma”	tabulata	
Gastropoda	“Sveltella”	parva	
Gastropoda	“Sveltella”	turritissima	
Gastropoda	“Sveltia”	alveata	
Gastropoda	“Sveltia”	priama	

Table B.2. Faunal list for the Gosport Formation, Claiborne Bluff, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	Note
Gastropoda	“Teinostoma”	angulare	
Gastropoda	“Teinostoma”	subrotundum	
Gastropoda	“Teinostoma”	texanum	bulk-only
Gastropoda	“Tenagodus”	vitis	
Gastropoda	“Terebra”	mirula	
Gastropoda	“Terebra”	polygyra	
Gastropoda	“Terebra”	ziga	
Gastropoda	“Terebrifusus”	amoenus	
Gastropoda	“Terebrifusus”	multiplicatus	
Gastropoda	“Thiara”	aldrichi	
Gastropoda	“Tiburnus”	eboreus	
Gastropoda	“Tornatellaea”	lata	
Gastropoda	“Trigonostoma”	aurorae	
Gastropoda	“Trigonostoma”	babylonicum	
Gastropoda	“Trigonostoma”	gemmatum	
Gastropoda	“Trigonostoma”	pulcherrimum	
Gastropoda	“Triphora”	distincta	
Gastropoda	“Triphora”	major	
Gastropoda	“Triphora”	similis	
Gastropoda	“Trochus”	gumus	
Gastropoda	“Trypanotoma”	melanella	
Gastropoda	“Trypanotoma”	terebriformis	
Gastropoda	“Turbo”	zecus	
Gastropoda	“Turboella”	ziga	
Gastropoda	“Turbonilla”	bidentata	
Gastropoda	“Turbonilla”	neglecta	
Gastropoda	“Turbonilla”	pellegrina	
Gastropoda	“Turricula”	aldreperta	
Gastropoda	“Turritella”	apita	
Gastropoda	“Turritella”	carinata	
Gastropoda	“Turritella”	dutexata	
Gastropoda	“Turritella”	ghigna	
Gastropoda	“Turritella”	nasuta	
Gastropoda	“Turritella”	obruta	
Gastropoda	“Uromitra”	gracilis	
Gastropoda	“Uromitra”	terplicata	

Table B.2. Faunal list for the Gosport Formation, Claiborne Bluff, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	Note
Gastropoda	“Volvaria”	alabamiensis	

Table B.3. Quantitative abundance data for the Moodys Branch Formation, Fossil Gulch, Hinds County, Mississippi. Data compiled from Elder (1981). Names in the first column ("Class") are taken from Palmer and Brann (1965; 1966) and the Paleobiology Database. Names in the second column ("Genus…") are taken from Palmer and Brann (1965; 1966) and were not evaluated for congruence with more recent systematic treatments of the genus nor used in any of the analyses presented herein. All genus names are accordingly presented in quotes; Appendix D provides a partially updated working taxonomy for bivalve species in the Carditoidea, Pectinoidea, and Veneroidea. Names in the third column ("Species") are taken from Palmer and Brann (1965; 1966), with additions and modifications from Heaslip (1968). Numbers denote individual bulk samples from the locality; MBtot are the summed counts for all bulk samples. Sampling and counting protocols are summarized in the Methods section of Chapter Two.

			Sample (H-79-11-#)					
Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	1	3	6	7	8	Mbtot
Bivalvia	"Abra"	nitens	0	1	4	0	0	5
Bivalvia	"Alectryonia"	vicksburgensis	0	0	0	0	1	1
Bivalvia	"Alveinus"	minutus	548	1132	206	369	8	2263
Bivalvia	"Barbatia"	aspera	0	0	2	12	0	14
Bivalvia	"Bathytormus"	flexurus	1	2	3	25	3	34
Bivalvia	"Caestocorbula"	wailesiana	35	43	26	24	4	132
Bivalvia	"Callista"	annexa	4	16	4	1	1	26
Bivalvia	"Chama"	radiata	0	1	0	0	0	1
Bivalvia	"Chlamys"	nupera	0	0	1	11	23	35
Bivalvia	"Corbula"	densata	12	17	18	47	10	104
Bivalvia	"Crassinella"	pygmaea	2	5	1	2	0	10
Bivalvia	"Eburneopecten"	scintillatus	67	139	17	10	15	248
Bivalvia	"Gastrochaena"	mississippiensis	0	0	1	2	0	3
Bivalvia	"Gonimyrtea"	curta	195	355	68	37	6	661
Bivalvia	"Hilgardia"	multilineata	75	89	33	50	8	255

Table B.3. Quantitative abundance data for the Moodys Branch Formation, Fossil Gulch, Hinds County, Mississippi, continued.

			Sample (H-79-11-#)					
Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	1	3	6	7	8	Mbtot
Bivalvia	"Kelliella"	boettgeri	0	0	136	720	16	872
Bivalvia	"Limopsis"	radiata	0	1	20	32	3	56
Bivalvia	"Lirodiscus"	jacksonensis	0	0	0	2	0	2
Bivalvia	"Nemocardium"	nicoletti	0	0	0	1	0	1
Bivalvia	"Nucula"	spheniopsis	49	74	5	3	26	157
Bivalvia	"Pitar"	securiformis	0	0	1	1	0	2
Bivalvia	"Venericardia"	inflatior	0	0	3	7	0	10
Bivalvia	"Poromya"	mississippiensis	0	1	1	2	0	4
Bivalvia	"Pteria"	limula	0	2	0	0	3	5
Bivalvia	"Pycnodonte"	trigonalis	0	0	0	0	6	6
Bivalvia	"Spisula"	jacksonensis	160	318	26	10	4	518
Bivalvia	"Timothynus"	bulla	2	3	0	2	0	7
Bivalvia	"Venericardia"	diversidentata	11	11	26	78	20	146
Bivalvia	"Verticordia"	cossmanni	0	1	0	0	9	10
Bivalvia	"Yoldia"	mater	18	72	0	0	0	90
Gastropoda	"Acrilla"	unilineata	0	0	1	0	0	1
Gastropoda	"Acteon"	annectens	0	2	0	0	0	2
Gastropoda	"Acteon"	idoneus	3	0	0	0	0	3
Gastropoda	"Agaronia"	media	9	4	0	0	0	13
Gastropoda	"Architectonica"	acuta	2	0	0	0	0	2
Gastropoda	"Architectonica"	bellistriata	2	1	0	0	0	3

Table B.3. Quantitative abundance data for the Moodys Branch Formation, Fossil Gulch, Hinds County, Mississippi, continued.

			Sample (H-79-11-#)				
Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	1	3	6	7	8	Mbtot
Gastropoda	“Bittium”	koeneni	34	31	0	0	0	65
Gastropoda	“Bonellitia”	jacksonica	1	0	0	0	0	1
Gastropoda	“Bullata”	semen	2	2	0	0	0	4
Gastropoda	“Calyptraea”	aperta	4	5	5	0	0	14
Gastropoda	“Calyptraphorus”	stamineus	15	16	0	0	0	31
Gastropoda	“Capulus”	americanus	2	2	1	1	0	6
Gastropoda	“Clio”	simplex	0	1	0	0	0	1
Gastropoda	“Cordieria”	ludoviciana	0	1	0	0	0	1
Gastropoda	“Cymatosyrinx”	dorseyi	0	1	0	0	0	1
Gastropoda	“Eucheilodon”	crenocarinata	1	0	0	0	0	1
Gastropoda	“Hipponix”	pygmaeus	29	48	26	14	21	138
Gastropoda	“Mathilda”	regularis	1	0	0	0	0	1
Gastropoda	“Melanella”	jacksonensis	0	1	0	0	0	1
Gastropoda	“Natica”	permunda	9	10	3	0	0	22
Gastropoda	“Pseudoliva”	vetusta	1	0	0	0	0	1
Gastropoda	“Pseudotoma”	heilprini	0	1	0	0	0	1
Gastropoda	“Pyramidella”	meyeri	2	4	0	0	0	6
Gastropoda	“Retusa”	jacksonensis	5	12	4	1	0	22
Gastropoda	“Sinistrella”	americana	2	0	0	0	0	2
Gastropoda	“Solariorbis”	subangulatus	0	2	0	0	0	2
Gastropoda	“Teinostoma”	moodiense	2	0	0	0	0	2

Table B.3. Quantitative abundance data for the Moodys Branch Formation, Fossil Gulch, Hinds County, Mississippi, continued.

			Sample (H-79-11-#)					
Class	Genus assignment in Palmer and Brann (1965; 1966)	Species	1	3	6	7	8	Mbtot
Gastropoda	“Terebra”	jacksonensis	5	0	0	0	0	5
Gastropoda	“Tritonatractus”	pearlensis	2	6	0	0	0	8
Gastropoda	“Turritella”	alveata	13	8	9	0	0	30
Gastropoda	“Turritella”	arenicola	3	0	0	0	0	3
Gastropoda	“Turritella”	perdita	0	1	61	38	0	100

Table B.4. Faunal list for the Moodys Branch Formation, Fossil Gulch, Hinds County, Mississippi. Data compiled from Palmer and Brann (1965; 1966), Dockery (1977), Dockery and Lozouet (2003), and Elder (1981). Names in the first column ("Class") are taken from Palmer and Brann (1965; 1966) and the Paleobiology Database. Names in the second column ("Genus…") are taken from Palmer and Brann (1965; 1966) and were not evaluated for congruence with more recent systematic treatments of the genus nor used in any of the analyses presented herein. All genus names are accordingly presented in quotes; Appendix D provides a partially updated working taxonomy for bivalve species in the Carditoidea, Pectinoidea, and Veneroidea. Names in the third column ("Species") are taken from Palmer and Brann (1965; 1966), with additions and modifications from Heaslip (1968).

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species
Bivalvia	"Atrina"	jacksoniana
Bivalvia	"Barbatia"	aspera
Bivalvia	"Barbatia"	cuculloides
Bivalvia	"Barbatia"	seraperta
Bivalvia	"Bathytormus"	flexurus
Bivalvia	"Caestocorbula"	wailesiana
Bivalvia	"Callista"	annexa
Bivalvia	"Chama"	radiata
Bivalvia	"Corbula"	densata
Bivalvia	"Eburneopecten"	scintillatus
Bivalvia	"Felaniella"	palmerae
Bivalvia	"Gastrochaena"	mississippiensis
Bivalvia	"Glycymeris"	filosa
Bivalvia	"Glycymeris"	idonea
Bivalvia	"Hilgardia"	multilineata
Bivalvia	"Lirodiscus"	jacksonensis
Bivalvia	"Nemocardium"	nicoletti
Bivalvia	"Nucula"	spheniopsis
Bivalvia	"Panopea"	oblongata
Bivalvia	"Periploma"	equalum
Bivalvia	"Pitar"	securiformis
Bivalvia	"Pteria"	limula
Bivalvia	"Pycnodonte"	trigonalis
Bivalvia	"Spisula"	jacksonensis
Bivalvia	"Spisula"	praetenuis
Bivalvia	"Tellina"	eburneopsis
Bivalvia	"Tellina"	linifera
Bivalvia	"Tellina"	vaughani
Bivalvia	"Tellina"	vicksburgensis
Bivalvia	"Teredo"	mississippiensis

Table B.4. Faunal list for the Moodys Branch Formation, Fossil Gulch, Hinds County, Mississippi, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species
Bivalvia	"Timothynus"	bulla
Bivalvia	"Venericardia"	apodensata
Bivalvia	"Yoldia"	mater
Bivalvia	"Yoldia"	reginajacksonis
Gastropoda	"Acteon"	annectens
Gastropoda	"Agaronia"	media
Gastropoda	"Architectonica"	acuta
Gastropoda	"Architectonica"	alveata
Gastropoda	"Architectonica"	bellistriata
Gastropoda	"Architectonica"	ornata
Gastropoda	"Athleta"	symmetricus
Gastropoda	"Aturia"	alabamiensis
Gastropoda	"Bittium"	koeneni
Gastropoda	"Bonellitia"	jacksonica
Gastropoda	"Bullata"	semen
Gastropoda	"Calyptraea"	alta
Gastropoda	"Calyptraea"	aperta
Gastropoda	"Calyptraphorus"	stamineus
Gastropoda	"Capulus"	americanus
Gastropoda	"Caricella"	polita
Gastropoda	"Caricella"	subangulata
Gastropoda	"Cirsotrema"	nassulum
Gastropoda	"Clavilithes"	humerosus
Gastropoda	"Cochlespira"	columbaria
Gastropoda	"Conomitra"	jacksonensis
Gastropoda	"Conorbis"	alatoideus
Gastropoda	"Conus"	tortilis
Gastropoda	"Cordieria"	ludoviciana
Gastropoda	"Cornulina"	dalli
Gastropoda	"Coronia"	nodulina
Gastropoda	"Cypraeorbis"	ventripotens
Gastropoda	"Dolicholatirus"	leaensis
Gastropoda	"Eucheilodon"	crenocarinata
Gastropoda	"Euspira"	jacksonensis
Gastropoda	"Fusimitra"	millingtoni
Gastropoda	"Galeodea"	petersoni

Table B.4. Faunal list for the Moodys Branch Formation, Fossil Gulch, Hinds County, Mississippi, continued.

Class	Genus assignment in Palmer and Brann (1965; 1966)	Species
Gastropoda	“Globularia”	morgani
Gastropoda	“Hemisurcula”	perexilis
Gastropoda	“Hexaplex”	marksi
Gastropoda	“Hipponix”	pygmaeus
Gastropoda	“Lapparia”	dumosa
Gastropoda	“Latirus”	humilior
Gastropoda	“Lithophysema”	grande
Gastropoda	“Melanella”	jacksonensis
Gastropoda	“Metula”	gentilicia
Gastropoda	“Natica”	permunda
Gastropoda	“Notoluponia”	healeyi
Gastropoda	“Papillina”	dumosa
Gastropoda	“Phalium”	taitii
Gastropoda	“Philine”	dockeryi
Gastropoda	“Platyoptera”	extenta
Gastropoda	“Pleurofusia”	fluctuosa
Gastropoda	“Polinices”	weisbordi
Gastropoda	“Pseudoliva”	vetusta
Gastropoda	“Pseudotoma”	heilprini
Gastropoda	“Puncturella”	jacksonensis
Gastropoda	“Retusa”	jacksonensis
Gastropoda	“Scaphander”	jacksonensis
Gastropoda	“Sinistrella”	americana
Gastropoda	“Sinum”	jacksonense
Gastropoda	“Solariella”	cancellata
Gastropoda	“Solariorbis”	subangulatus
Gastropoda	“Terebra”	jacksonensis
Gastropoda	“Transovula”	producta
Gastropoda	“Tritonatractus”	pearlensis
Gastropoda	“Turritella”	alveata
Gastropoda	“Turritella”	perdita
Gastropoda	“Turritella”	rivurbana
Gastropoda	“Umbraculum”	planulatum
Gastropoda	“Unitas”	pearlensis
Gastropoda	“Xenophora”	reclusa

Table B.5. Quantitative abundance data for the Red Bluff Formation, Mississippi Geological Survey localities MGS-35 and MGS-38, Wayne County, Mississippi. Data compiled from Hansen et al. (2004). Names in the first column ("Class") are taken from Dockery (1982) and MacNeil and Dockery (1984). Names in the second column ("Genus…") are taken from Dockery (1982) and MacNeil and Dockery (1984) and were not evaluated for congruence with more recent systematic treatments of the genus nor used in any of the analyses presented herein. All genus names are accordingly presented in quotes; Appendix D provides a partially updated working taxonomy for bivalve species in the Carditoidea, Pectinoidea, and Veneroidea. Names in the third column ("Species") are taken from Dockery (1982) and MacNeil and Dockery (1984), with additions and modifications from Heaslip (1968). Numbers denote individual bulk samples; RBtot are the summed counts for all bulk samples. Sampling and counting protocols are summarized in the Methods section of Chapter Two.

			Sample #							
Class	Genus assignment in Dockery (1982) and MacNeil and Dockery (1984)	Species	1	2	3	4	5	6	7	RBtot
Bivalvia	"Astarte"	triangulata	145	48	39	19	17	4	42	314
Bivalvia	"Barbatia"	paradiagona	0	0	0	0	1	0	0	1
Bivalvia	"Brevinucula"	pseudopunctata	0	0	0	0	0	2	5	7
Bivalvia	"Chione"	victoria	0	1	1	0	0	0	1	3
Bivalvia	"Chlamys"	cocoana	14	5	2	2	0	0	0	23
Bivalvia	"Corbula"	engonata	10	5	2	1	0	0	1	19
Bivalvia	"Corbula"	rufaripa	162	94	68	26	161	198	517	1226
Bivalvia	"Crassinella"	variabilis	0	0	0	0	0	0	2	2
Bivalvia	"Dimya"	rufaripa	1	2	0	0	12	0	0	15
Bivalvia	"Eburneopecten"	subminutus	12	7	2	3	15	23	41	103
Bivalvia	"Ervilia"	exterolaevis	0	0	0	0	0	0	2	2
Bivalvia	"Haliris"	quadrangularis	3	3	1	2	0	1	0	10
Bivalvia	"Kelliella"	rufaripa	16	15	6	2	0	6	19	64
Bivalvia	"Lucina"	varisculpta	0	1	0	0	0	0	0	1
Bivalvia	"Myrtaea"	scopularis	11	12	41	17	0	2	10	93
Bivalvia	"Nemocardium"	eocenense	6	3	5	1	1	1	4	21

Table B.5. Quantitative abundance data for the Red Bluff Formation, Mississippi Geological Survey localities MGS-35 and MGS-38, Wayne County, Mississippi, continued.

			Sample #							
Class	Genus assignment in Dockery (1982) and MacNeil and Dockery (1984)	Species	1	2	3	4	5	6	7	RBtot
Bivalvia	“Nucula”	vicksburgensis	17	10	16	6	2	5	16	72
Bivalvia	“Pecten”	perplanus	0	0	0	0	0	0	1	1
Bivalvia	“Pitar”	aldrichi	0	3	1	1	0	0	5	10
Bivalvia	“Plectodon”	intastriata	5	0	0	0	0	0	0	5
Bivalvia	“Pteria”	argentea	4	2	0	0	6	0	0	12
Bivalvia	“Scapharca”	invidiosa	275	89	45	19	30	7	62	527
Bivalvia	“Spheniopsis”	mississippiensis	1	1	1	1	5	2	0	11
Bivalvia	“Spondylus”	dumosus	0	0	0	0	5	0	0	5
Bivalvia	“Timothynus”	turgida	0	0	0	0	0	0	0	0
Bivalvia	“Venericardia”	carsonensis	2	1	0	0	0	0	2	5
Bivalvia	“Verticordia”	dalliana	6	5	4	3	1	1	4	24
Bivalvia	“Yoldia”	clydonionia	15	15	38	23	5	14	12	122
Gastropoda	“Acteocina”	crassiplica	1	1	6	6	1	0	0	15
Gastropoda	“Acteon”	subaldrichi	0	4	0	1	0	0	1	6
Gastropoda	“Agatrix”	mississippiensis	0	0	2	0	0	0	0	2
Gastropoda	“Architectonica”	hargeri	0	0	0	0	0	0	1	1
Gastropoda	“Architectonica”	textilina	1	0	0	1	0	0	0	2
Gastropoda	“Atys”	caseyi	0	2	1	2	0	0	0	5
Gastropoda	“Bathytoma”	rhomboidea	0	4	0	0	0	0	0	4
Gastropoda	“Calyptraea”	aperta	1	7	1	1	0	0	1	11
Gastropoda	“Caricella”	reticulata	0	0	0	0	0	0	2	2
Gastropoda	“Cerithiella”	langdoni	0	0	0	0	0	0	1	1
Gastropoda	“Conus”	alveatus	0	1	3	0	0	0	0	4

Table B.5. Quantitative abundance data for the Red Bluff Formation, Mississippi Geological Survey localities MGS-35 and MGS-38, Wayne County, Mississippi, continued.

			Sample #							
Class	Genus assignment in Dockery (1982) and MacNeil and Dockery (1984)	Species	1	2	3	4	5	6	7	RBtot
Gastropoda	“Conus”	protractus	0	0	0	1	0	0	0	1
Gastropoda	“Eulimella”	clearyensis	1	0	4	1	1	1	4	12
Gastropoda	“Gemmula”	amica	64	35	39	6	9	7	12	172
Gastropoda	“Levifusus”	spiniger	1	2	0	0	0	0	0	3
Gastropoda	“Mathilda”	regularis	1	0	1	0	0	0	0	2
Gastropoda	“Microdrillia”	infans	5	5	3	0	0	0	3	16
Gastropoda	“Mitra”	conquista	6	1	1	0	1	0	6	15
Gastropoda	“Natica”	caseyi	72	29	46	14	12	12	39	224
Gastropoda	“Olssonella”	elongata	1	0	1	1	0	0	0	3
Gastropoda	“Pleuroliria”	subsimilis	1	0	0	0	1	0	0	2
Gastropoda	“Ringicula”	mississippiensis	15	12	14	8	3	1	4	57
Gastropoda	“Scalina”	rubricollis	1	0	0	0	0	0	0	1
Gastropoda	“Scaphander”	primus	0	2	1	2	0	0	0	5
Gastropoda	“Scobinella”	caelata	0	1	0	0	0	0	0	1
Gastropoda	“Strombiformis”	caseyi	4	1	1	0	0	2	2	10
Gastropoda	“Syntomodrillia”	collarubra	8	3	7	5	2	3	2	30
Gastropoda	“Teinostoma”	caseyi	0	0	1	0	0	0	1	2
Gastropoda	“Terebra”	hiwanneensis	1	0	0	0	0	1	0	2
Gastropoda	“Tritiaria”	falsus	33	20	30	22	12	28	25	170
Gastropoda	“Tropisurcula”	caseyi	12	9	4	0	0	0	0	25
Gastropoda	“Turbonilla”	mississippiensis	2	0	0	0	0	1	0	3
Gastropoda	“Turritella”	premimetes	65	26	22	12	38	2	47	212
Gastropoda	“Urosalpinx”	aspinosus	0	0	0	0	4	0	2	6

Table B.5. Quantitative abundance data for the Red Bluff Formation, Mississippi Geological Survey localities MGS-35 and MGS-38, Wayne County, Mississippi, continued.

			Sample #							
Class	Genus assignment in Dockery (1982) and MacNeil and Dockery (1984)	Species	1	2	3	4	5	6	7	RBtot
Gastropoda	“Vexillum”	lintoidea	7	2	2	0	0	0	0	11
Gastropoda	“Vitrinella”	laevis	1	3	0	0	1	1	0	6
Gastropoda	“Volvulella”	subspinosa	1	0	3	0	0	0	0	4

Table B.6. Faunal list for the Red Bluff Formation, Mississippi Geological Survey localities MGS-35, MGS-38, and MGS-39, Wayne County, Mississippi. Data compiled from Dockery (1982), MacNeil and Dockery (1984), Dockery and Lozouet (2003), and Hansen et al. (2004). Names in the first column ("Class") are taken from Dockery (1982) and Macneil and Dockery (1984). Names in the second column ("Genus…") are taken from Dockery (1982) and Macneil and Dockery (1984) and were not evaluated for congruence with more recent systematic treatments of the genus nor used in any of the analyses presented herein. All genus names are accordingly presented in quotes; Appendix D provides a partially updated working taxonomy for bivalve species in the Carditoidea, Pectinoidea, and Veneroidea. Names in the third column ("Species") are taken from Dockery (1982) and Macneil and Dockery (1984), with additions and modifications from Heaslip (1968).

Class	Genus assignment in Dockery (1982) and MacNeil and Dockery (1984)	Species
Bivalvia	"Abra"	pectorosa
Bivalvia	"Agnocardia"	glebosum
Bivalvia	"Anodonta"	mississippiensis
Bivalvia	"Astarte"	triangulata
Bivalvia	"Callista"	sobrina
Bivalvia	"Chama"	pappiladerma
Bivalvia	"Chione"	victoria
Bivalvia	"Chlamys"	cocoana
Bivalvia	"Corbula"	engonata
Bivalvia	"Corbula"	rufaripa
Bivalvia	"Dimya"	rufaripa
Bivalvia	"Glycymeris"	intercostata
Bivalvia	"Jouannetia"	triquetra
Bivalvia	"Lopha"	vicksburgensis
Bivalvia	"Myrtea"	scopularis
Bivalvia	"Nemocardium"	eocenense
Bivalvia	"Ostrea"	paroxis
Bivalvia	"Pecten"	perplanus
Bivalvia	"Pitar"	aldrichi
Bivalvia	"Pteria"	argentea
Bivalvia	"Scapharca"	invidiosa
Bivalvia	"Septifer"	probolus
Bivalvia	"Spondylus"	dumosus
Bivalvia	"Venericardia"	carsonensis
Bivalvia	"Ventricolaria"	ucuttana
Bivalvia	"Yoldia"	clydoniona
Gastropoda	"Acteocina"	crassiplica
Gastropoda	"Acteon"	meyeri

Table B.6. Faunal list for the Red Bluff Formation, Mississippi Geological Survey localities MGS-35, MGS-38, and MGS-39, Wayne County, Mississippi, continued.

Class	Genus assignment in Dockery (1982) and MacNeil and Dockery (1984)	Species
Gastropoda	“Acteon”	subaldrichi
Gastropoda	“Agatrix”	mississippiensis
Gastropoda	“Ampullinopsis”	mississippiensis
Gastropoda	“Architectonica”	textilina
Gastropoda	“Bathytoma”	rhomboidea
Gastropoda	“Bittium”	ottoi
Gastropoda	“Bovicornu”	eocenense
Gastropoda	“Capulus”	americanus
Gastropoda	“Capulus”	planus
Gastropoda	“Caricella”	reticulata
Gastropoda	“Cerithiella”	langdoni
Gastropoda	“Cerithiella”	nassuloides
Gastropoda	“Chicoreus”	stetopus
Gastropoda	“Clavilithes”	longiformis
Gastropoda	“Clavilithes”	vicksburgensis
Gastropoda	“Cochlespira”	cookei
Gastropoda	“Conomitra”	crenulata
Gastropoda	“Conomitra”	vicksburgensis
Gastropoda	“Conus”	alveatus
Gastropoda	“Conus”	protractus
Gastropoda	“Coronia”	ancilla
Gastropoda	“Creseis”	hastata
Gastropoda	“Dermomurex”	cookei
Gastropoda	“Dolicholatirus”	cervicrassus
Gastropoda	“Eulimella”	clearyensis
Gastropoda	“Ficus”	mississippiensis
Gastropoda	“Galeodaria”	shubutensis
Gastropoda	“Gemmula”	amica
Gastropoda	“Latirus”	aldrichi
Gastropoda	“Latirus”	indistinctus
Gastropoda	“Latirus”	mississippiensis
Gastropoda	“Latirus”	protractus
Gastropoda	“Levifusus”	spiniger
Gastropoda	“Limacina”	inflata

Table B.6. Faunal list for the Red Bluff Formation, Mississippi Geological Survey localities MGS-35, MGS-38, and MGS-39, Wayne County, Mississippi, continued.

Class	Genus assignment in Dockery (1982) and MacNeil and Dockery (1984)	Species
Gastropoda	“Lyria”	nestor
Gastropoda	“Mambrinia”	brevidentata
Gastropoda	“Mathilda”	regularis
Gastropoda	“Melanella”	amnicreta
Gastropoda	“Melanella”	postnotata
Gastropoda	“Metula”	dockeryi
Gastropoda	“Metula”	fastidiosa
Gastropoda	“Metula”	hiwanneenis
Gastropoda	“Metula”	neptuneiformis
Gastropoda	“Microdrillia”	vicksburgella
Gastropoda	“Mitra”	conquista
Gastropoda	“Mitra”	mississippiensis
Gastropoda	“Murexiella”	vaughani
Gastropoda	“Odostomia”	byramensis
Gastropoda	“Odostomia”	vicksburgella
Gastropoda	“Phandella”	transemma
Gastropoda	“Pleurofusia”	clarkeana
Gastropoda	“Pleurofusia”	fessa
Gastropoda	“Pleurofusia”	hiwanneenis
Gastropoda	“Pleurofusia”	oblivia
Gastropoda	“Pleuroliria”	subsimilis
Gastropoda	“Pterynotus”	angelus
Gastropoda	“Ringicula”	mississippiensis
Gastropoda	“Sablea”	minuta
Gastropoda	“Sassia”	conradiana
Gastropoda	“Scalina”	rubricollis
Gastropoda	“Scaphander”	primus
Gastropoda	“Scobinella”	caelata
Gastropoda	“Scobinella”	pluriplicata
Gastropoda	“Sconsia”	prelintea
Gastropoda	“Sinum”	danvillense
Gastropoda	“Siphonochelus”	curvirostratus
Gastropoda	“Sulcocypraea”	healeyi
Gastropoda	“Syntomodrillia”	collarubra

Table B.6. Faunal list for the Red Bluff Formation, Mississippi Geological Survey localities MGS-35, MGS-38, and MGS-39, Wayne County, Mississippi, continued.

Class	Genus assignment in Dockery (1982) and MacNeil and Dockery (1984)	Species
Gastropoda	“Terebra”	hiwanneenis
Gastropoda	“Triphora”	bilineata
Gastropoda	“Tritiaria”	falsus
Gastropoda	“Tritiaria”	macilenta
Gastropoda	“Tropiscurcula”	caseyi
Gastropoda	“Turricula”	longiforma
Gastropoda	“Turritella”	rubricollis
Gastropoda	“Vexillum”	lintoidea
Gastropoda	“Vitrinella”	laevis
Gastropoda	“Xenophora”	conica

APPENDIX C

CHAPTER THREE AND CHAPTER FOUR DATA SETS

INTRODUCTION

This section contains the data sets analyzed in Chapters Three and Four. These data were used to assess the relative contributions of intrinsic biological factors to extinction risk and the stability of these relationships among different clades and over geologic time. More detailed discussion of data compilation, treatment, and analysis is covered in the Methods sections of Chapters Three and Four.

In the tables that follow, “Superfamily” assignments are taken from Palmer and Brann (1965) and the bivalve volume of the Treatise on Invertebrate Paleontology (Moore 1969-1971), and were used to group species into target clades for analysis. “Genus” names are taken from Palmer and Brann (1965) and were not evaluated here for congruence with more recent systematic treatments of the genus nor used in any of the analyses presented herein. All genus names are accordingly presented in quotes; Appendix D provides a partially updated working taxonomy for bivalve species in the Carditoidea, Pectinoidea, and Veneroidea. “Species” names are taken from Palmer and Brann (1965), with additions and modifications from Heaslip (1968), Glawe (1969; 1974), Allen (1970), Dockery (1980; 1982; 1997), Campbell (1995), and Garvie (1996).

Table C.1. Macroecological data for Paleogene bivalve species used in extinction risk models in Chapters Three and Four. Columns are:

1. Superfamily: assignments are taken from Palmer and Brann (1965) and the bivalve volume of the Treatise on Invertebrate Paleontology (Moore 1969-1971), and were used to group species into target clades for analysis
2. Genus: names are taken from Palmer and Brann (1965) and were not evaluated here for congruence with more recent systematic treatments of the genus nor used in any of the analyses presented herein. All genus names are accordingly presented in quotes; see Appendix D for a partially updated working taxonomy for bivalve species in the Carditoidea, Pectinoidea, and Veneroidea. Paleocene and Eocene species described after the publication of Palmer and Brann's (1965) compendium, and Oligocene species described by Dockery (1982), are indicated with an asterisk next to the genus assignment.
3. Species: names are taken from Palmer and Brann (1965), with additions and modifications from Heaslip (1968), Glawe (1969; 1974), Allen (1970), Dockery (1980; 1982; 1997), Campbell (1995), and Garvie (1996)
4. Abundance: at each locality species abundance was calculated as the number of specimens of a given species divided by the total number of bivalve specimens at that locality. The maximum local abundance was used in all analyses. Abundance estimates for each species were derived from 1-17 samples, with a median of 2 and a mean of 3.5.
5. List-only: Yes, indicates species known only from faunal lists but absent in the current quantitative sample of individuals. The abundance of these "list-only" species was estimated as 1 / N, where N is the current sample size of individuals at that locality.
6. Body size: size was measured as the square-root of the product of shell length and height and the maximum size was used in all analyses. The median number of measurements for each species was 12 specimens.
7. Geographic Extent: measured as the maximum great circle distance between counties in which a species occurred over its duration relative to the maximum distance possible between counties containing fossil occurrences in the Coastal Plain during that time. The geographic extent of species restricted to a single county was estimated as the median length of a county in Coastal Plain states containing fossils (39 km). Variation in sampling extent over time can, however, generate markedly different measures of proportional extent for these single-county taxa so the minimum geographic extent was subtracted from the observed extent of all species, thus setting the extent of single-county species to zero.
8. Geographic Occupancy: calculated as the number of counties in which a species occurred over its duration scaled to the total number of counties containing fossil occurrences during that time. A value of one was subtracted from the numerator to standardize the occupancy of all single-county species as described above for extent.

Table C.1. Macroecological data for Paleogene bivalve species used in extinction risk models in Chapters Three and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Abundance	List-Only	Body Size	Geographic Extent	Geographic Occupancy
Carditoidea	“Carditamera”*	williamsi	0.0008	Yes	19.1	0.000	0.018
Carditoidea	“Carditella”*	aldrichi	---	---	5.0	0.119	---
Carditoidea	“Cf. Miodontiscus”	aldrichianus	---	---	11.8	0.000	---
Carditoidea	“Cf. Miodontiscus”	timothii	---	---	---	0.000	---
Carditoidea	“Venericardia”	aldrichi	0.0008	---	1.0	0.005	0.045
Carditoidea	“Venericardia”	alticostate	0.3850	---	63.8	0.719	0.081
Carditoidea	“Venericardia”*	amplicrenata	---	---	29.1	0.000	---
Carditoidea	“Venericardia”	angustoscrobis	0.0008	Yes	34.7	0.000	0.014
Carditoidea	“Venericardia”	apodensata	0.0223	---	69.0	0.330	0.263
Carditoidea	“Venericardia”	aposmithii	0.7917	---	120.0	0.123	0.269
Carditoidea	“Venericardia”	ascia	---	---	98.4	0.029	---
Carditoidea	“Venericardia”	bashiplata	0.3044	---	90.5	0.406	0.480
Carditoidea	“Venericardia”	bilineata	---	---	16.2	0.000	---
Carditoidea	“Venericardia”	blandingi	---	---	15.1	0.000	---
Carditoidea	“Venericardia”	bulla	0.0355	---	35.4	0.036	0.050
Carditoidea	“Venericardia”	carolinensis	---	---	---	0.000	---
Carditoidea	“Venericardia”*	carsonensis	0.0837	---	22.2	0.235	0.261
Carditoidea	“Venericardia”	claiboplata	0.0457	---	81.4	0.670	0.181
Carditoidea	“Venericardia”	claviger	---	---	---	---	---
Carditoidea	“Venericardia”	coloradonis	0.0511	---	21.0	0.294	0.173
Carditoidea	“Venericardia”	complexicosta	0.0008	---	17.0	0.403	0.095

Table C.1. Macroecological data for Paleogene bivalve species used in extinction risk models in Chapters Three and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Abundance	List-Only	Body Size	Geographic Extent	Geographic Occupancy
Carditoidea	“Venericardia”	cookei	0.8343	---	40.1	0.000	0.042
Carditoidea	“Venericardia”	crenaea	---	---	27.9	0.019	---
Carditoidea	“Venericardia”	densata	0.0647	---	59.0	0.940	0.279
Carditoidea	“Venericardia”	diversidentata	0.1119	---	25.0	0.668	0.196
Carditoidea	“Venericardia”	eoa	0.0667	---	21.8	0.060	0.091
Carditoidea	“Venericardia”	eutawcolens	---	---	26.8	0.000	---
Carditoidea	“Venericardia”	flabellum	0.0164	---	22.3	0.033	0.083
Carditoidea	“Venericardia”	francescae	---	---	28.0	0.000	---
Carditoidea	“Venericardia”	gardnerae	---	---	30.5	0.018	---
Carditoidea	“Venericardia”	greggiana	0.0455	---	66.7	0.057	0.148
Carditoidea	“Venericardia”	gulielmi	0.0003	---	15.6	0.008	0.083
Carditoidea	“Venericardia”	hatcheplata	0.5488	---	77.5	0.879	1.000
Carditoidea	“Venericardia”	hesperia	---	---	41.4	0.070	---
Carditoidea	“Venericardia”	hijuana	---	---	50.0	0.000	---
Carditoidea	“Venericardia”	horatiana	0.1161	---	95.0	0.398	0.417
Carditoidea	“Venericardia”	inflatior	0.0282	---	15.4	0.281	0.105
Carditoidea	“Venericardia”	intermedia	---	---	18.1	0.000	---
Carditoidea	“Venericardia”	jewelli	---	---	68.3	0.000	---
Carditoidea	“Venericardia”	klimacodes	0.0009	Yes	51.4	0.594	0.045
Carditoidea	“Venericardia”	leonensis	---	---	1.0	0.000	---
Carditoidea	“Venericardia”*	linguinodifera	0.0461	---	14.7	0.459	0.276
Carditoidea	“Venericardia”	mediaplata	0.1264	---	59.0	1.000	0.500

Table C.1. Macroecological data for Paleogene bivalve species used in extinction risk models in Chapters Three and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Abundance	List-Only	Body Size	Geographic Extent	Geographic Occupancy
Carditoidea	“Venericardia”	mingoensis	---	---	---	---	---
Carditoidea	“Venericardia”	moa	0.0181	---	32.6	0.394	0.273
Carditoidea	“Venericardia”	mooreana	0.0018	Yes	38.7	0.000	0.053
Carditoidea	“Venericardia”	nanaplata	0.2901	---	63.4	0.133	0.259
Carditoidea	“Venericardia”	nasuta	0.0631	---	34.5	0.057	0.059
Carditoidea	“Venericardia”	natchitoches	---	---	18.5	0.029	---
Carditoidea	“Venericardia”	ocalaedes	---	---	84.9	0.000	---
Carditoidea	“Venericardia”	parva	0.1476	---	6.5	0.212	0.080
Carditoidea	“Venericardia”	perantiqua	---	---	23.7	0.010	---
Carditoidea	“Venericardia”	pilsbryi	0.0019	---	100.0	0.094	0.154
Carditoidea	“Venericardia”	potapacoensis	---	---	40.3	0.033	---
Carditoidea	“Venericardia”*	quadrata	0.0009	---	5.5	0.069	0.035
Carditoidea	“Venericardia”	regia	---	---	110.7	0.072	---
Carditoidea	“Venericardia”	rotunda	0.3603	---	28.0	0.988	0.167
Carditoidea	“Venericardia”	sabinensis	---	---	33.7	0.000	---
Carditoidea	“Venericardia”	smithii	0.2299	---	57.8	0.609	0.400
Carditoidea	“Venericardia”	stewarti	0.0012	---	96.9	0.283	0.063
Carditoidea	“Venericardia”	subquadrata	---	---	11.8	0.000	---
Carditoidea	“Venericardia”	subrotunda	---	---	7.6	0.000	---
Carditoidea	“Venericardia”	tortidens	0.0067	---	5.4	0.045	0.041
Carditoidea	“Venericardia”	trapaquara	0.0033	---	17.5	0.410	0.146
Carditoidea	“Venericardia”*	trapaquaroides	---	---	25.8	0.000	---

Table C.1. Macroecological data for Paleogene bivalve species used in extinction risk models in Chapters Three and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Abundance	List-Only	Body Size	Geographic Extent	Geographic Occupancy
Carditoidea	“Venericardia”	turneri	0.0122	---	93.0	0.083	0.083
Carditoidea	“Venericardia”	vigintinaria	---	---	20.7	0.000	---
Carditoidea	“Venericardia”	whitei	---	---	31.0	0.032	---
Carditoidea	“Venericardia”	wilcoxensis	0.5143	---	37.1	0.366	0.130
Carditoidea	“Venericardia”	withlacoochensis	---	---	18.5	0.000	---
Carditoidea	“Venericardia”	zapatai	---	---	63.8	0.000	---
Pectinoidea	“Amusium”	alabamense	0.5519	---	4.0	0.419	0.175
Pectinoidea	“Amusium”	ocalanum	---	---	55.5	0.311	---
Pectinoidea	“Amusium”	cf. squamulum	0.0086	---	4.5	0.249	0.045
Pectinoidea	“Amusium”*	zinguli	0.0132	---	4.4	0.000	0.125
Pectinoidea	“Batequeus”*	ducenticostatus	---	---	50.2	0.000	---
Pectinoidea	“Chlamys”	alpha	---	---	---	---	---
Pectinoidea	“Chlamys”*	anatipes	0.0032	---	28.0	0.508	0.267
Pectinoidea	“Chlamys”	beverlyi	---	---	16.7	0.000	---
Pectinoidea	“Chlamys”	biddleana	---	---	25.5	0.190	---
Pectinoidea	“Chlamys”	burlesonensis	0.0033	Yes	21.1	0.337	0.157
Pectinoidea	“Chlamys”	cainei	---	---	20.0	0.006	---
Pectinoidea	“Chlamys”	cawcawensis	---	---	25.1	0.532	---
Pectinoidea	“Chlamys”	choctavensis	0.0090	---	25.2	0.830	0.400
Pectinoidea	“Chlamys”	clarkeana	0.0362	---	22.8	0.072	0.078
Pectinoidea	“Chlamys”*	clinchfieldensis	---	---	46.3	0.322	---
Pectinoidea	“Chlamys”	cocoana	0.0085	---	23.4	0.560	0.161

Table C.1. Macroecological data for Paleogene bivalve species used in extinction risk models in Chapters Three and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Abundance	List-Only	Body Size	Geographic Extent	Geographic Occupancy
Pectinoidea	"Chlamys"	cookei	---	---	16.5	0.056	---
Pectinoidea	"Chlamys"	corvina	---	---	10.7	0.000	---
Pectinoidea	"Chlamys"	cushmani	---	---	17.5	0.056	---
Pectinoidea	"Chlamys"	danvillensis	0.2532	---	15.2	0.303	0.088
Pectinoidea	"Chlamys"	deshayesii	0.0390	---	47.4	0.777	0.228
Pectinoidea	"Chlamys"*	duncanensis	---	---	29.3	0.564	---
Pectinoidea	"Chlamys"	dysoni	---	---	49.3	0.000	---
Pectinoidea	"Chlamys"	greggi	0.0221	---	27.8	0.092	0.167
Pectinoidea	"Chlamys"	incertae	---	---	34.4	0.181	---
Pectinoidea	"Chlamys"	indecisa	---	---	27.5	0.216	---
Pectinoidea	"Chlamys"	johnsoni	---	---	18.3	0.000	---
Pectinoidea	"Chlamys"	kneiskerni	---	---	21.2	0.909	---
Pectinoidea	"Chlamys"	membranosa	---	---	35.5	0.094	---
Pectinoidea	"Chlamys"*	menthifontis	0.0100	---	41.6	0.119	0.136
Pectinoidea	"Chlamys"	nupera	0.0055	---	36.4	0.593	0.228
Pectinoidea	"Chlamys"	pulchricosta	---	---	16.0	0.000	---
Pectinoidea	"Chlamys"*	redwoodensis	---	---	29.7	0.235	---
Pectinoidea	"Chlamys"	rigbyi	---	---	28.7	0.000	---
Pectinoidea	"Chlamys"	seabeensis	---	---	---	---	---
Pectinoidea	"Chlamys"	sheldonae	---	---	19.9	0.000	---
Pectinoidea	"Chlamys"	spillmani	0.0009	Yes	36.3	0.699	0.373
Pectinoidea	"Chlamys"	suwaneensis	---	---	24.4	0.000	---

Table C.1. Macroecological data for Paleogene bivalve species used in extinction risk models in Chapters Three and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Abundance	List-Only	Body Size	Geographic Extent	Geographic Occupancy
Pectinoidea	“Chlamys”	wahtubbeana	0.0426	---	43.8	0.826	0.098
Pectinoidea	“Eburneopecten”	calvatus	---	---	13.4	0.106	---
Pectinoidea	“Eburneopecten”	corneoides	0.0542	---	33.8	0.004	0.083
Pectinoidea	“Eburneopecten”	dalli	---	---	17.3	0.074	---
Pectinoidea	“Eburneopecten”	frontalis	0.0027	---	15.5	0.109	0.034
Pectinoidea	“Eburneopecten”	hamiltonensis	0.0596	---	21.2	0.789	0.076
Pectinoidea	“Eburneopecten”	scintillatus	0.8442	---	32.4	0.955	0.175
Pectinoidea	“Eburneopecten”	subminutus	0.0609	---	3.2	0.205	0.075
Pectinoidea	“Pecten”*	byramensis	0.0780	---	30.8	0.704	0.636
Pectinoidea	“Pecten”	elixatus	---	---	24.8	0.000	---
Pectinoidea	“Pecten”*	howei	---	---	50.2	0.501	---
Pectinoidea	“Pecten”*	perplanus	0.0004	---	36.2	0.606	0.304
Pectinoidea	“Pecten”*	poulsoni	0.1635	---	26.9	0.672	0.409
Pectinoidea	“Plicatula”*	creola	---	---	21.2	0.000	---
Pectinoidea	“Plicatula”	filamentosa	0.0190	---	24.7	0.832	0.202
Pectinoidea	“Plicatula”	louisiana	0.0009	Yes	19.4	0.000	0.018
Pectinoidea	“Plicatula”*	pustula	0.0571	---	25.0	0.016	0.250
Pectinoidea	“Plicatula”*	variplicata	---	---	7.3	0.065	---
Pectinoidea	“Spondylus”	dumosus	0.0018	---	54.4	0.863	0.308
Pectinoidea	“Spondylus”*	filiaris	0.0093	---	66.7	0.642	0.174
Pectinoidea	“Spondylus”*	granulocostatus	---	---	17.0	0.000	---
Pectinoidea	“Spondylus”	hollisteri	---	---	54.2	0.405	---

Table C.1. Macroecological data for Paleogene bivalve species used in extinction risk models in Chapters Three and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Abundance	List-Only	Body Size	Geographic Extent	Geographic Occupancy
Pectinoidea	“Spondylus”	lamellacea	---	---	84.7	0.090	---
Veneroidea	“Cf. Blagraveia”	gunteri	---	---	19.9	0.006	---
Veneroidea	“Callista”	aequorea	0.2817	---	34.4	0.024	0.068
Veneroidea	“Callista”	aldrichi	0.0025	---	44.7	0.024	0.045
Veneroidea	“Callista”	annexa	0.3161	---	32.9	0.581	0.158
Veneroidea	“Callista”*	goniopisthus	0.0064	---	25.8	0.020	0.091
Veneroidea	“Callista”	mortoni	0.1920	---	50.7	0.024	0.068
Veneroidea	“Callista”	pearlensis	0.0064	---	33.0	0.128	0.053
Veneroidea	“Callista”	perovata	0.2514	---	39.7	0.680	0.104
Veneroidea	“Callista”*	sobrina	0.1402	---	29.0	0.821	0.304
Veneroidea	“Chamelea”*	mississippiensis	---	---	34.6	0.212	---
Veneroidea	“Chione”*	bainbridgensis	---	---	30.6	0.745	---
Veneroidea	“Chione”*	craspedonia	---	---	26.3	0.235	---
Veneroidea	“Chione”*	perbrevisformis	---	---	13.0	0.029	---
Veneroidea	“Chione”*	victoria	0.0128	---	26.5	0.235	0.174
Veneroidea	“Dosiniopsis”	lenticularis	---	---	51.8	0.791	---
Veneroidea	“Gratelupia”	hydana	0.0008	Yes	47.5	0.005	0.045
Veneroidea	“Katherinella”	smithvillensis	0.0033	Yes	25.8	0.078	0.063
Veneroidea	“Katherinella”	texitrina	---	---	31.3	0.048	---
Veneroidea	“Katherinella”	trigoniata	0.0389	---	30.9	0.746	0.196
Veneroidea	“Katherinella”	trinitatis	0.0039	---	22.9	0.338	0.073
Veneroidea	“Macrocallista”	subimpressa	---	---	21.1	0.762	---

Table C.1. Macroecological data for Paleogene bivalve species used in extinction risk models in Chapters Three and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Abundance	List-Only	Body Size	Geographic Extent	Geographic Occupancy
Veneroidea	“Macrocallista”	sylvaerupis	0.5973	---	21.3	0.166	0.375
Veneroidea	“Macrocallista”	triangulata	---	---	6.2	0.000	---
Veneroidea	“Mercimonia”	mercenaroidea	0.0038	---	39.8	0.393	0.054
Veneroidea	“Pelecyora”	hatchetigbeensis	0.2209	---	23.4	0.000	0.500
Veneroidea	“Pitar”*	aldrichi	0.0288	---	12.4	0.135	0.174
Veneroidea	“Pitar”	amichel	---	---	33.2	0.015	---
Veneroidea	“Pitar”	angelinae	---	---	---	---	---
Veneroidea	“Pitar”*	astartiformis	---	---	16.3	0.054	---
Veneroidea	“Cf. Pitar”	biboraensis	---	---	41.0	0.000	---
Veneroidea	“Pitar”*	calcanea	0.0280	---	17.8	0.745	0.182
Veneroidea	“Pitar”	cornelli	0.0008	Yes	54.6	0.000	0.023
Veneroidea	“Pitar”	eversus	---	---	44.7	0.018	---
Veneroidea	“Pitar”	exiguus	0.0008	Yes	19.9	0.000	0.023
Veneroidea	“Pitar”	gazleyensis	---	---	32.0	0.000	---
Veneroidea	“Cf. Pitar”	hawtofi	---	---	24.2	0.000	---
Veneroidea	“Pitar”*	imitabilis	0.0051	---	37.5	0.212	0.300
Veneroidea	“Pitar”	juliae	---	---	6.2	0.000	---
Veneroidea	“Cf. Pitar”	kempae	0.0651	---	35.5	0.100	0.050
Veneroidea	“Pitar”	lenis	---	---	11.0	0.050	---
Veneroidea	“Pitar”	macbeani	0.0083	---	19.2	0.203	0.027
Veneroidea	“Pitar”*	megacostata	0.0064	---	46.4	0.135	0.130
Veneroidea	“Pitar”	nuttali	0.2252	---	61.6	0.057	0.049

Table C.1. Macroecological data for Paleogene bivalve species used in extinction risk models in Chapters Three and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Abundance	List-Only	Body Size	Geographic Extent	Geographic Occupancy
Veneroidea	"Pitar"	nuttalliopsis	0.8129	---	39.7	0.406	0.593
Veneroidea	"Pitar"	ovalis	---	---	29.4	0.000	---
Veneroidea	"Pitar"	ovatus	---	---	28.9	0.177	---
Veneroidea	"Pitar"*	perbrevis	---	---	13.4	0.029	---
Veneroidea	"Pitar"	petropolitanus	0.0533	---	31.3	0.440	0.122
Veneroidea	"Pitar"	poulsoni	0.0024	---	55.5	0.000	0.023
Veneroidea	"Pitar"*	protena	0.0093	---	33.1	0.054	0.136
Veneroidea	"Pitar"	pteleinus	0.0118	---	20.4	0.084	0.075
Veneroidea	"Pitar"	pyga	---	---	42.4	0.086	---
Veneroidea	"Pitar"	ripleyanus	0.1043	---	25.0	0.402	0.135
Veneroidea	"Pitar"	securiformis	0.0230	---	43.2	0.238	0.140
Veneroidea	"Pitar"*	semipunctata	0.0029	---	17.2	0.212	0.300
Veneroidea	"Pitar"*	silicifluvia	---	---	17.9	0.745	---
Veneroidea	"Pitar"	texacola	0.0018	Yes	45.6	0.351	0.115
Veneroidea	"Pitar"	texibrazus	0.0213	---	54.2	0.342	0.041
Veneroidea	"Pitar"	tornadonis	0.0046	---	34.3	0.340	0.098
Veneroidea	"Pitar"*	turneri	0.0015	---	28.6	0.000	0.125
Veneroidea	"Pitar"	vetus	---	---	20.8	0.001	---
Veneroidea	"Rhabdopitaria"	astartoides	---	---	25.9	0.249	---
Veneroidea	"Rhabdopitaria"	discoidalis	0.0008	Yes	25.0	0.000	0.023
Veneroidea	"Rhabdopitaria"	pricei	---	---	21.9	0.000	---
Veneroidea	"Rhabdopitaria"	subcrassa	0.0008	---	28.3	0.003	0.027

Table C.1. Macroecological data for Paleogene bivalve species used in extinction risk models in Chapters Three and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Abundance	List-Only	Body Size	Geographic Extent	Geographic Occupancy
Veneroidea	“Rhabdopitaria”	texangelina	---	---	25.8	0.000	---
Veneroidea	“Rhabdopitaria”	winnensis	---	---	30.1	0.000	---
Veneroidea	“Sinodia”	eocaenica	0.0033	Yes	19.1	0.000	0.026
Veneroidea	“Textivenus”	retisculpta	0.0008	Yes	5.7	0.000	0.023
Veneroidea	“Ventricolaria”*	ucuttana	---	---	15.1	0.171	---
Veneroidea	“Venus”	jacksonensis	---	---	4.0	0.000	---

Table C.2. Durations of Paleogene bivalve species used in extinction risk models in Chapters Three and Four. Ages are given in millions of years ago (MYA). Columns are:

1. Superfamily: assignments are taken from Palmer and Brann (1965) and the bivalve volume of the Treatise on Invertebrate Paleontology (Moore 1969-1971), and were used to group species into target clades for analysis
2. Genus: names are taken from Palmer and Brann (1965) and were not evaluated here for congruence with more recent systematic treatments of the genus nor used in any of the analyses presented herein. All genus names are accordingly presented in quotes; see Appendix D for a partially updated working taxonomy for bivalve species in the Carditoidea, Pectinoidea, and Veneroidea. Paleocene and Eocene species described after the publication of Palmer and Brann's (1965) compendium, and Oligocene species described by Dockery (1982), are indicated with an asterisk next to the genus assignment.
3. Species: names are taken from Palmer and Brann (1965), with additions and modifications from Heaslip (1968), Glawe (1969; 1974), Allen (1970), Dockery (1980; 1982; 1997), Campbell (1995), and Garvie (1996)FADbase: age of the base of the lithostratigraphic unit in which a species first occurred
4. LADtop: age of the top of the lithostratigraphic unit in which a species last occurred
5. FADmid: age of the mid-point of the lithostratigraphic unit in which a species first occurred
6. LADmid: age of the mid-point of the lithostratigraphic unit in which a species last occurred
7. Duration: difference in millions of years between LAD mid and FAD mid. Durations were rounded to the nearest million years. All species restricted to a single interval were assigned a duration of zero.

Table C.2. Durations of Paleogene bivalve species used in extinction risk models in Chapters Three and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	FADbase	LADtop	FADmid	LADmid	Duration
Carditoidea	“Carditamera”*	williamsi	38.7	37	37.85	37.85	0
Carditoidea	“Carditella”*	aldrichi	33.5	32.3	33.15	32.45	1
Carditoidea	“Cf. Miodontiscus”	aldrichianus	62.2	58.4	60.95	59.1	2
Carditoidea	“Cf. Miodontiscus”	timothii	55	53.61	54.305	54.305	0
Carditoidea	“Venericardia”	aldrichi	40.4	38.7	39.55	39.55	0
Carditoidea	“Venericardia”	alticostata	41.9	38.7	41.15	39.55	2
Carditoidea	“Venericardia”*	amplicrenata	65	63.8	64.4	64.4	0
Carditoidea	“Venericardia”	angustoscrobis	41.9	38.7	41.15	39.55	2
Carditoidea	“Venericardia”	apodensata	38.7	37	37.85	37.85	0
Carditoidea	“Venericardia”	aposmithii	58.4	55	57.3	55.3	2
Carditoidea	“Venericardia”	ascia	55	52.85	53.925	53.925	0
Carditoidea	“Venericardia”	bashiplata	56.2	52.85	55.6	53.925	2
Carditoidea	“Venericardia”	bilineata	41.9	38.7	40.3	40.3	0
Carditoidea	“Venericardia”	blandingi	43.4	36	39.7	39.7	0
Carditoidea	“Venericardia”	bulla	65	58.4	64.4	61.1	3
Carditoidea	“Venericardia”	carolinensis	41.9	38.7	40.3	40.3	0
Carditoidea	“Venericardia”*	carsonensis	34.2	32.3	33.85	32.45	1
Carditoidea	“Venericardia”	claiboplata	50.6	38.7	50.15	39.55	11
Carditoidea	“Venericardia”	claviger	---	---	---	---	---
Carditoidea	“Venericardia”	coloradonis	50.15	40.4	49.925	41.15	9
Carditoidea	“Venericardia”	complexicosta	41.9	38.7	41.15	39.55	2

Table C.2. Durations of Paleogene bivalve species used in extinction risk models in Chapters Three and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	FADbase	LADtop	FADmid	LADmid	Duration
Carditoidea	“Venericardia”	cookei	50.6	47.3	50.15	48.5	2
Carditoidea	“Venericardia”	crenaea	65	63.8	64.4	64.4	0
Carditoidea	“Venericardia”	densata	58.4	37	57.3	41.15	16
Carditoidea	“Venericardia”	diversidentata	47.3	34.2	43.85	35.6	8
Carditoidea	“Venericardia”	eoa	65	63.8	64.4	64.4	0
Carditoidea	“Venericardia”	eutawcolens	43.4	36	39.7	39.7	0
Carditoidea	“Venericardia”	flabellum	47.3	40.4	46	41.15	5
Carditoidea	“Venericardia”	francescae	65	63.8	64.4	64.4	0
Carditoidea	“Venericardia”	gardnerae	60.95	59.7	60.325	60.325	0
Carditoidea	“Venericardia”	greggiana	58.4	53.61	57.3	54.305	3
Carditoidea	“Venericardia”	gulielmi	55	53.61	54.305	54.305	0
Carditoidea	“Venericardia”	hatcheplata	53.61	52.85	53.23	53.23	0
Carditoidea	“Venericardia”	hesperia	65	63.8	64.4	64.4	0
Carditoidea	“Venericardia”	hijuana	65	63.8	64.4	64.4	0
Carditoidea	“Venericardia”	horatiana	55	52.85	54.305	53.23	1
Carditoidea	“Venericardia”	inflatior	40.4	37	39.55	37.85	2
Carditoidea	“Venericardia”	intermedia	49.7	40.4	45.05	45.05	0
Carditoidea	“Venericardia”	jewelli	65	63.8	64.4	64.4	0
Carditoidea	“Venericardia”	klimacodes	43.4	34.2	39.7	35.6	4
Carditoidea	“Venericardia”	leonensis	41.9	40.4	41.15	41.15	0
Carditoidea	“Venericardia”*	linguinodifera	55	49.7	54.305	49.925	4
Carditoidea	“Venericardia”	mediaplata	65	63.8	64.4	64.4	0

Table C.2. Durations of Paleogene bivalve species used in extinction risk models in Chapters Three and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	FADbase	LADtop	FADmid	LADmid	Duration
Carditoidea	“Venericardia”	mingoensis	---	---	---	---	---
Carditoidea	“Venericardia”	moa	65	63.8	64.4	64.4	0
Carditoidea	“Venericardia”	mooreana	47.3	44.7	46	46	0
Carditoidea	“Venericardia”	nanaplata	58.4	53.61	57.3	54.305	3
Carditoidea	“Venericardia”	nasuta	49.7	40.4	48.5	41.15	7
Carditoidea	“Venericardia”	natchitoches	47.3	40.4	46	41.15	5
Carditoidea	“Venericardia”	ocalaedes	37	34.2	35.6	35.6	0
Carditoidea	“Venericardia”	parva	41.9	37	41.15	37.85	3
Carditoidea	“Venericardia”	perantiqua	49.7	40.4	45.05	45.05	0
Carditoidea	“Venericardia”	pilsbryi	58.4	55	57.3	55.3	2
Carditoidea	“Venericardia”	potapacoensis	55	52.85	53.925	53.925	0
Carditoidea	“Venericardia”*	quadrata	38.7	37	37.85	37.85	0
Carditoidea	“Venericardia”	regia	59.7	55	57.35	57.35	0
Carditoidea	“Venericardia”	rotunda	50.6	37	50.15	39.55	11
Carditoidea	“Venericardia”	sabinensis	56.2	55	55.6	55.6	0
Carditoidea	“Venericardia”	smithii	65	58.4	64.4	61.1	3
Carditoidea	“Venericardia”	stewarti	47.3	40.4	46	41.15	5
Carditoidea	“Venericardia”	subquadrata	41.9	38.7	40.3	40.3	0
Carditoidea	“Venericardia”	subrotunda	41.9	38.7	40.3	40.3	0
Carditoidea	“Venericardia”	tortidens	41.9	38.7	41.15	39.55	2
Carditoidea	“Venericardia”	trapaquara	42.6	40.4	42.25	41.15	1
Carditoidea	“Venericardia”*	trapaquaroides	47.3	44.7	46	46	0

Table C.2. Durations of Paleogene bivalve species used in extinction risk models in Chapters Three and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	FADbase	LADtop	FADmid	LADmid	Duration
Carditoidea	“Venericardia”	turneri	55	52.85	54.305	53.23	1
Carditoidea	“Venericardia”	vigintinaria	41.9	38.7	40.3	40.3	0
Carditoidea	“Venericardia”	whitei	65	63.8	64.4	64.4	0
Carditoidea	“Venericardia”	wilcoxensis	63.8	58.4	61.75	59.05	3
Carditoidea	“Venericardia”	withlacoochensis	38.7	37	37.85	37.85	0
Carditoidea	“Venericardia”	zapatai	41.9	40.4	41.15	41.15	0
Pectinoidea	“Amusium”	alabamense	65	58.4	64.4	60.95	3
Pectinoidea	“Amusium”	ocalanum	38.7	32.6	37.35	32.7	5
Pectinoidea	“Amusium”	cf. squamulum	55	40.4	54.305	41.15	13
Pectinoidea	“Amusium”*	zinguli	50.15	49.7	49.925	49.925	0
Pectinoidea	“Batequeus”*	ducenticostatus	38.7	36	37.35	37.35	0
Pectinoidea	“Chlamys”	alpha	---	---	---	---	---
Pectinoidea	“Chlamys”*	anatipes	37	32.6	35.6	32.7	3
Pectinoidea	“Chlamys”	beverlyi	41.9	40.4	41.15	41.15	0
Pectinoidea	“Chlamys”	biddleana	38.7	36	37.35	37.35	0
Pectinoidea	“Chlamys”	burlesonensis	49.7	40.4	48.5	41.15	7
Pectinoidea	“Chlamys”	cainei	41.9	40.4	41.15	41.15	0
Pectinoidea	“Chlamys”	cawcawensis	43.4	36	41.15	37.35	4
Pectinoidea	“Chlamys”	choctavensis	59.7	52.85	57.35	53.23	4
Pectinoidea	“Chlamys”	clarkeana	49.7	40.4	48.5	41.15	7
Pectinoidea	“Chlamys”*	clinchfieldensis	38.7	34.2	37.85	35.6	2
Pectinoidea	“Chlamys”	cocoana	38.7	33.5	37.85	33.85	4

Table C.2. Durations of Paleogene bivalve species used in extinction risk models in Chapters Three and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	FADbase	LADtop	FADmid	LADmid	Duration
Pectinoidea	“Chlamys”	cookei	38.7	36	37.35	37.35	0
Pectinoidea	“Chlamys”	corvina	38.7	37	37.85	37.85	0
Pectinoidea	“Chlamys”	cushmani	38.7	36	37.35	37.35	0
Pectinoidea	“Chlamys”	danvillensis	37	34.2	35.6	35.6	0
Pectinoidea	“Chlamys”	deshayesii	40.4	34.2	39.55	35.6	4
Pectinoidea	“Chlamys”*	duncanensis	37	32.3	35.6	32.45	3
Pectinoidea	“Chlamys”	dysoni	37	34.2	35.6	35.6	0
Pectinoidea	“Chlamys”	greggi	56.2	55	55.9	55.3	1
Pectinoidea	“Chlamys”	incertae	37	34.2	35.6	35.6	0
Pectinoidea	“Chlamys”	indecisa	37	34.2	35.6	35.6	0
Pectinoidea	“Chlamys”	johnsoni	59.7	52.85	57.35	53.925	3
Pectinoidea	“Chlamys”	kneiskerni	49.7	40.4	45.05	45.05	0
Pectinoidea	“Chlamys”	membranosa	38.7	36	37.35	37.35	0
Pectinoidea	“Chlamys”*	menthifontis	33.5	32.8	33.15	33.15	0
Pectinoidea	“Chlamys”	nupera	38.7	37	37.85	37.85	0
Pectinoidea	“Chlamys”	pulchricosta	41.9	40.4	41.15	41.15	0
Pectinoidea	“Chlamys”*	redwoodensis	34.2	32.3	33.85	32.45	1
Pectinoidea	“Chlamys”	rigbyi	49.7	40.4	45.05	45.05	0
Pectinoidea	“Chlamys”	seabeensis	---	---	---	---	---
Pectinoidea	“Chlamys”	sheldonae	59.7	55	57.35	57.35	0
Pectinoidea	“Chlamys”	spillmani	38.7	32.8	37.85	33.15	5
Pectinoidea	“Chlamys”	suwaneensis	37	34.2	35.6	35.6	0

Table C.2. Durations of Paleogene bivalve species used in extinction risk models in Chapters Three and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	FADbase	LADtop	FADmid	LADmid	Duration
Pectinoidea	"Chlamys"	wahtubbeana	47.3	37	45.35	41.15	4
Pectinoidea	"Eburneopecten"	calvatus	43.4	36	39.7	37.35	2
Pectinoidea	"Eburneopecten"	corneoides	55	52.85	54.305	53.23	1
Pectinoidea	"Eburneopecten"	dalli	59.7	52.85	57.35	53.925	3
Pectinoidea	"Eburneopecten"	frontalis	41.9	37	41.15	37.85	3
Pectinoidea	"Eburneopecten"	hamiltonensis	47.3	37	42.15	41.15	1
Pectinoidea	"Eburneopecten"	scintillatus	40.4	34.2	39.55	35.6	4
Pectinoidea	"Eburneopecten"	subminutus	38.7	32.3	37.85	32.45	5
Pectinoidea	"Pecten"*	byramensis	33.5	31.7	33.15	32	1
Pectinoidea	"Pecten"	elixatus	43.4	36	39.7	39.7	0
Pectinoidea	"Pecten"*	howei	33.5	28.7	33.15	29.3	4
Pectinoidea	"Pecten"*	perplanus	34.2	31.7	33.85	32	2
Pectinoidea	"Pecten"*	poulsoni	33.5	32.6	33.15	32.7	0
Pectinoidea	"Plicatula"*	creola	38.7	37	37.85	37.85	0
Pectinoidea	"Plicatula"	filamentosa	55	36	54.305	37.35	17
Pectinoidea	"Plicatula"	louisiana	38.7	37	37.85	37.85	0
Pectinoidea	"Plicatula"*	pustula	50.15	49.7	49.925	49.925	0
Pectinoidea	"Plicatula"*	variplicata	34.2	32.3	33.85	32.45	1
Pectinoidea	"Spondylus"	dumosus	34.2	33.5	33.85	33.85	0
Pectinoidea	"Spondylus"*	filiaris	34.2	32.3	33.85	32.45	1
Pectinoidea	"Spondylus"*	granulocostatus	34.2	33.5	33.85	33.85	0
Pectinoidea	"Spondylus"	hollisteri	37	34.2	35.6	35.6	0

Table C.2. Durations of Paleogene bivalve species used in extinction risk models in Chapters Three and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	FADbase	LADtop	FADmid	LADmid	Duration
Pectinoidea	“Spondylus”	lamellacea	43.4	36	39.7	37.35	2
Veneroidea	“Cf. Blagraveia”	gunteri	47.3	37	43.85	37.85	6
Veneroidea	“Callista”	aequorea	40.4	38.7	39.55	39.55	0
Veneroidea	“Callista”	aldrichi	40.4	38.7	39.55	39.55	0
Veneroidea	“Callista”	annexa	40.4	34.2	39.55	35.6	4
Veneroidea	“Callista”*	goniopisthus	33.5	32.8	33.15	33.15	0
Veneroidea	“Callista”	mortoni	40.4	38.7	39.55	39.55	0
Veneroidea	“Callista”	pearlensis	38.7	37	37.85	37.85	0
Veneroidea	“Callista”	perovata	50.6	37	50.15	39.55	11
Veneroidea	“Callista”*	sobrina	34.2	32.3	33.85	32.45	1
Veneroidea	“Chamelea”*	mississippiensis	32.6	32.3	32.45	32.45	0
Veneroidea	“Chione”*	bainbridgensis	32.8	28.7	32.7	29.3	3
Veneroidea	“Chione”*	craspedonia	34.2	32.8	33.85	33.15	1
Veneroidea	“Chione”*	perbrevisformis	32.6	32.3	32.45	32.45	0
Veneroidea	“Chione”*	victoria	34.2	32.8	33.85	33.15	1
Veneroidea	“Dosiniopsis”	lenticularis	59.7	55	57.35	55.3	2
Veneroidea	“Gratelupia”	hydana	40.4	38.7	39.55	39.55	0
Veneroidea	“Katherinella”	smithvillensis	47.3	40.4	46	41.15	5
Veneroidea	“Katherinella”	texitrina	42.6	41.9	42.25	42.25	0
Veneroidea	“Katherinella”	trigoniata	47.3	37	46	37.85	8
Veneroidea	“Katherinella”	trinitatis	42.6	40.4	42.25	41.15	1
Veneroidea	“Macrocallista”	subimpressa	55	52.85	54.305	53.925	0

Table C.2. Durations of Paleogene bivalve species used in extinction risk models in Chapters Three and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	FADbase	LADtop	FADmid	LADmid	Duration
Veneroidea	“Macrocallista”	sylvaerupis	55	52.85	54.305	53.23	1
Veneroidea	“Macrocallista”	triangulata	55	52.85	54.305	53.925	0
Veneroidea	“Mercimonia”	mercenaroidea	41.9	38.7	41.15	40.3	1
Veneroidea	“Pelecyora”	hatchetigbeensis	53.61	52.85	53.23	53.23	0
Veneroidea	“Pitar”*	aldrichi	34.2	32.8	33.85	33.15	1
Veneroidea	“Pitar”	amichel	44.4	40.4	42.4	42.4	0
Veneroidea	“Pitar”	angelinae	---	---	---	---	---
Veneroidea	“Pitar”*	astartiformis	33.5	32.3	33.15	32.45	1
Veneroidea	“Cf. Pitar”	biboraensis	65	63.8	64.4	64.4	0
Veneroidea	“Pitar”*	calcanea	33.5	32.6	33.15	32.7	0
Veneroidea	“Pitar”	cornelli	40.4	38.7	39.55	39.55	0
Veneroidea	“Pitar”	eversus	55	52.85	53.925	53.925	0
Veneroidea	“Pitar”	exiguus	40.4	38.7	39.55	39.55	0
Veneroidea	“Pitar”	gazleyensis	48.5	47.3	47.9	47.9	0
Veneroidea	“Cf. Pitar”	hawtofi	65	63.8	64.4	64.4	0
Veneroidea	“Pitar”*	imitabilis	32.6	32.3	32.45	32.45	0
Veneroidea	“Pitar”	juliae	48.5	47.3	47.9	47.9	0
Veneroidea	“Cf. Pitar”	kempae	65	58.4	64.4	61.1	3
Veneroidea	“Pitar”	lenis	55	52.85	53.925	53.925	0
Veneroidea	“Pitar”	macbeani	41.9	38.7	41.15	40.3	1
Veneroidea	“Pitar”*	megacostata	34.2	32.8	33.85	33.15	1
Veneroidea	“Pitar”	nuttali	49.7	38.7	48.5	39.55	9

Table C.2. Durations of Paleogene bivalve species used in extinction risk models in Chapters Three and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	FADbase	LADtop	FADmid	LADmid	Duration
Veneroidea	"Pitar"	nuttalliopsis	58.4	52.85	57.3	53.925	3
Veneroidea	"Pitar"	ovalis	49.7	40.4	45.05	45.05	0
Veneroidea	"Pitar"	ovatus	55	52.85	53.925	53.925	0
Veneroidea	"Pitar"*	perbrevis	32.6	32.3	32.45	32.45	0
Veneroidea	"Pitar"	petropolitanus	42.6	40.4	42.25	41.15	1
Veneroidea	"Pitar"	poulsoni	40.4	38.7	39.55	39.55	0
Veneroidea	"Pitar"*	protena	33.5	32.3	33.15	32.45	1
Veneroidea	"Pitar"	pteleinus	65	58.4	64.4	61.1	3
Veneroidea	"Pitar"	pyga	59.7	52.85	57.35	53.925	3
Veneroidea	"Pitar"	ripleyanus	65	59.7	64.4	60.95	3
Veneroidea	"Pitar"	securiformis	40.4	34.2	39.55	35.6	4
Veneroidea	"Pitar"*	semipunctata	32.6	32.3	32.45	32.45	0
Veneroidea	"Pitar"*	silicifluvia	33.5	32.6	33.15	32.7	0
Veneroidea	"Pitar"	texacola	50.15	40.4	49.925	41.15	9
Veneroidea	"Pitar"	texibrazus	49.7	41.9	48.5	42.25	6
Veneroidea	"Pitar"	tornadonis	42.6	40.4	42.25	41.15	1
Veneroidea	"Pitar"*	turneri	50.15	49.7	49.925	49.925	0
Veneroidea	"Pitar"	vetus	55	40.4	53.925	45.05	9
Veneroidea	"Rhabdopitaria"	astartoides	42.6	41.9	42.25	42.25	0
Veneroidea	"Rhabdopitaria"	discoidalis	40.4	38.7	39.55	39.55	0
Veneroidea	"Rhabdopitaria"	pricei	48.5	47.3	47.9	47.9	0
Veneroidea	"Rhabdopitaria"	subcrassa	41.9	38.7	41.15	39.55	2

Table C.2. Durations of Paleogene bivalve species used in extinction risk models in Chapters Three and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	FADbase	LADtop	FADmid	LADmid	Duration
Veneroidea	"Rhabdopitaria"	texangelina	42.6	41.9	42.25	42.25	0
Veneroidea	"Rhabdopitaria"	winnensis	41.9	40.4	41.15	41.15	0
Veneroidea	"Sinodia"	eocaenica	42.6	41.9	42.25	42.25	0
Veneroidea	"Textivenus"	retisculpta	40.4	38.7	39.55	39.55	0
Veneroidea	"Ventricolaria"*	ucuttana	34.2	32.3	33.85	32.45	1
Veneroidea	"Venus"	jacksonensis	38.7	37	37.85	37.85	0

Table C.3. Lithostratigraphic units in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene. Ages are provided as millions of years ago (MYA). Age relationships were derived from the work of Allmon (1988; 1996), Bryan and Huddlestun (1991), Dockery (1986b), Edwards et al. (1997), Gibson et al. (2000), Glawe (1974), Heaslip (1968), Huddlestun and Hetrick (1986), Mancini and Tew (1992), Randazzo and Jones (1997), Toulmin (1977), and Ward (1985), with absolute dates taken from calibrated nannoplankton zones (Berggren et al. 1995). Rows are sorted by Epoch, Stratigraphic Group, and then Lithostratigraphic unit name. Columns are:

1. StratID: a unique numeric identifier used in Tables C.4 – C.6 to identify lithostratigraphic units
2. Epoch
3. Group: stratigraphic group
4. Lithunit: name of lithostratigraphic unit
5. Lithbase: age of the base of the lithostratigraphic unit
6. Lithtop: age of the top of the lithostratigraphic unit
7. Lithmid: age of the midpoint of the lithostratigraphic unit

StratID	Epoch	Group	Lithunit	Lithbase	Lithtop	Lithmid
7	Paleocene	Midway	Clayton	65	63.8	64.4
58	Paleocene	Midway	Coal Bluff	59.7	58.4	59.05
1	Paleocene	Midway	Kincaid	65	63.8	64.4
5	Paleocene	Midway	Logansport	60.95	59.7	60.325
53	Paleocene	Midway	Matthews Landing	62.2	59.7	60.95
8	Paleocene	Midway	Naheola	59.8	58.4	59.1
118	Paleocene	Midway	Oak Hill	59.7	58.4	59.05
3	Paleocene	Midway	Porters Creek	63.8	59.7	61.75
67	Paleocene	Midway	Tehuacana	65	63.8	64.4
2	Paleocene	Midway	Wills Point	63.8	58.4	61.1
73	Paleocene	Pamunkey	Aquia	59.7	55	57.35
65	Paleocene	Rancocas	Manasquan	55	52.85	53.925
11	Paleocene	Wilcox	Marthaville	58.4	56.2	57.3

Table C.3. Lithostratigraphic units in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

StratID	Epoch	Group	Lithunit	Lithbase	Lithtop	Lithmid
13	Paleocene	Wilcox	Nanafalia	58.4	56.2	57.3
12	Paleocene	Wilcox	Pendleton	56.2	55	55.6
14	Paleocene	Wilcox	Tuscahoma	56.2	55	55.6
57	Eocene	Claiborne	Archusa Marl	41.9	40.4	41.15
80	Eocene	Claiborne	Avon Park	47.3	40.4	43.85
115	Eocene	Claiborne	Basic City Shale	49.7	47.3	48.5
75	Eocene	Claiborne	Castle Hayne	38.7	36	37.35
26	Eocene	Claiborne	Cockfield	40.4	38.7	39.55
23	Eocene	Claiborne	Cook Mountain	41.9	40.4	41.15
110	Eocene	Claiborne	Cross	38.7	36	37.35
56	Eocene	Claiborne	Dobys Bluff Tongue	42.6	41.9	42.25
34	Eocene	Claiborne	Gosport	40.4	38.7	39.55
54	Eocene	Claiborne	Landrum	41.9	40.4	41.15
84	Eocene	Claiborne	Laredo	44.4	40.4	42.4
31	Eocene	Claiborne	Lower Lisbon	47.3	43.4	45.35
69	Eocene	Claiborne	Marquez	50.15	49.7	49.925
47	Eocene	Claiborne	Mcbean	41.9	38.7	40.3
32	Eocene	Claiborne	Middle Lisbon	43.4	41.9	42.65
112	Eocene	Claiborne	Piney Point	47.3	37	42.15
20	Eocene	Claiborne	Queen City	48.5	47.3	47.9
19	Eocene	Claiborne	Reklaw	50.15	49.7	49.925
63	Eocene	Claiborne	Santee	43.4	36	39.7

Table C.3. Lithostratigraphic units in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

StratID	Epoch	Group	Lithunit	Lithbase	Lithtop	Lithmid
61	Eocene	Claiborne	Shark River	49.7	40.4	45.05
59	Eocene	Claiborne	Stone City	42.6	41.9	42.25
28	Eocene	Claiborne	Tallahatta (Lower)	50.6	49.7	50.15
113	Eocene	Claiborne	Tallahatta (Upper)	49.7	47.3	48.5
85	Eocene	Claiborne	Tyus	47.3	44.7	46
33	Eocene	Claiborne	Upper Lisbon	41.9	40.4	41.15
86	Eocene	Claiborne	Wautubbee	41.9	40.4	41.15
21	Eocene	Claiborne	Weches	47.3	44.7	46
55	Eocene	Claiborne	Wheelock	41.9	40.4	41.15
87	Eocene	Claiborne	Winona	47.3	45.4	46.35
114	Eocene	Jackson	Clinchfield	38.7	37	37.85
117	Eocene	Jackson	Cocoa Sand	36	34.2	35.1
108	Eocene	Jackson	Cooper Marl	36	34.2	35.1
38	Eocene	Jackson	Moodys Branch	38.7	37	37.85
60	Eocene	Jackson	Pachuta Marl	36	34.2	35.1
62	Eocene	Jackson	White Bluff	38.7	37	37.85
39	Eocene	Jackson	Yazoo	37	34.2	35.6
104	Eocene	Ocala	Crystal River	37	34.2	35.6
68	Eocene	Ocala	Inglis	38.7	37	37.85
66	Eocene	Ocala	Ocala	37	34.2	35.6
116	Eocene	Ocala	Twiggs Clay	37	36	36.5
105	Eocene	Ocala	Williston	38.7	36	37.35

Table C.3. Lithostratigraphic units in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

StratID	Epoch	Group	Lithunit	Lithbase	Lithtop	Lithmid
50	Eocene	Pamunkey	Nanjemoy	55	52.85	53.925
16	Eocene	Wilcox	Bashi	55	53.61	54.305
52	Eocene	Wilcox	Bells Landing	55.6	55	55.3
72	Eocene	Wilcox	Greggs Landing	56.2	55.6	55.9
17	Eocene	Wilcox	Hatchetigbee	53.61	52.85	53.23
15	Eocene	Wilcox	Sabinetown	55	52.85	53.925
109	Oligocene	NA	Bridgeboro	32.8	32.6	32.7
82	Oligocene	NA	Chickasawhay	29.9	28.7	29.3
77	Oligocene	NA	Flint River	32.8	32.6	32.7
79	Oligocene	NA	Suwannee	32.8	32.6	32.7
46	Oligocene	Vicksburg	Bucatunna	32.3	31.7	32
74	Oligocene	Vicksburg	Bumpnose	34.2	33.5	33.85
45	Oligocene	Vicksburg	Byram	32.6	32.3	32.45
107	Oligocene	Vicksburg	Florala	32.8	32.6	32.7
41	Oligocene	Vicksburg	Forest Hill	34.2	33.5	33.85
44	Oligocene	Vicksburg	Glendon	32.8	32.6	32.7
43	Oligocene	Vicksburg	Marianna	33.5	32.8	33.15
42	Oligocene	Vicksburg	Mint Spring	33.5	32.8	33.15
40	Oligocene	Vicksburg	Red Bluff	34.2	33.5	33.85

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene. Note that individual localities might have multiple LocalityID numbers due to historical differences in nomenclature among workers. Rows are sorted by State, County, and then LocalityID. Columns are:

1. LocalityID: a unique numeric identifier used in Tables C.4 – C.6 to identify localities
2. State
3. County
4. CoLat: latitude of the mid-point of the county in which the locality occurs
5. CoLong: longitude of the mid-point of the county in which the locality occurs
6. LocLat: latitude of the locality when available
7. LocLong: longitude of the locality when available

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
853	AL	Barbour	31.857	-85.331	---	---
913	AL	Barbour	31.857	-85.331	---	---
845	AL	Bullock	32.098	-85.705	---	---
915	AL	Butler	31.736	-86.662	---	---
916	AL	Butler	31.736	-86.662	---	---
952	AL	Butler	31.736	-86.662	---	---
41	AL	Choctaw	32.028	-88.258	---	---
42	AL	Choctaw	32.028	-88.258	31.891	-88.385
56	AL	Choctaw	32.028	-88.258	32.090	-88.228
70	AL	Choctaw	32.028	-88.258	---	---
71	AL	Choctaw	32.028	-88.258	---	---
100	AL	Choctaw	32.028	-88.258	32.236	-88.016
101	AL	Choctaw	32.028	-88.258	32.170	-88.062
194	AL	Choctaw	32.028	-88.258	---	---
256	AL	Choctaw	32.028	-88.258	---	---
257	AL	Choctaw	32.028	-88.258	---	---
355	AL	Choctaw	32.028	-88.258	---	---
428	AL	Choctaw	32.028	-88.258	---	---
467	AL	Choctaw	32.028	-88.258	---	---
471	AL	Choctaw	32.028	-88.258	---	---
499	AL	Choctaw	32.028	-88.258	---	---
511	AL	Choctaw	32.028	-88.258	---	---
512	AL	Choctaw	32.028	-88.258	---	---
513	AL	Choctaw	32.028	-88.258	---	---
555	AL	Choctaw	32.028	-88.258	---	---
556	AL	Choctaw	32.028	-88.258	---	---
583	AL	Choctaw	32.028	-88.258	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
595	AL	Choctaw	32.028	-88.258	---	---
667	AL	Choctaw	32.028	-88.258	---	---
871	AL	Choctaw	32.028	-88.258	---	---
901	AL	Choctaw	32.028	-88.258	---	---
903	AL	Choctaw	32.028	-88.258	---	---
953	AL	Choctaw	32.028	-88.258	---	---
954	AL	Choctaw	32.028	-88.258	---	---
958	AL	Choctaw	32.028	-88.258	---	---
959	AL	Choctaw	32.028	-88.258	---	---
965	AL	Choctaw	32.028	-88.258	---	---
968	AL	Choctaw	32.028	-88.258	---	---
1000	AL	Choctaw	32.028	-88.258	---	---
43	AL	Clarke	31.688	-87.834	31.792	-88.084
44	AL	Clarke	31.688	-87.834	31.757	-88.102
45	AL	Clarke	31.688	-87.834	---	---
62	AL	Clarke	31.688	-87.834	---	---
102	AL	Clarke	31.688	-87.834	31.942	-87.981
105	AL	Clarke	31.688	-87.834	31.512	-87.621
108	AL	Clarke	31.688	-87.834	31.754	-88.101
159	AL	Clarke	31.688	-87.834	---	---
160	AL	Clarke	31.688	-87.834	---	---
161	AL	Clarke	31.688	-87.834	---	---
178	AL	Clarke	31.688	-87.834	---	---
213	AL	Clarke	31.688	-87.834	---	---
255	AL	Clarke	31.688	-87.834	---	---
293	AL	Clarke	31.688	-87.834	---	---
344	AL	Clarke	31.688	-87.834	---	---
371	AL	Clarke	31.688	-87.834	---	---
427	AL	Clarke	31.688	-87.834	---	---
436	AL	Clarke	31.688	-87.834	---	---
469	AL	Clarke	31.688	-87.834	---	---
498	AL	Clarke	31.688	-87.834	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
557	AL	Clarke	31.688	-87.834	---	---
567	AL	Clarke	31.688	-87.834	---	---
568	AL	Clarke	31.688	-87.834	---	---
588	AL	Clarke	31.688	-87.834	---	---
589	AL	Clarke	31.688	-87.834	---	---
592	AL	Clarke	31.688	-87.834	---	---
617	AL	Clarke	31.688	-87.834	---	---
648	AL	Clarke	31.688	-87.834	---	---
649	AL	Clarke	31.688	-87.834	---	---
655	AL	Clarke	31.688	-87.834	---	---
656	AL	Clarke	31.688	-87.834	---	---
860	AL	Clarke	31.688	-87.834	---	---
875	AL	Clarke	31.688	-87.834	---	---
877	AL	Clarke	31.688	-87.834	---	---
878	AL	Clarke	31.688	-87.834	---	---
975	AL	Clarke	31.688	-87.834	---	---
110	AL	Coffee	31.379	-85.957	31.364	-86.093
158	AL	Coffee	31.379	-85.957	---	---
191	AL	Coffee	31.379	-85.957	---	---
452	AL	Coffee	31.379	-85.957	---	---
563	AL	Coffee	31.379	-85.957	---	---
619	AL	Coffee	31.379	-85.957	---	---
654	AL	Coffee	31.379	-85.957	---	---
421	AL	Conecuh	31.416	-87.002	---	---
476	AL	Conecuh	31.416	-87.002	---	---
493	AL	Conecuh	31.416	-87.002	---	---
554	AL	Conecuh	31.416	-87.002	---	---
572	AL	Conecuh	31.416	-87.002	---	---
584	AL	Conecuh	31.416	-87.002	---	---
590	AL	Conecuh	31.416	-87.002	---	---
889	AL	Conecuh	31.416	-87.002	---	---
890	AL	Conecuh	31.416	-87.002	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
109	AL	Covington	31.251	-86.416	31.360	-86.518
112	AL	Covington	31.251	-86.416	---	---
189	AL	Covington	31.251	-86.416	---	---
190	AL	Covington	31.251	-86.416	---	---
211	AL	Covington	31.251	-86.416	---	---
401	AL	Covington	31.251	-86.416	---	---
508	AL	Covington	31.251	-86.416	---	---
551	AL	Covington	31.251	-86.416	---	---
552	AL	Covington	31.251	-86.416	---	---
553	AL	Covington	31.251	-86.416	---	---
558	AL	Covington	31.251	-86.416	---	---
564	AL	Covington	31.251	-86.416	---	---
565	AL	Covington	31.251	-86.416	---	---
566	AL	Covington	31.251	-86.416	---	---
569	AL	Covington	31.251	-86.416	---	---
570	AL	Covington	31.251	-86.416	---	---
582	AL	Covington	31.251	-86.416	---	---
585	AL	Covington	31.251	-86.416	---	---
586	AL	Covington	31.251	-86.416	---	---
593	AL	Covington	31.251	-86.416	---	---
609	AL	Covington	31.251	-86.416	---	---
615	AL	Covington	31.251	-86.416	---	---
862	AL	Covington	31.251	-86.416	---	---
908	AL	Covington	31.251	-86.416	---	---
974	AL	Covington	31.251	-86.416	---	---
921	AL	Crenshaw	31.710	-86.289	---	---
52	AL	Dale	31.394	-85.615	31.471	-85.643
53	AL	Dale	31.394	-85.615	31.348	-85.614
111	AL	Dale	31.394	-85.615	31.596	-85.783
157	AL	Dale	31.394	-85.615	---	---
618	AL	Dale	31.394	-85.615	---	---
664	AL	Dale	31.394	-85.615	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
962	AL	Dale	31.394	-85.615	---	---
967	AL	Dale	31.394	-85.615	---	---
573	AL	Escambia	31.104	-87.233	---	---
591	AL	Escambia	31.104	-87.233	---	---
594	AL	Escambia	31.104	-87.233	---	---
891	AL	Escambia	31.104	-87.233	---	---
559	AL	Geneva	31.095	-85.797	---	---
560	AL	Geneva	31.095	-85.797	---	---
468	AL	Henry	31.494	-85.254	---	---
653	AL	Henry	31.494	-85.254	---	---
663	AL	Henry	31.494	-85.254	---	---
917	AL	Henry	31.494	-85.254	---	---
955	AL	Henry	31.494	-85.254	---	---
957	AL	Henry	31.494	-85.254	---	---
990	AL	Henry	31.494	-85.254	---	---
193	AL	Marengo	32.332	-87.789	---	---
209	AL	Marengo	32.332	-87.789	---	---
339	AL	Marengo	32.332	-87.789	---	---
345	AL	Marengo	32.332	-87.789	---	---
928	AL	Marengo	32.332	-87.789	---	---
932	AL	Marengo	32.332	-87.789	---	---
933	AL	Marengo	32.332	-87.789	---	---
1	AL	Monroe	31.556	-87.360	---	---
6	AL	Monroe	31.556	-87.360	---	---
10	AL	Monroe	31.556	-87.360	---	---
46	AL	Monroe	31.556	-87.360	31.546	-87.517
67	AL	Monroe	31.556	-87.360	---	---
68	AL	Monroe	31.556	-87.360	---	---
103	AL	Monroe	31.556	-87.360	31.591	-87.542
104	AL	Monroe	31.556	-87.360	31.557	-87.560
106	AL	Monroe	31.556	-87.360	31.526	-87.603
335	AL	Monroe	31.556	-87.360	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
415	AL	Monroe	31.556	-87.360	---	---
418	AL	Monroe	31.556	-87.360	---	---
548	AL	Monroe	31.556	-87.360	---	---
550	AL	Monroe	31.556	-87.360	---	---
710	AL	Monroe	31.556	-87.360	---	---
861	AL	Monroe	31.556	-87.360	---	---
876	AL	Monroe	31.556	-87.360	---	---
907	AL	Monroe	31.556	-87.360	---	---
914	AL	Monroe	31.556	-87.360	---	---
960	AL	Monroe	31.556	-87.360	---	---
971	AL	Monroe	31.556	-87.360	---	---
963	AL	Pike	31.792	-85.937	---	---
964	AL	Pike	31.792	-85.937	---	---
47	AL	Sumter	32.559	-88.216	---	---
48	AL	Washington	31.366	-88.151	31.567	-88.036
66	AL	Washington	31.366	-88.151	---	---
75	AL	Washington	31.366	-88.151	---	---
76	AL	Washington	31.366	-88.151	---	---
107	AL	Washington	31.366	-88.151	31.654	-88.091
208	AL	Washington	31.366	-88.151	---	---
454	AL	Washington	31.366	-88.151	---	---
859	AL	Washington	31.366	-88.151	---	---
886	AL	Washington	31.366	-88.151	---	---
888	AL	Washington	31.366	-88.151	---	---
900	AL	Washington	31.366	-88.151	---	---
904	AL	Washington	31.366	-88.151	---	---
49	AL	Wilcox	31.993	-87.348	---	---
50	AL	Wilcox	31.993	-87.348	32.033	-87.447
51	AL	Wilcox	31.993	-87.348	---	---
54	AL	Wilcox	31.993	-87.348	31.941	-87.186
55	AL	Wilcox	31.993	-87.348	31.891	-87.088
61	AL	Wilcox	31.993	-87.348	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
69	AL	Wilcox	31.993	-87.348	---	---
97	AL	Wilcox	31.993	-87.348	31.936	-87.465
98	AL	Wilcox	31.993	-87.348	31.904	-87.389
99	AL	Wilcox	31.993	-87.348	31.945	-87.070
197	AL	Wilcox	31.993	-87.348	---	---
210	AL	Wilcox	31.993	-87.348	---	---
330	AL	Wilcox	31.993	-87.348	---	---
340	AL	Wilcox	31.993	-87.348	---	---
341	AL	Wilcox	31.993	-87.348	---	---
350	AL	Wilcox	31.993	-87.348	---	---
354	AL	Wilcox	31.993	-87.348	---	---
386	AL	Wilcox	31.993	-87.348	31.797	-87.422
426	AL	Wilcox	31.993	-87.348	---	---
464	AL	Wilcox	31.993	-87.348	---	---
472	AL	Wilcox	31.993	-87.348	---	---
482	AL	Wilcox	31.993	-87.348	---	---
727	AL	Wilcox	31.993	-87.348	---	---
846	AL	Wilcox	31.993	-87.348	---	---
847	AL	Wilcox	31.993	-87.348	---	---
848	AL	Wilcox	31.993	-87.348	---	---
911	AL	Wilcox	31.993	-87.348	---	---
912	AL	Wilcox	31.993	-87.348	---	---
918	AL	Wilcox	31.993	-87.348	---	---
919	AL	Wilcox	31.993	-87.348	---	---
922	AL	Wilcox	31.993	-87.348	---	---
923	AL	Wilcox	31.993	-87.348	---	---
924	AL	Wilcox	31.993	-87.348	---	---
925	AL	Wilcox	31.993	-87.348	---	---
926	AL	Wilcox	31.993	-87.348	---	---
927	AL	Wilcox	31.993	-87.348	---	---
929	AL	Wilcox	31.993	-87.348	---	---
930	AL	Wilcox	31.993	-87.348	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
931	AL	Wilcox	31.993	-87.348	---	---
934	AL	Wilcox	31.993	-87.348	---	---
935	AL	Wilcox	31.993	-87.348	---	---
966	AL	Wilcox	31.993	-87.348	---	---
336	AL	---	---	---	---	---
616	AL	---	---	---	---	---
662	AL	---	---	---	---	---
303	AR	Bradley	33.521	-92.141	---	---
610	AR	Bradley	33.521	-92.141	---	---
651	AR	Bradley	33.521	-92.141	---	---
300	AR	Cleveland	33.905	-92.216	---	---
349	AR	Cleveland	33.905	-92.216	---	---
437	AR	Cleveland	33.905	-92.216	---	---
611	AR	Cleveland	33.905	-92.216	---	---
755	AR	Cleveland	33.905	-92.216	---	---
756	AR	Cleveland	33.905	-92.216	---	---
301	AR	Drew	33.601	-91.736	---	---
302	AR	Drew	33.601	-91.736	---	---
438	AR	Drew	33.601	-91.736	---	---
83	AR	Jefferson	34.244	-91.987	---	---
668	AR	Pulaski	34.767	-92.294	---	---
681	AR	Pulaski	34.767	-92.294	---	---
79	AR	St. Francis	35.016	-90.709	---	---
84	AR	St. Francis	35.016	-90.709	35.012	90.738
85	AR	St. Francis	35.016	-90.709	35.003	90.739
86	AR	St. Francis	35.016	-90.709	35.002	90.739
298	AR	St. Francis	35.016	-90.709	---	---
650	AR	St. Francis	35.016	-90.709	---	---
370	FL	Alachua	29.676	-82.380	---	---
393	FL	Alachua	29.676	-82.380	---	---
396	FL	Alachua	29.676	-82.380	29.614	-82.402
399	FL	Alachua	29.676	-82.380	29.850	-82.550

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
538	FL	Alachua	29.676	-82.380	---	---
545	FL	Alachua	29.676	-82.380	---	---
680	FL	Alachua	29.676	-82.380	---	---
898	FL	Alachua	29.676	-82.380	---	---
943	FL	Alachua	29.676	-82.380	---	---
379	FL	Citrus	28.895	-82.469	---	---
899	FL	Columbia	30.184	-82.639	---	---
402	FL	Dixie	29.607	-83.120	29.774	-83.317
413	FL	Dixie	29.607	-83.120	---	---
574	FL	Dixie	29.607	-83.120	---	---
395	FL	Hernando	28.521	-82.481	28.650	-82.400
892	FL	Holmes	30.854	-85.786	---	---
387	FL	Jackson	30.770	-85.241	30.817	-85.311
397	FL	Jackson	30.770	-85.241	30.882	-85.349
412	FL	Jackson	30.770	-85.241	30.773	-85.217
416	FL	Jackson	30.770	-85.241	---	---
419	FL	Jackson	30.770	-85.241	---	---
420	FL	Jackson	30.770	-85.241	30.642	-85.174
547	FL	Jackson	30.770	-85.241	---	---
575	FL	Jackson	30.770	-85.241	---	---
879	FL	Jackson	30.770	-85.241	---	---
895	FL	Jackson	30.770	-85.241	---	---
910	FL	Jackson	30.770	-85.241	---	---
390	FL	Lafayette	30.001	-83.183	30.089	-83.235
398	FL	Lafayette	30.001	-83.183	30.253	-83.258
576	FL	Lafayette	30.001	-83.183	---	---
577	FL	Lafayette	30.001	-83.183	---	---
338	FL	Levy	29.330	-82.708	---	---
378	FL	Levy	29.330	-82.708	29.034	-82.718
380	FL	Levy	29.330	-82.708	29.100	-82.650
381	FL	Levy	29.330	-82.708	---	---
382	FL	Levy	29.330	-82.708	29.292	-82.831

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
383	FL	Levy	29.330	-82.708	29.221	-82.740
384	FL	Levy	29.330	-82.708	29.138	-83.038
385	FL	Levy	29.330	-82.708	29.418	-82.492
578	FL	Levy	29.330	-82.708	---	---
623	FL	Levy	29.330	-82.708	---	---
659	FL	Levy	29.330	-82.708	---	---
669	FL	Levy	29.330	-82.708	---	---
937	FL	Levy	29.330	-82.708	---	---
938	FL	Levy	29.330	-82.708	---	---
423	FL	Marion	29.143	-82.115	---	---
490	FL	Marion	29.143	-82.115	---	---
607	FL	Marion	29.143	-82.115	---	---
635	FL	Marion	29.143	-82.115	---	---
636	FL	Marion	29.143	-82.115	---	---
670	FL	Marion	29.143	-82.115	---	---
674	FL	Marion	29.143	-82.115	---	---
677	FL	Marion	29.143	-82.115	---	---
896	FL	Marion	29.143	-82.115	---	---
897	FL	Marion	29.143	-82.115	---	---
936	FL	Marion	29.143	-82.115	---	---
518	FL	Monroe	24.778	-81.228	---	---
407	FL	Polk	27.992	-81.758	28.301	-82.053
665	FL	St. Johns	29.882	-81.358	---	---
388	FL	Suwannee	30.192	-82.985	30.047	-82.953
389	FL	Suwannee	30.192	-82.985	30.004	-82.939
507	FL	Suwannee	30.192	-82.985	---	---
666	FL	Suwannee	30.192	-82.985	---	---
941	FL	Suwannee	30.192	-82.985	---	---
394	FL	Taylor	30.054	-83.585	29.778	-83.321
579	FL	Taylor	30.054	-83.585	---	---
580	FL	Taylor	30.054	-83.585	---	---
581	FL	Taylor	30.054	-83.585	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
863	FL	Walton	30.638	-86.156	---	---
406	FL	Washington	30.631	-85.638	30.703	-85.589
827	FL	Washington	30.631	-85.638	---	---
973	FL	Washington	30.631	-85.638	---	---
542	FL	---	---	---	---	---
989	GA	Bibb	32.830	-83.665	---	---
453	GA	Burke	33.054	-82.006	---	---
671	GA	Burke	33.054	-82.006	---	---
869	GA	Calhoun	31.518	-84.654	---	---
58	GA	Clay	31.621	-84.993	31.604	-85.055
196	GA	Clay	31.621	-84.993	---	---
365	GA	Clay	31.621	-84.993	---	---
920	GA	Clay	31.621	-84.993	---	---
868	GA	Crawford	32.710	-83.978	---	---
537	GA	Decatur	30.884	-84.570	---	---
546	GA	Decatur	30.884	-84.570	---	---
549	GA	Decatur	30.884	-84.570	---	---
631	GA	Decatur	30.884	-84.570	---	---
826	GA	Decatur	30.884	-84.570	---	---
939	GA	Decatur	30.884	-84.570	---	---
972	GA	Decatur	30.884	-84.570	---	---
391	GA	Dougherty	31.573	-84.163	---	---
864	GA	Dougherty	31.573	-84.163	---	---
865	GA	Dougherty	31.573	-84.163	---	---
561	GA	Early	31.311	-84.936	---	---
562	GA	Early	31.311	-84.936	---	---
956	GA	Early	31.311	-84.936	---	---
195	GA	Houston	32.558	-83.663	---	---
405	GA	Houston	32.558	-83.663	---	---
410	GA	Houston	32.558	-83.663	---	---
622	GA	Houston	32.558	-83.663	---	---
867	GA	Houston	32.558	-83.663	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
872	GA	Houston	32.558	-83.663	---	---
874	GA	Houston	32.558	-83.663	---	---
977	GA	Houston	32.558	-83.663	---	---
392	GA	Lee	31.746	-84.179	---	---
866	GA	Lee	31.746	-84.179	---	---
856	GA	Mitchell	31.207	-84.172	---	---
994	GA	Mitchell	31.207	-84.172	---	---
855	GA	Pulaski	32.247	-83.467	---	---
57	GA	Randolph	31.764	-84.745	31.671	-84.916
978	GA	Randolph	31.764	-84.745	---	---
229	GA	Schley	32.247	-84.320	---	---
206	GA	Stewart	32.086	-84.815	---	---
517	GA	Sumter	32.052	-84.203	---	---
587	GA	Twiggs	32.659	-83.395	---	---
870	GA	Wilkinson	32.836	-83.227	---	---
873	GA	Wilkinson	32.836	-83.227	---	---
409	GA	---	---	---	---	---
726	GA	---	---	---	---	---
940	GA	---	---	---	---	---
186	LA	Bienville Parish	32.393	-93.043	---	---
306	LA	Bienville Parish	32.393	-93.043	---	---
72	LA	Caldwell Parish	32.084	-92.130	---	---
539	LA	Caldwell Parish	32.084	-92.130	---	---
540	LA	Caldwell Parish	32.084	-92.130	---	---
80	LA	Catahoula Parish	31.653	-91.865	---	---
887	LA	Catahoula Parish	31.653	-91.865	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
305	LA	Claiborne Parish	32.823	-93.034	---	---
763	LA	De Soto Parish	32.056	-93.758	---	---
74	LA	Grant Parish	31.583	-92.569	---	---
155	LA	Grant Parish	31.583	-92.569	---	---
307	LA	Grant Parish	31.583	-92.569	---	---
942	LA	Grant Parish	31.583	-92.569	---	---
514	LA	Jackson Parish	32.286	-92.601	---	---
735	LA	Jackson Parish	32.286	-92.601	---	---
59	LA	Natchitoches Parish	31.743	-93.095	---	---
60	LA	Natchitoches Parish	31.743	-93.095	---	---
625	LA	Natchitoches Parish	31.743	-93.095	---	---
762	LA	Natchitoches Parish	31.743	-93.095	---	---
764	LA	Natchitoches Parish	31.743	-93.095	---	---
765	LA	Natchitoches Parish	31.743	-93.095	---	---
766	LA	Natchitoches Parish	31.743	-93.095	---	---
767	LA	Natchitoches Parish	31.743	-93.095	---	---
768	LA	Natchitoches Parish	31.743	-93.095	---	---
769	LA	Natchitoches Parish	31.743	-93.095	---	---
770	LA	Natchitoches Parish	31.743	-93.095	---	---
771	LA	Natchitoches Parish	31.743	-93.095	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
772	LA	Natchitoches Parish	31.743	-93.095	---	---
789	LA	Natchitoches Parish	31.743	-93.095	---	---
790	LA	Natchitoches Parish	31.743	-93.095	---	---
791	LA	Natchitoches Parish	31.743	-93.095	---	---
792	LA	Natchitoches Parish	31.743	-93.095	---	---
793	LA	Natchitoches Parish	31.743	-93.095	---	---
794	LA	Natchitoches Parish	31.743	-93.095	---	---
795	LA	Natchitoches Parish	31.743	-93.095	---	---
799	LA	Natchitoches Parish	31.743	-93.095	---	---
992	LA	Natchitoches Parish	31.743	-93.095	---	---
2	LA	Sabine Parish	31.560	-93.558	---	---
9	LA	Sabine Parish	31.560	-93.558	---	---
604	LA	Sabine Parish	31.560	-93.558	---	---
704	LA	Sabine Parish	31.560	-93.558	---	---
757	LA	Sabine Parish	31.560	-93.558	---	---
758	LA	Sabine Parish	31.560	-93.558	---	---
759	LA	Sabine Parish	31.560	-93.558	---	---
760	LA	Sabine Parish	31.560	-93.558	---	---
761	LA	Sabine Parish	31.560	-93.558	---	---
773	LA	Sabine Parish	31.560	-93.558	---	---
774	LA	Sabine Parish	31.560	-93.558	---	---
775	LA	Sabine Parish	31.560	-93.558	---	---
776	LA	Sabine Parish	31.560	-93.558	---	---
777	LA	Sabine Parish	31.560	-93.558	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
778	LA	Sabine Parish	31.560	-93.558	---	---
796	LA	Sabine Parish	31.560	-93.558	---	---
797	LA	Sabine Parish	31.560	-93.558	---	---
798	LA	Sabine Parish	31.560	-93.558	---	---
424	LA	Vernon Parish	31.116	-93.214	31.273	93.535
260	LA	Webster Parish	32.729	-93.343	---	---
8	LA	Winn Parish	31.948	-92.637	---	---
64	LA	Winn Parish	31.948	-92.637	---	---
259	LA	Winn Parish	31.948	-92.637	---	---
532	LA	Winn Parish	31.948	-92.637	---	---
729	LA	Winn Parish	31.948	-92.637	---	---
65	LA	---	---	---	---	---
465	MD	Anne Arundel	39.058	-76.577	---	---
690	MD	Anne Arundel	39.058	-76.577	---	---
841	MD	Anne Arundel	39.058	-76.577	---	---
842	MD	Anne Arundel	39.058	-76.577	---	---
843	MD	Anne Arundel	39.058	-76.577	---	---
844	MD	Anne Arundel	39.058	-76.577	---	---
692	MD	Cecil	39.593	-75.951	---	---
63	MD	Charles	38.522	-76.972	---	---
202	MD	Charles	38.522	-76.972	---	---
203	MD	Charles	38.522	-76.972	---	---
218	MD	Charles	38.522	-76.972	---	---
219	MD	Charles	38.522	-76.972	---	---
430	MD	Charles	38.522	-76.972	---	---
431	MD	Charles	38.522	-76.972	---	---
432	MD	Charles	38.522	-76.972	---	---
502	MD	Charles	38.522	-76.972	---	---
684	MD	Charles	38.522	-76.972	---	---
685	MD	Charles	38.522	-76.972	---	---
686	MD	Charles	38.522	-76.972	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
687	MD	Charles	38.522	-76.972	---	---
688	MD	Charles	38.522	-76.972	---	---
689	MD	Charles	38.522	-76.972	---	---
720	MD	Charles	38.522	-76.972	---	---
948	MD	Charles	38.522	-76.972	---	---
691	MD	Kent	39.261	-76.054	---	---
215	MD	Prince Georges	38.906	-76.882	---	---
216	MD	Prince Georges	38.906	-76.882	---	---
217	MD	Prince Georges	38.906	-76.882	---	---
461	MD	Prince Georges	38.906	-76.882	---	---
463	MD	Prince Georges	38.906	-76.882	---	---
470	MD	Prince Georges	38.906	-76.882	---	---
475	MD	Prince Georges	38.906	-76.882	---	---
500	MD	Prince Georges	38.906	-76.882	---	---
673	MD	Prince Georges	38.906	-76.882	---	---
683	MD	Prince Georges	38.906	-76.882	---	---
693	MD	Prince Georges	38.906	-76.882	---	---
694	MD	Prince Georges	38.906	-76.882	---	---
709	MD	Prince Georges	38.906	-76.882	---	---
719	MD	Prince Georges	38.906	-76.882	---	---
744	MD	Prince Georges	38.906	-76.882	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
695	MD	Queen Anne's	39.048	-76.099	---	---
745	MD	Queen Anne's	39.048	-76.099	---	---
462	MD	---	---	---	---	---
90	MS	Attala	33.076	-89.573	33.048	-89.542
91	MS	Attala	33.076	-89.573	33.044	-89.541
3	MS	Clarke	32.057	-88.725	---	---
37	MS	Clarke	32.057	-88.725	32.019	-88.705
38	MS	Clarke	32.057	-88.725	---	---
39	MS	Clarke	32.057	-88.725	32.030	-88.705
73	MS	Clarke	32.057	-88.725	---	---
81	MS	Clarke	32.057	-88.725	---	---
95	MS	Clarke	32.057	-88.725	32.169	-88.815
258	MS	Clarke	32.057	-88.725	---	---
294	MS	Clarke	32.057	-88.725	---	---
332	MS	Clarke	32.057	-88.725	---	---
360	MS	Clarke	32.057	-88.725	---	---
434	MS	Clarke	32.057	-88.725	---	---
497	MS	Clarke	32.057	-88.725	---	---
519	MS	Clarke	32.057	-88.725	---	---
541	MS	Clarke	32.057	-88.725	---	---
597	MS	Clarke	32.057	-88.725	---	---
598	MS	Clarke	32.057	-88.725	---	---
600	MS	Clarke	32.057	-88.725	---	---
601	MS	Clarke	32.057	-88.725	---	---
602	MS	Clarke	32.057	-88.725	---	---
603	MS	Clarke	32.057	-88.725	---	---
606	MS	Clarke	32.057	-88.725	---	---
632	MS	Clarke	32.057	-88.725	---	---
637	MS	Clarke	32.057	-88.725	---	---
644	MS	Clarke	32.057	-88.725	---	---
679	MS	Clarke	32.057	-88.725	---	---
738	MS	Clarke	32.057	-88.725	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
817	MS	Clarke	32.057	-88.725	---	---
944	MS	Clarke	32.057	-88.725	---	---
26	MS	Hinds	32.294	-90.305	32.340	90.628
27	MS	Hinds	32.294	-90.305	32.326	-90.156
77	MS	Hinds	32.294	-90.305	---	---
78	MS	Hinds	32.294	-90.305	---	---
82	MS	Hinds	32.294	-90.305	---	---
87	MS	Hinds	32.294	-90.305	32.177	90.243
295	MS	Hinds	32.294	-90.305	---	---
296	MS	Hinds	32.294	-90.305	---	---
297	MS	Hinds	32.294	-90.305	---	---
323	MS	Hinds	32.294	-90.305	---	---
448	MS	Hinds	32.294	-90.305	---	---
484	MS	Hinds	32.294	-90.305	---	---
485	MS	Hinds	32.294	-90.305	---	---
495	MS	Hinds	32.294	-90.305	---	---
596	MS	Hinds	32.294	-90.305	---	---
657	MS	Hinds	32.294	-90.305	---	---
808	MS	Hinds	32.294	-90.305	---	---
818	MS	Hinds	32.294	-90.305	---	---
819	MS	Hinds	32.294	-90.305	---	---
880	MS	Hinds	32.294	-90.305	---	---
433	MS	Jasper	31.999	-89.146	---	---
857	MS	Jasper	31.999	-89.146	---	---
991	MS	Jasper	31.999	-89.146	---	---
28	MS	Lauderdale	32.400	-88.678	---	---
29	MS	Lauderdale	32.400	-88.678	32.356	-88.684
30	MS	Lauderdale	32.400	-88.678	32.263	-88.444
162	MS	Lauderdale	32.400	-88.678	---	---
163	MS	Lauderdale	32.400	-88.678	---	---
164	MS	Lauderdale	32.400	-88.678	---	---
165	MS	Lauderdale	32.400	-88.678	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
166	MS	Lauderdale	32.400	-88.678	---	---
599	MS	Lauderdale	32.400	-88.678	---	---
633	MS	Lauderdale	32.400	-88.678	---	---
646	MS	Lauderdale	32.400	-88.678	---	---
660	MS	Lauderdale	32.400	-88.678	---	---
4	MS	Newton	32.405	-89.118	---	---
31	MS	Newton	32.405	-89.118	32.301	-89.045
32	MS	Newton	32.405	-89.118	32.340	-89.132
40	MS	Newton	32.405	-89.118	32.339	-89.139
505	MS	Newton	32.405	-89.118	---	---
643	MS	Newton	32.405	-89.118	---	---
645	MS	Newton	32.405	-89.118	---	---
739	MS	Newton	32.405	-89.118	---	---
987	MS	Newton	32.405	-89.118	---	---
92	MS	Rankin	32.266	-89.999	32.174	-90.189
414	MS	Rankin	32.266	-89.999	---	---
445	MS	Rankin	32.266	-89.999	---	---
447	MS	Rankin	32.266	-89.999	---	---
806	MS	Rankin	32.266	-89.999	---	---
812	MS	Rankin	32.266	-89.999	---	---
881	MS	Rankin	32.266	-89.999	---	---
894	MS	Scott	32.392	-89.518	---	---
93	MS	Smith	31.985	-89.518	31.967	-89.388
94	MS	Smith	31.985	-89.518	31.990	-89.360
96	MS	Smith	31.985	-89.518	31.990	-89.420
440	MS	Smith	31.985	-89.518	---	---
621	MS	Smith	31.985	-89.518	---	---
804	MS	Smith	31.985	-89.518	---	---
805	MS	Smith	31.985	-89.518	---	---
807	MS	Smith	31.985	-89.518	---	---
811	MS	Smith	31.985	-89.518	---	---
883	MS	Smith	31.985	-89.518	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
909	MS	Smith	31.985	-89.518	---	---
501	MS	Tallahatchie	33.944	-90.228	---	---
198	MS	Tippah	34.769	-88.926	---	---
851	MS	Tippah	34.769	-88.926	---	---
852	MS	Tippah	34.769	-88.926	---	---
221	MS	Union	34.489	-89.000	---	---
33	MS	Warren	32.342	-90.855	32.412	90.839
88	MS	Warren	32.342	-90.855	32.318	90.900
89	MS	Warren	32.342	-90.855	32.350	90.785
357	MS	Warren	32.342	-90.855	---	---
417	MS	Warren	32.342	-90.855	---	---
439	MS	Warren	32.342	-90.855	---	---
443	MS	Warren	32.342	-90.855	---	---
444	MS	Warren	32.342	-90.855	---	---
813	MS	Warren	32.342	-90.855	---	---
815	MS	Warren	32.342	-90.855	---	---
820	MS	Warren	32.342	-90.855	---	---
821	MS	Warren	32.342	-90.855	---	---
822	MS	Warren	32.342	-90.855	---	---
823	MS	Warren	32.342	-90.855	---	---
824	MS	Warren	32.342	-90.855	---	---
906	MS	Warren	32.342	-90.855	---	---
995	MS	Warren	32.342	-90.855	---	---
34	MS	Wayne	31.650	-88.653	---	---
35	MS	Wayne	31.650	-88.653	31.838	-88.690
328	MS	Wayne	31.650	-88.653	---	---
356	MS	Wayne	31.650	-88.653	---	---
372	MS	Wayne	31.650	-88.653	---	---
422	MS	Wayne	31.650	-88.653	---	---
441	MS	Wayne	31.650	-88.653	---	---
442	MS	Wayne	31.650	-88.653	---	---
446	MS	Wayne	31.650	-88.653	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
605	MS	Wayne	31.650	-88.653	---	---
638	MS	Wayne	31.650	-88.653	---	---
801	MS	Wayne	31.650	-88.653	---	---
802	MS	Wayne	31.650	-88.653	---	---
803	MS	Wayne	31.650	-88.653	---	---
809	MS	Wayne	31.650	-88.653	---	---
810	MS	Wayne	31.650	-88.653	---	---
814	MS	Wayne	31.650	-88.653	---	---
825	MS	Wayne	31.650	-88.653	---	---
828	MS	Wayne	31.650	-88.653	---	---
829	MS	Wayne	31.650	-88.653	---	---
884	MS	Wayne	31.650	-88.653	---	---
885	MS	Wayne	31.650	-88.653	---	---
893	MS	Wayne	31.650	-88.653	---	---
905	MS	Wayne	31.650	-88.653	---	---
976	MS	Wayne	31.650	-88.653	---	---
988	MS	Wayne	31.650	-88.653	---	---
36	MS	Yazoo	32.798	-90.388	32.900	-90.188
156	MS	Yazoo	32.798	-90.388	---	---
309	MS	Yazoo	32.798	-90.388	---	---
310	MS	Yazoo	32.798	-90.388	---	---
311	MS	Yazoo	32.798	-90.388	---	---
312	MS	Yazoo	32.798	-90.388	---	---
486	MS	Yazoo	32.798	-90.388	---	---
496	MS	Yazoo	32.798	-90.388	---	---
647	MS	Yazoo	32.798	-90.388	---	---
7	MS	---	---	---	---	---
457	NC	Craven	35.096	-77.062	---	---
516	NC	Craven	35.096	-77.062	---	---
993	NC	Craven	35.096	-77.062	---	---
364	NC	Duplin	34.924	-77.988	---	---
400	NC	Duplin	34.924	-77.988	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
456	NC	Duplin	34.924	-77.988	---	---
526	NC	Duplin	34.924	-77.988	---	---
527	NC	Duplin	34.924	-77.988	---	---
528	NC	Duplin	34.924	-77.988	---	---
535	NC	Duplin	34.924	-77.988	---	---
831	NC	Duplin	34.924	-77.988	---	---
832	NC	Duplin	34.924	-77.988	---	---
836	NC	Duplin	34.924	-77.988	---	---
523	NC	Harnett	35.353	-78.782	---	---
713	NC	Johnston	35.526	-78.368	---	---
521	NC	Jones	35.039	-77.379	---	---
544	NC	Jones	35.039	-77.379	---	---
834	NC	Jones	35.039	-77.379	---	---
838	NC	Jones	35.039	-77.379	---	---
839	NC	Jones	35.039	-77.379	---	---
376	NC	New Hanover	34.202	-77.895	---	---
460	NC	New Hanover	34.202	-77.895	---	---
522	NC	New Hanover	34.202	-77.895	---	---
458	NC	Onslow	34.710	-77.373	---	---
529	NC	Onslow	34.710	-77.373	---	---
530	NC	Onslow	34.710	-77.373	---	---
837	NC	Onslow	34.710	-77.373	---	---
361	NC	Pender	34.500	-77.899	---	---
459	NC	Pender	34.500	-77.899	---	---
524	NC	Pender	34.500	-77.899	---	---
525	NC	Pender	34.500	-77.899	---	---
533	NC	Pender	34.500	-77.899	---	---
835	NC	Pender	34.500	-77.899	---	---
455	NC	Pitt	35.590	-77.391	---	---
534	NC	Pitt	35.590	-77.391	---	---
969	NC	Wake	35.797	-78.666	---	---
536	NC	Wayne	35.365	-77.995	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
833	NC	Wayne	35.365	-77.995	---	---
705	NC	---	---	---	---	---
840	NC	---	---	---	---	---
491	NJ	Burlington	39.955	-74.776	---	---
358	NJ	Monmouth	40.286	-74.127	---	---
366	NJ	Monmouth	40.286	-74.127	---	---
367	NJ	Monmouth	40.286	-74.127	---	---
368	NJ	Monmouth	40.286	-74.127	---	---
715	NJ	Monmouth	40.286	-74.127	---	---
743	NJ	Monmouth	40.286	-74.127	---	---
728	NJ	Ocean	39.919	-74.211	---	---
212	SC	Aiken	33.552	-81.700	---	---
404	SC	Berkeley	33.127	-79.981	35.352	-80.234
543	SC	Berkeley	33.127	-79.981	---	---
620	SC	Berkeley	33.127	-79.981	---	---
494	SC	Calhoun	33.669	-80.793	---	---
515	SC	Calhoun	33.669	-80.793	---	---
429	SC	Dorchester	33.044	-80.328	---	---
970	SC	Dorchester	33.044	-80.328	---	---
313	SC	Georgetown	33.424	-79.313	---	---
314	SC	Georgetown	33.424	-79.313	---	---
169	SC	Lexington	33.949	-81.232	---	---
5	SC	Orangeburg	33.464	-80.812	---	---
170	SC	Orangeburg	33.464	-80.812	---	---
171	SC	Orangeburg	33.464	-80.812	---	---
172	SC	Orangeburg	33.464	-80.812	---	---
173	SC	Orangeburg	33.464	-80.812	---	---
174	SC	Orangeburg	33.464	-80.812	---	---
175	SC	Orangeburg	33.464	-80.812	---	---
176	SC	Orangeburg	33.464	-80.812	---	---
177	SC	Orangeburg	33.464	-80.812	---	---
483	SC	Orangeburg	33.464	-80.812	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
487	SC	Orangeburg	33.464	-80.812	---	---
489	SC	Orangeburg	33.464	-80.812	---	---
492	SC	Orangeburg	33.464	-80.812	---	---
506	SC	Orangeburg	33.464	-80.812	---	---
672	SC	Orangeburg	33.464	-80.812	---	---
698	SC	Orangeburg	33.464	-80.812	---	---
520	SC	---	---	---	---	---
199	TN	Hardeman	35.203	-88.997	---	---
226	TN	Hardeman	35.203	-88.997	---	---
227	TN	Hardeman	35.203	-88.997	---	---
228	TN	Hardeman	35.203	-88.997	---	---
722	TN	Hardeman	35.203	-88.997	---	---
723	TN	Hardeman	35.203	-88.997	---	---
724	TN	Hardeman	35.203	-88.997	---	---
725	TN	Hardeman	35.203	-88.997	---	---
849	TN	Hardeman	35.203	-88.997	---	---
850	TN	Hardeman	35.203	-88.997	---	---
180	TX	Anderson	31.798	-95.630	---	---
181	TX	Anderson	31.798	-95.630	---	---
182	TX	Anderson	31.798	-95.630	---	---
265	TX	Anderson	31.798	-95.630	---	---
266	TX	Anderson	31.798	-95.630	---	---
640	TX	Anderson	31.798	-95.630	---	---
614	TX	Angelina	31.288	-94.671	---	---
629	TX	Angelina	31.288	-94.671	---	---
277	TX	Atascosa	28.928	-98.529	---	---
278	TX	Atascosa	28.928	-98.529	---	---
279	TX	Atascosa	28.928	-98.529	---	---
346	TX	Atascosa	28.928	-98.529	---	---
12	TX	Bastrop	30.126	-97.296	---	---
13	TX	Bastrop	30.126	-97.296	---	---
14	TX	Bastrop	30.126	-97.296	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
20	TX	Bastrop	30.126	-97.296	29.942	97.145
21	TX	Bastrop	30.126	-97.296	30.020	97.168
22	TX	Bastrop	30.126	-97.296	30.012	97.163
23	TX	Bastrop	30.126	-97.296	30.013	97.159
24	TX	Bastrop	30.126	-97.296	30.182	97.473
25	TX	Bastrop	30.126	-97.296	30.187	97.480
185	TX	Bastrop	30.126	-97.296	---	---
236	TX	Bastrop	30.126	-97.296	---	---
237	TX	Bastrop	30.126	-97.296	---	---
238	TX	Bastrop	30.126	-97.296	---	---
269	TX	Bastrop	30.126	-97.296	---	---
270	TX	Bastrop	30.126	-97.296	---	---
321	TX	Bastrop	30.126	-97.296	---	---
322	TX	Bastrop	30.126	-97.296	---	---
326	TX	Bastrop	30.126	-97.296	---	---
348	TX	Bastrop	30.126	-97.296	---	---
369	TX	Bastrop	30.126	-97.296	---	---
373	TX	Bastrop	30.126	-97.296	---	---
374	TX	Bastrop	30.126	-97.296	---	---
488	TX	Bastrop	30.126	-97.296	---	---
612	TX	Bastrop	30.126	-97.296	---	---
697	TX	Bastrop	30.126	-97.296	---	---
699	TX	Bastrop	30.126	-97.296	---	---
736	TX	Bastrop	30.126	-97.296	---	---
737	TX	Bastrop	30.126	-97.296	---	---
751	TX	Bastrop	30.126	-97.296	---	---
754	TX	Bastrop	30.126	-97.296	---	---
982	TX	Bastrop	30.126	-97.296	---	---
983	TX	Bastrop	30.126	-97.296	---	---
985	TX	Bastrop	30.126	-97.296	---	---
996	TX	Bastrop	30.126	-97.296	---	---
999	TX	Bastrop	30.126	-97.296	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
752	TX	Bexar	29.453	-98.509	---	---
16	TX	Brazos	30.635	-96.342	---	---
274	TX	Brazos	30.635	-96.342	---	---
510	TX	Brazos	30.635	-96.342	---	---
696	TX	Brazos	30.635	-96.342	---	---
986	TX	Brazos	30.635	-96.342	---	---
15	TX	Burleson	30.444	-96.616	30.628	96.545
17	TX	Burleson	30.444	-96.616	---	---
324	TX	Burleson	30.444	-96.616	---	---
363	TX	Burleson	30.444	-96.616	---	---
375	TX	Burleson	30.444	-96.616	30.628	96.545
377	TX	Burleson	30.444	-96.616	---	---
411	TX	Burleson	30.444	-96.616	---	---
239	TX	Caldwell	29.815	-97.669	---	---
240	TX	Caldwell	29.815	-97.669	---	---
984	TX	Caldwell	29.815	-97.669	---	---
347	TX	Cherokee	31.895	-95.190	---	---
362	TX	Cherokee	31.895	-95.190	---	---
639	TX	Cherokee	31.895	-95.190	---	---
658	TX	Cherokee	31.895	-95.190	---	---
235	TX	Falls	31.266	-96.964	---	---
746	TX	Falls	31.266	-96.964	---	---
997	TX	Falls	31.266	-96.964	---	---
352	TX	Frio	28.883	-99.112	---	---
179	TX	Gonzales	29.457	-97.508	---	---
275	TX	Gonzales	29.457	-97.508	---	---
250	TX	Guadalupe	29.594	-97.994	---	---
18	TX	Houston	31.326	-95.434	---	---
183	TX	Houston	31.326	-95.434	---	---
188	TX	Houston	31.326	-95.434	---	---
267	TX	Houston	31.326	-95.434	---	---
331	TX	Houston	31.326	-95.434	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
337	TX	Houston	31.326	-95.434	---	---
343	TX	Houston	31.326	-95.434	---	---
353	TX	Houston	31.326	-95.434	---	---
608	TX	Houston	31.326	-95.434	---	---
641	TX	Houston	31.326	-95.434	---	---
980	TX	Hunt	33.111	-96.085	---	---
230	TX	Kaufman	32.615	-96.302	---	---
231	TX	Kaufman	32.615	-96.302	---	---
721	TX	Kaufman	32.615	-96.302	---	---
280	TX	La Salle	28.354	-99.162	---	---
281	TX	La Salle	28.354	-99.162	---	---
268	TX	Lee	30.272	-96.947	---	---
333	TX	Lee	30.272	-96.947	---	---
334	TX	Lee	30.272	-96.947	---	---
184	TX	Leon	31.276	-96.063	---	---
359	TX	Leon	31.276	-96.063	---	---
449	TX	Leon	31.276	-96.063	---	---
200	TX	Limestone	31.575	-96.552	---	---
232	TX	Limestone	31.575	-96.552	---	---
233	TX	Limestone	31.575	-96.552	---	---
234	TX	Limestone	31.575	-96.552	---	---
854	TX	Limestone	31.575	-96.552	---	---
201	TX	Maverick	28.743	-100.387	---	---
222	TX	Maverick	28.743	-100.387	---	---
223	TX	Maverick	28.743	-100.387	---	---
224	TX	Maverick	28.743	-100.387	---	---
225	TX	Maverick	28.743	-100.387	---	---
246	TX	Maverick	28.743	-100.387	---	---
247	TX	Maverick	28.743	-100.387	---	---
248	TX	Maverick	28.743	-100.387	---	---
251	TX	Maverick	28.743	-100.387	---	---
317	TX	Maverick	28.743	-100.387	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
318	TX	Maverick	28.743	-100.387	---	---
319	TX	Maverick	28.743	-100.387	---	---
451	TX	Maverick	28.743	-100.387	---	---
474	TX	Maverick	28.743	-100.387	---	---
979	TX	Maverick	28.743	-100.387	---	---
241	TX	Medina	29.294	-99.031	---	---
242	TX	Medina	29.294	-99.031	---	---
243	TX	Medina	29.294	-99.031	---	---
315	TX	Medina	29.294	-99.031	---	---
450	TX	Medina	29.294	-99.031	---	---
740	TX	Medina	29.294	-99.031	---	---
741	TX	Medina	29.294	-99.031	---	---
742	TX	Medina	29.294	-99.031	---	---
753	TX	Medina	29.294	-99.031	---	---
624	TX	Milam	30.780	-97.006	---	---
747	TX	Milam	30.780	-97.006	---	---
748	TX	Milam	30.780	-97.006	---	---
749	TX	Milam	30.780	-97.006	---	---
264	TX	Nacogdoches	31.631	-94.629	---	---
19	TX	Robertson	30.981	-96.580	---	---
271	TX	Robertson	30.981	-96.580	---	---
272	TX	Robertson	30.981	-96.580	---	---
273	TX	Robertson	30.981	-96.580	---	---
325	TX	Robertson	30.981	-96.580	---	---
642	TX	Robertson	30.981	-96.580	---	---
167	TX	Sabine	31.339	-93.857	---	---
168	TX	Sabine	31.339	-93.857	---	---
192	TX	Sabine	31.339	-93.857	---	---
214	TX	Sabine	31.339	-93.857	---	---
254	TX	Sabine	31.339	-93.857	---	---
261	TX	Sabine	31.339	-93.857	---	---
262	TX	Sabine	31.339	-93.857	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
308	TX	Sabine	31.339	-93.857	---	---
351	TX	Sabine	31.339	-93.857	---	---
627	TX	Sabine	31.339	-93.857	---	---
711	TX	Sabine	31.339	-93.857	---	---
779	TX	Sabine	31.339	-93.857	---	---
780	TX	Sabine	31.339	-93.857	---	---
781	TX	Sabine	31.339	-93.857	---	---
782	TX	Sabine	31.339	-93.857	---	---
783	TX	Sabine	31.339	-93.857	---	---
784	TX	Sabine	31.339	-93.857	---	---
785	TX	Sabine	31.339	-93.857	---	---
786	TX	Sabine	31.339	-93.857	---	---
787	TX	Sabine	31.339	-93.857	---	---
788	TX	Sabine	31.339	-93.857	---	---
800	TX	Sabine	31.339	-93.857	---	---
263	TX	San Augustine	31.391	-94.155	---	---
329	TX	San Augustine	31.391	-94.155	---	---
320	TX	Travis	30.322	-97.770	---	---
981	TX	Travis	30.322	-97.770	---	---
244	TX	Uvalde	29.282	-99.733	---	---
245	TX	Uvalde	29.282	-99.733	---	---
316	TX	Uvalde	29.282	-99.733	---	---
282	TX	Webb	27.592	-99.390	---	---
283	TX	Webb	27.592	-99.390	---	---
284	TX	Webb	27.592	-99.390	---	---
285	TX	Webb	27.592	-99.390	---	---
286	TX	Webb	27.592	-99.390	---	---
613	TX	Webb	27.592	-99.390	---	---
707	TX	Webb	27.592	-99.390	---	---
731	TX	Webb	27.592	-99.390	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
732	TX	Webb	27.592	-99.390	---	---
276	TX	Wilson	29.196	-98.109	---	---
287	TX	Zapata	26.953	-99.203	---	---
288	TX	Zapata	26.953	-99.203	---	---
289	TX	Zapata	26.953	-99.203	---	---
290	TX	Zapata	26.953	-99.203	---	---
291	TX	Zapata	26.953	-99.203	---	---
630	TX	Zapata	26.953	-99.203	---	---
708	TX	Zapata	26.953	-99.203	---	---
733	TX	Zapata	26.953	-99.203	---	---
480	VA	Caroline	38.033	-77.383	---	---
481	VA	Caroline	38.033	-77.383	---	---
425	VA	Hanover	37.714	-77.444	37.657	-77.184
503	VA	Hanover	37.714	-77.444	---	---
509	VA	Hanover	37.714	-77.444	---	---
701	VA	Hanover	37.714	-77.444	---	---
717	VA	Hanover	37.714	-77.444	---	---
945	VA	Hanover	37.714	-77.444	---	---
949	VA	Hanover	37.714	-77.444	---	---
950	VA	Hanover	37.714	-77.444	---	---
951	VA	Hanover	37.714	-77.444	---	---
204	VA	King George	38.292	-77.152	---	---
220	VA	King George	38.292	-77.152	---	---
342	VA	King George	38.292	-77.152	---	---
504	VA	King George	38.292	-77.152	---	---
675	VA	King George	38.292	-77.152	---	---
676	VA	King George	38.292	-77.152	---	---
946	VA	King George	38.292	-77.152	---	---
947	VA	King George	38.292	-77.152	---	---
702	VA	King William	37.662	-76.999	---	---
703	VA	Prince Georges	37.204	-77.263	---	---

Table C.4. Localities in the Gulf and Atlantic Coastal Plains containing fossil occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Paleogene, continued.

LocalityID	State	County	CoLat	CoLong	LocLat	LocLong
712	VA	Prince Georges	37.204	-77.263	---	---
718	VA	Prince Georges	37.204	-77.263	---	---
252	VA	Stafford	38.394	-77.432	---	---
253	VA	Stafford	38.394	-77.432	---	---
682	VA	Stafford	38.394	-77.432	---	---
716	VA	Stafford	38.394	-77.432	---	---
628	VA	York	37.194	-76.504	---	---

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene. Note that individual localities might have multiple LocalityID numbers due to historical differences in nomenclature among workers. Rows are sorted by Superfamily, Genus, and then Species. Columns are:

1. Superfamily: assignments are taken from Palmer and Brann (1965) and the bivalve volume of the Treatise on Invertebrate Paleontology (Moore 1969-1971), and were used to group species into target clades for analysis
2. Genus: names are taken from Palmer and Brann (1965) and were not evaluated here for congruence with more recent systematic treatments of the genus nor used in any of the analyses presented herein. All genus names are accordingly presented in quotes; see Appendix D for a partially updated working taxonomy for bivalve species in the Carditoidea, Pectinoidea, and Veneroidea. Paleocene and Eocene species described after the publication of Palmer and Brann's (1965) compendium, and Oligocene species described by Dockery (1982), are indicated with an asterisk next to the genus assignment.
3. Species: names are taken from Palmer and Brann (1965), with additions and modifications from Heaslip (1968), Glawe (1969; 1974), Allen (1970), Dockery (1980; 1982; 1997), Campbell (1995), and Garvie (1996)
4. LocalityID: matches LocalityID in Table C.4
5. StratID: matches StratID in Table C.3

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	"Carditamera"*	williamsi	156	38
Carditoidea	"Carditamera"*	williamsi	36	38
Carditoidea	"Carditella"*	aldrichi	357	42
Carditoidea	"Carditella"*	aldrichi	417	42
Carditoidea	"Carditella"*	aldrichi	440	45
Carditoidea	"Cf. Miodontiscus"	aldrichianus	340	53
Carditoidea	"Cf. Miodontiscus"	aldrichianus	340	8
Carditoidea	"Cf. Miodontiscus"	timothii	62	16
Carditoidea	"Venericardia"	aldrichi	1	34
Carditoidea	"Venericardia"	aldrichi	371	34
Carditoidea	"Venericardia"	aldrichi	46	34
Carditoidea	"Venericardia"	alticostata	1	34
Carditoidea	"Venericardia"	alticostata	336	---
Carditoidea	"Venericardia"	alticostata	371	34
Carditoidea	"Venericardia"	alticostata	454	34
Carditoidea	"Venericardia"	alticostata	371	71

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	"Venericardia"	alticostata	213	71
Carditoidea	"Venericardia"	alticostata	469	71
Carditoidea	"Venericardia"	alticostata	567	34
Carditoidea	"Venericardia"	alticostata	176	47
Carditoidea	"Venericardia"	alticostata	993	---
Carditoidea	"Venericardia"	alticostata	46	34
Carditoidea	"Venericardia"	alticostata	48	34
Carditoidea	"Venericardia"	alticostata	371	33
Carditoidea	"Venericardia"	alticostata	259	23
Carditoidea	"Venericardia"*	amplicrenata	320	67
Carditoidea	"Venericardia"	angustoscrobis	10	33
Carditoidea	"Venericardia"	angustoscrobis	1	34
Carditoidea	"Venericardia"	angustoscrobis	46	34
Carditoidea	"Venericardia"	apodensata	82	38
Carditoidea	"Venericardia"	apodensata	83	38
Carditoidea	"Venericardia"	apodensata	74	38
Carditoidea	"Venericardia"	apodensata	349	38
Carditoidea	"Venericardia"	apodensata	323	38
Carditoidea	"Venericardia"	apodensata	298	38
Carditoidea	"Venericardia"	apodensata	306	38
Carditoidea	"Venericardia"	apodensata	300	38
Carditoidea	"Venericardia"	apodensata	81	38
Carditoidea	"Venericardia"	apodensata	650	38
Carditoidea	"Venericardia"	apodensata	301	38
Carditoidea	"Venericardia"	apodensata	303	38
Carditoidea	"Venericardia"	apodensata	437	48
Carditoidea	"Venericardia"	apodensata	293	38
Carditoidea	"Venericardia"	apodensata	255	38
Carditoidea	"Venericardia"	apodensata	294	38
Carditoidea	"Venericardia"	apodensata	295	38
Carditoidea	"Venericardia"	apodensata	296	38

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	"Venericardia"	apodensata	297	38
Carditoidea	"Venericardia"	apodensata	302	38
Carditoidea	"Venericardia"	apodensata	305	38
Carditoidea	"Venericardia"	apodensata	155	38
Carditoidea	"Venericardia"	apodensata	307	38
Carditoidea	"Venericardia"	apodensata	308	38
Carditoidea	"Venericardia"	apodensata	512	38
Carditoidea	"Venericardia"	apodensata	596	38
Carditoidea	"Venericardia"	apodensata	485	38
Carditoidea	"Venericardia"	apodensata	156	38
Carditoidea	"Venericardia"	apodensata	647	38
Carditoidea	"Venericardia"	apodensata	597	38
Carditoidea	"Venericardia"	apodensata	36	38
Carditoidea	"Venericardia"	apodensata	27	38
Carditoidea	"Venericardia"	apodensata	496	38
Carditoidea	"Venericardia"	apodensata	72	38
Carditoidea	"Venericardia"	aposmithii	---	---
Carditoidea	"Venericardia"	aposmithii	68	52
Carditoidea	"Venericardia"	aposmithii	67	72
Carditoidea	"Venericardia"	aposmithii	69	14
Carditoidea	"Venericardia"	aposmithii	345	13
Carditoidea	"Venericardia"	aposmithii	386	52
Carditoidea	"Venericardia"	aposmithii	194	14
Carditoidea	"Venericardia"	aposmithii	210	14
Carditoidea	"Venericardia"	aposmithii	193	13
Carditoidea	"Venericardia"	aposmithii	962	13
Carditoidea	"Venericardia"	aposmithii	209	13
Carditoidea	"Venericardia"	aposmithii	963	13
Carditoidea	"Venericardia"	aposmithii	964	13
Carditoidea	"Venericardia"	aposmithii	957	72
Carditoidea	"Venericardia"	aposmithii	966	72

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	"Venericardia"	aposmithii	965	52
Carditoidea	"Venericardia"	aposmithii	967	52
Carditoidea	"Venericardia"	aposmithii	67	52
Carditoidea	"Venericardia"	aposmithii	69	52
Carditoidea	"Venericardia"	aposmithii	210	52
Carditoidea	"Venericardia"	ascia	342	50
Carditoidea	"Venericardia"	ascia	220	50
Carditoidea	"Venericardia"	ascia	425	50
Carditoidea	"Venericardia"	ascia	431	50
Carditoidea	"Venericardia"	ascia	204	50
Carditoidea	"Venericardia"	ascia	202	50
Carditoidea	"Venericardia"	ascia	203	50
Carditoidea	"Venericardia"	ascia	205	50
Carditoidea	"Venericardia"	ascia	949	50
Carditoidea	"Venericardia"	bashiplata	344	16
Carditoidea	"Venericardia"	bashiplata	62	16
Carditoidea	"Venericardia"	bashiplata	160	16
Carditoidea	"Venericardia"	bashiplata	471	16
Carditoidea	"Venericardia"	bashiplata	191	16
Carditoidea	"Venericardia"	bashiplata	617	16
Carditoidea	"Venericardia"	bashiplata	618	16
Carditoidea	"Venericardia"	bashiplata	653	16
Carditoidea	"Venericardia"	bashiplata	210	14
Carditoidea	"Venericardia"	bashiplata	69	14
Carditoidea	"Venericardia"	bashiplata	157	16
Carditoidea	"Venericardia"	bashiplata	164	16
Carditoidea	"Venericardia"	bashiplata	660	16
Carditoidea	"Venericardia"	bashiplata	162	16
Carditoidea	"Venericardia"	bashiplata	165	16
Carditoidea	"Venericardia"	bashiplata	158	16
Carditoidea	"Venericardia"	bashiplata	159	16

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	“Venericardia”	bashiplata	161	16
Carditoidea	“Venericardia”	bashiplata	163	16
Carditoidea	“Venericardia”	bashiplata	166	16
Carditoidea	“Venericardia”	bashiplata	167	16
Carditoidea	“Venericardia”	bashiplata	168	16
Carditoidea	“Venericardia”	bashiplata	427	16
Carditoidea	“Venericardia”	bashiplata	633	16
Carditoidea	“Venericardia”	bashiplata	796	15
Carditoidea	“Venericardia”	bashiplata	797	15
Carditoidea	“Venericardia”	bashiplata	798	15
Carditoidea	“Venericardia”	bashiplata	952	16
Carditoidea	“Venericardia”	bashiplata	953	16
Carditoidea	“Venericardia”	bashiplata	959	16
Carditoidea	“Venericardia”	bashiplata	954	16
Carditoidea	“Venericardia”	bashiplata	968	16
Carditoidea	“Venericardia”	bashiplata	655	16
Carditoidea	“Venericardia”	bashiplata	664	16
Carditoidea	“Venericardia”	bashiplata	955	16
Carditoidea	“Venericardia”	bashiplata	956	16
Carditoidea	“Venericardia”	bashiplata	110	16
Carditoidea	“Venericardia”	bashiplata	56	16
Carditoidea	“Venericardia”	bashiplata	57	16
Carditoidea	“Venericardia”	bilineata	494	47
Carditoidea	“Venericardia”	blandingi	492	63
Carditoidea	“Venericardia”	bulla	373	1
Carditoidea	“Venericardia”	bulla	374	70
Carditoidea	“Venericardia”	bulla	322	2
Carditoidea	“Venericardia”	bulla	321	2
Carditoidea	“Venericardia”	bulla	736	2
Carditoidea	“Venericardia”	bulla	737	70
Carditoidea	“Venericardia”	bulla	997	1

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	“Venericardia”	bulla	999	2
Carditoidea	“Venericardia”	carolinensis	494	47
Carditoidea	“Venericardia”*	carsonensis	328	40
Carditoidea	“Venericardia”*	carsonensis	372	40
Carditoidea	“Venericardia”*	carsonensis	357	51
Carditoidea	“Venericardia”*	carsonensis	422	40
Carditoidea	“Venericardia”*	carsonensis	801	40
Carditoidea	“Venericardia”*	carsonensis	809	40
Carditoidea	“Venericardia”*	carsonensis	638	40
Carditoidea	“Venericardia”*	carsonensis	632	40
Carditoidea	“Venericardia”*	carsonensis	802	41
Carditoidea	“Venericardia”*	carsonensis	804	42
Carditoidea	“Venericardia”*	carsonensis	805	42
Carditoidea	“Venericardia”*	carsonensis	812	42
Carditoidea	“Venericardia”*	carsonensis	447	42
Carditoidea	“Venericardia”*	carsonensis	806	42
Carditoidea	“Venericardia”*	carsonensis	417	42
Carditoidea	“Venericardia”*	carsonensis	808	45
Carditoidea	“Venericardia”	claiboplata	1	---
Carditoidea	“Venericardia”	claiboplata	1	34
Carditoidea	“Venericardia”	claiboplata	10	33
Carditoidea	“Venericardia”	claiboplata	324	21
Carditoidea	“Venericardia”	claiboplata	337	23
Carditoidea	“Venericardia”	claiboplata	335	33
Carditoidea	“Venericardia”	claiboplata	348	23
Carditoidea	“Venericardia”	claiboplata	186	23
Carditoidea	“Venericardia”	claiboplata	1	33
Carditoidea	“Venericardia”	claiboplata	136	34
Carditoidea	“Venericardia”	claiboplata	476	71
Carditoidea	“Venericardia”	claiboplata	189	---
Carditoidea	“Venericardia”	claiboplata	178	33

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	“Venericardia”	claiboplata	169	47
Carditoidea	“Venericardia”	claiboplata	170	47
Carditoidea	“Venericardia”	claiboplata	171	47
Carditoidea	“Venericardia”	claiboplata	172	47
Carditoidea	“Venericardia”	claiboplata	173	47
Carditoidea	“Venericardia”	claiboplata	174	47
Carditoidea	“Venericardia”	claiboplata	175	47
Carditoidea	“Venericardia”	claiboplata	176	47
Carditoidea	“Venericardia”	claiboplata	177	47
Carditoidea	“Venericardia”	claiboplata	179	19
Carditoidea	“Venericardia”	claiboplata	180	21
Carditoidea	“Venericardia”	claiboplata	181	21
Carditoidea	“Venericardia”	claiboplata	182	21
Carditoidea	“Venericardia”	claiboplata	183	21
Carditoidea	“Venericardia”	claiboplata	184	21
Carditoidea	“Venericardia”	claiboplata	185	21
Carditoidea	“Venericardia”	claiboplata	188	23
Carditoidea	“Venericardia”	claiboplata	189	34
Carditoidea	“Venericardia”	claiboplata	190	34
Carditoidea	“Venericardia”	claiboplata	552	28
Carditoidea	“Venericardia”	claiboplata	189	113
Carditoidea	“Venericardia”	claiboplata	569	113
Carditoidea	“Venericardia”	claiboplata	211	113
Carditoidea	“Venericardia”	claiboplata	189	31
Carditoidea	“Venericardia”	claiboplata	564	31
Carditoidea	“Venericardia”	claiboplata	551	33
Carditoidea	“Venericardia”	claiboplata	566	33
Carditoidea	“Venericardia”	claiboplata	371	34
Carditoidea	“Venericardia”	claiboplata	567	34
Carditoidea	“Venericardia”	claiboplata	454	34
Carditoidea	“Venericardia”	claiboplata	601	56

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	“Venericardia”	claiboplata	469	71
Carditoidea	“Venericardia”	claiboplata	108	33
Carditoidea	“Venericardia”	claiboplata	46	34
Carditoidea	“Venericardia”	claiboplata	48	34
Carditoidea	“Venericardia”	claiboplata	553	28
Carditoidea	“Venericardia”	claiboplata	554	33
Carditoidea	“Venericardia”	claviger	212	71
Carditoidea	“Venericardia”	claviger	213	71
Carditoidea	“Venericardia”	coloradonis	324	21
Carditoidea	“Venericardia”	coloradonis	326	21
Carditoidea	“Venericardia”	coloradonis	332	23
Carditoidea	“Venericardia”	coloradonis	8	23
Carditoidea	“Venericardia”	coloradonis	12	21
Carditoidea	“Venericardia”	coloradonis	259	86
Carditoidea	“Venericardia”	coloradonis	3	23
Carditoidea	“Venericardia”	coloradonis	59	23
Carditoidea	“Venericardia”	coloradonis	9	23
Carditoidea	“Venericardia”	coloradonis	369	21
Carditoidea	“Venericardia”	coloradonis	264	21
Carditoidea	“Venericardia”	coloradonis	991	23
Carditoidea	“Venericardia”	coloradonis	519	23
Carditoidea	“Venericardia”	coloradonis	259	23
Carditoidea	“Venericardia”	coloradonis	643	23
Carditoidea	“Venericardia”	coloradonis	32	23
Carditoidea	“Venericardia”	coloradonis	23	21
Carditoidea	“Venericardia”	coloradonis	40	23
Carditoidea	“Venericardia”	coloradonis	996	69
Carditoidea	“Venericardia”	complexicosta	186	23
Carditoidea	“Venericardia”	complexicosta	511	33
Carditoidea	“Venericardia”	complexicosta	738	23
Carditoidea	“Venericardia”	complexicosta	739	23

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	"Venericardia"	complexicosta	985	23
Carditoidea	"Venericardia"	complexicosta	371	34
Carditoidea	"Venericardia"	complexicosta	46	34
Carditoidea	"Venericardia"	cookei	211	48
Carditoidea	"Venericardia"	cookei	552	28
Carditoidea	"Venericardia"	cookei	553	28
Carditoidea	"Venericardia"	cookei	570	28
Carditoidea	"Venericardia"	cookei	569	113
Carditoidea	"Venericardia"	cookei	211	113
Carditoidea	"Venericardia"	crenaea	450	67
Carditoidea	"Venericardia"	crenaea	740	67
Carditoidea	"Venericardia"	crenaea	741	67
Carditoidea	"Venericardia"	crenaea	315	67
Carditoidea	"Venericardia"	crenaea	242	67
Carditoidea	"Venericardia"	crenaea	245	67
Carditoidea	"Venericardia"	crenaea	244	67
Carditoidea	"Venericardia"	densata	334	23
Carditoidea	"Venericardia"	densata	10	33
Carditoidea	"Venericardia"	densata	335	33
Carditoidea	"Venericardia"	densata	274	23
Carditoidea	"Venericardia"	densata	12	21
Carditoidea	"Venericardia"	densata	347	21
Carditoidea	"Venericardia"	densata	333	---
Carditoidea	"Venericardia"	densata	348	23
Carditoidea	"Venericardia"	densata	351	12
Carditoidea	"Venericardia"	densata	352	23
Carditoidea	"Venericardia"	densata	353	71
Carditoidea	"Venericardia"	densata	375	23
Carditoidea	"Venericardia"	densata	377	23
Carditoidea	"Venericardia"	densata	278	23
Carditoidea	"Venericardia"	densata	257	33

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	"Venericardia"	densata	1	33
Carditoidea	"Venericardia"	densata	467	71
Carditoidea	"Venericardia"	densata	254	14
Carditoidea	"Venericardia"	densata	178	33
Carditoidea	"Venericardia"	densata	255	33
Carditoidea	"Venericardia"	densata	256	33
Carditoidea	"Venericardia"	densata	258	86
Carditoidea	"Venericardia"	densata	259	23
Carditoidea	"Venericardia"	densata	260	23
Carditoidea	"Venericardia"	densata	261	21
Carditoidea	"Venericardia"	densata	262	21
Carditoidea	"Venericardia"	densata	263	21
Carditoidea	"Venericardia"	densata	264	21
Carditoidea	"Venericardia"	densata	181	21
Carditoidea	"Venericardia"	densata	265	21
Carditoidea	"Venericardia"	densata	266	21
Carditoidea	"Venericardia"	densata	182	21
Carditoidea	"Venericardia"	densata	183	21
Carditoidea	"Venericardia"	densata	267	21
Carditoidea	"Venericardia"	densata	184	21
Carditoidea	"Venericardia"	densata	268	21
Carditoidea	"Venericardia"	densata	269	21
Carditoidea	"Venericardia"	densata	270	21
Carditoidea	"Venericardia"	densata	271	23
Carditoidea	"Venericardia"	densata	272	23
Carditoidea	"Venericardia"	densata	273	23
Carditoidea	"Venericardia"	densata	275	23
Carditoidea	"Venericardia"	densata	276	23
Carditoidea	"Venericardia"	densata	277	23
Carditoidea	"Venericardia"	densata	279	23
Carditoidea	"Venericardia"	densata	280	23

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	“Venericardia”	densata	281	23
Carditoidea	“Venericardia”	densata	282	23
Carditoidea	“Venericardia”	densata	283	23
Carditoidea	“Venericardia”	densata	284	23
Carditoidea	“Venericardia”	densata	285	23
Carditoidea	“Venericardia”	densata	286	23
Carditoidea	“Venericardia”	densata	287	23
Carditoidea	“Venericardia”	densata	288	23
Carditoidea	“Venericardia”	densata	289	23
Carditoidea	“Venericardia”	densata	290	23
Carditoidea	“Venericardia”	densata	511	33
Carditoidea	“Venericardia”	densata	371	33
Carditoidea	“Venericardia”	densata	551	33
Carditoidea	“Venericardia”	densata	377	59
Carditoidea	“Venericardia”	densata	624	19
Carditoidea	“Venericardia”	densata	601	56
Carditoidea	“Venericardia”	densata	764	11
Carditoidea	“Venericardia”	densata	765	11
Carditoidea	“Venericardia”	densata	766	11
Carditoidea	“Venericardia”	densata	767	11
Carditoidea	“Venericardia”	densata	768	11
Carditoidea	“Venericardia”	densata	769	11
Carditoidea	“Venericardia”	densata	770	11
Carditoidea	“Venericardia”	densata	771	11
Carditoidea	“Venericardia”	densata	772	11
Carditoidea	“Venericardia”	densata	773	11
Carditoidea	“Venericardia”	densata	774	11
Carditoidea	“Venericardia”	densata	775	11
Carditoidea	“Venericardia”	densata	776	11
Carditoidea	“Venericardia”	densata	777	11
Carditoidea	“Venericardia”	densata	778	11

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	"Venericardia"	densata	779	11
Carditoidea	"Venericardia"	densata	780	12
Carditoidea	"Venericardia"	densata	781	12
Carditoidea	"Venericardia"	densata	782	12
Carditoidea	"Venericardia"	densata	783	12
Carditoidea	"Venericardia"	densata	784	12
Carditoidea	"Venericardia"	densata	785	12
Carditoidea	"Venericardia"	densata	786	12
Carditoidea	"Venericardia"	densata	787	12
Carditoidea	"Venericardia"	densata	788	12
Carditoidea	"Venericardia"	densata	789	12
Carditoidea	"Venericardia"	densata	790	12
Carditoidea	"Venericardia"	densata	791	12
Carditoidea	"Venericardia"	densata	792	12
Carditoidea	"Venericardia"	densata	793	12
Carditoidea	"Venericardia"	densata	794	12
Carditoidea	"Venericardia"	densata	795	12
Carditoidea	"Venericardia"	densata	15	59
Carditoidea	"Venericardia"	densata	108	33
Carditoidea	"Venericardia"	densata	46	33
Carditoidea	"Venericardia"	densata	498	33
Carditoidea	"Venericardia"	densata	509	112
Carditoidea	"Venericardia"	densata	514	23
Carditoidea	"Venericardia"	densata	23	21
Carditoidea	"Venericardia"	densata	996	69
Carditoidea	"Venericardia"	densata	555	31
Carditoidea	"Venericardia"	densata	14	54
Carditoidea	"Venericardia"	diversidentata	323	---
Carditoidea	"Venericardia"	diversidentata	74	38
Carditoidea	"Venericardia"	diversidentata	338	38
Carditoidea	"Venericardia"	diversidentata	370	66

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	“Venericardia”	diversidentata	376	75
Carditoidea	“Venericardia”	diversidentata	378	68
Carditoidea	“Venericardia”	diversidentata	379	68
Carditoidea	“Venericardia”	diversidentata	380	80
Carditoidea	“Venericardia”	diversidentata	381	66
Carditoidea	“Venericardia”	diversidentata	382	68
Carditoidea	“Venericardia”	diversidentata	383	80
Carditoidea	“Venericardia”	diversidentata	384	68
Carditoidea	“Venericardia”	diversidentata	385	66
Carditoidea	“Venericardia”	diversidentata	437	48
Carditoidea	“Venericardia”	diversidentata	306	38
Carditoidea	“Venericardia”	diversidentata	72	38
Carditoidea	“Venericardia”	diversidentata	651	48
Carditoidea	“Venericardia”	diversidentata	303	38
Carditoidea	“Venericardia”	diversidentata	438	38
Carditoidea	“Venericardia”	diversidentata	323	38
Carditoidea	“Venericardia”	diversidentata	490	66
Carditoidea	“Venericardia”	diversidentata	512	38
Carditoidea	“Venericardia”	diversidentata	81	38
Carditoidea	“Venericardia”	diversidentata	596	38
Carditoidea	“Venericardia”	diversidentata	485	38
Carditoidea	“Venericardia”	diversidentata	513	39
Carditoidea	“Venericardia”	diversidentata	295	38
Carditoidea	“Venericardia”	diversidentata	540	38
Carditoidea	“Venericardia”	diversidentata	1	34
Carditoidea	“Venericardia”	diversidentata	438	62
Carditoidea	“Venericardia”	diversidentata	611	62
Carditoidea	“Venericardia”	diversidentata	651	---
Carditoidea	“Venericardia”	diversidentata	755	62
Carditoidea	“Venericardia”	diversidentata	756	62
Carditoidea	“Venericardia”	diversidentata	937	80

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	“Venericardia”	diversidentata	623	68
Carditoidea	“Venericardia”	diversidentata	938	68
Carditoidea	“Venericardia”	diversidentata	988	38
Carditoidea	“Venericardia”	diversidentata	669	68
Carditoidea	“Venericardia”	diversidentata	989	48
Carditoidea	“Venericardia”	diversidentata	36	38
Carditoidea	“Venericardia”	diversidentata	27	38
Carditoidea	“Venericardia”	diversidentata	496	38
Carditoidea	“Venericardia”	diversidentata	74	26
Carditoidea	“Venericardia”	diversidentata	497	26
Carditoidea	“Venericardia”	diversidentata	497	38
Carditoidea	“Venericardia”	eoa	236	1
Carditoidea	“Venericardia”	eoa	488	1
Carditoidea	“Venericardia”	eoa	322	1
Carditoidea	“Venericardia”	eoa	997	1
Carditoidea	“Venericardia”	eutawcolens	489	63
Carditoidea	“Venericardia”	flabellum	12	21
Carditoidea	“Venericardia”	flabellum	333	---
Carditoidea	“Venericardia”	flabellum	348	23
Carditoidea	“Venericardia”	flabellum	985	---
Carditoidea	“Venericardia”	flabellum	642	---
Carditoidea	“Venericardia”	flabellum	986	---
Carditoidea	“Venericardia”	flabellum	23	21
Carditoidea	“Venericardia”	francescae	221	7
Carditoidea	“Venericardia”	gardnerae	625	5
Carditoidea	“Venericardia”	gardnerae	757	5
Carditoidea	“Venericardia”	gardnerae	758	5
Carditoidea	“Venericardia”	gardnerae	759	5
Carditoidea	“Venericardia”	gardnerae	760	5
Carditoidea	“Venericardia”	gardnerae	761	5
Carditoidea	“Venericardia”	gardnerae	762	5

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	“Venericardia”	gardnerae	763	5
Carditoidea	“Venericardia”	greggiana	67	72
Carditoidea	“Venericardia”	greggiana	68	52
Carditoidea	“Venericardia”	greggiana	210	14
Carditoidea	“Venericardia”	greggiana	67	14
Carditoidea	“Venericardia”	greggiana	633	16
Carditoidea	“Venericardia”	greggiana	209	13
Carditoidea	“Venericardia”	gulielmi	436	16
Carditoidea	“Venericardia”	gulielmi	471	16
Carditoidea	“Venericardia”	gulielmi	62	16
Carditoidea	“Venericardia”	gulielmi	56	16
Carditoidea	“Venericardia”	hatcheplata	66	17
Carditoidea	“Venericardia”	hatcheplata	206	17
Carditoidea	“Venericardia”	hatcheplata	208	17
Carditoidea	“Venericardia”	hesperia	315	1
Carditoidea	“Venericardia”	hesperia	242	1
Carditoidea	“Venericardia”	hesperia	316	1
Carditoidea	“Venericardia”	hesperia	244	1
Carditoidea	“Venericardia”	hesperia	244	67
Carditoidea	“Venericardia”	hesperia	245	1
Carditoidea	“Venericardia”	hesperia	742	1
Carditoidea	“Venericardia”	hesperia	451	1
Carditoidea	“Venericardia”	hesperia	201	1
Carditoidea	“Venericardia”	hijuana	226	7
Carditoidea	“Venericardia”	hijuana	227	7
Carditoidea	“Venericardia”	hijuana	228	7
Carditoidea	“Venericardia”	horatiana	344	16
Carditoidea	“Venericardia”	horatiana	62	16
Carditoidea	“Venericardia”	horatiana	192	16
Carditoidea	“Venericardia”	horatiana	452	16
Carditoidea	“Venericardia”	horatiana	471	16

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	“Venericardia”	horatiana	191	16
Carditoidea	“Venericardia”	horatiana	66	17
Carditoidea	“Venericardia”	horatiana	158	16
Carditoidea	“Venericardia”	horatiana	653	16
Carditoidea	“Venericardia”	horatiana	427	16
Carditoidea	“Venericardia”	horatiana	655	16
Carditoidea	“Venericardia”	horatiana	663	49
Carditoidea	“Venericardia”	horatiana	664	16
Carditoidea	“Venericardia”	horatiana	159	16
Carditoidea	“Venericardia”	horatiana	161	16
Carditoidea	“Venericardia”	horatiana	168	16
Carditoidea	“Venericardia”	horatiana	192	15
Carditoidea	“Venericardia”	horatiana	646	16
Carditoidea	“Venericardia”	horatiana	168	15
Carditoidea	“Venericardia”	horatiana	952	16
Carditoidea	“Venericardia”	horatiana	953	16
Carditoidea	“Venericardia”	horatiana	959	16
Carditoidea	“Venericardia”	horatiana	954	16
Carditoidea	“Venericardia”	horatiana	955	16
Carditoidea	“Venericardia”	horatiana	956	16
Carditoidea	“Venericardia”	horatiana	110	16
Carditoidea	“Venericardia”	horatiana	56	16
Carditoidea	“Venericardia”	inflatior	81	38
Carditoidea	“Venericardia”	inflatior	38	38
Carditoidea	“Venericardia”	inflatior	295	38
Carditoidea	“Venericardia”	inflatior	74	38
Carditoidea	“Venericardia”	inflatior	1	34
Carditoidea	“Venericardia”	inflatior	323	38
Carditoidea	“Venericardia”	inflatior	323	48
Carditoidea	“Venericardia”	inflatior	485	38
Carditoidea	“Venericardia”	inflatior	597	38

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	“Venericardia”	inflatior	74	26
Carditoidea	“Venericardia”	inflatior	72	38
Carditoidea	“Venericardia”	inflatior	497	26
Carditoidea	“Venericardia”	inflatior	497	38
Carditoidea	“Venericardia”	inflatior	46	34
Carditoidea	“Venericardia”	intermedia	358	61
Carditoidea	“Venericardia”	jewelli	225	1
Carditoidea	“Venericardia”	jewelli	222	1
Carditoidea	“Venericardia”	jewelli	223	1
Carditoidea	“Venericardia”	jewelli	224	1
Carditoidea	“Venericardia”	klimacodes	74	38
Carditoidea	“Venericardia”	klimacodes	424	39
Carditoidea	“Venericardia”	klimacodes	312	39
Carditoidea	“Venericardia”	klimacodes	309	39
Carditoidea	“Venericardia”	klimacodes	310	39
Carditoidea	“Venericardia”	klimacodes	311	39
Carditoidea	“Venericardia”	klimacodes	543	63
Carditoidea	“Venericardia”	leonensis	449	23
Carditoidea	“Venericardia”*	linguinodifera	62	16
Carditoidea	“Venericardia”*	linguinodifera	468	16
Carditoidea	“Venericardia”*	linguinodifera	157	16
Carditoidea	“Venericardia”*	linguinodifera	66	17
Carditoidea	“Venericardia”*	linguinodifera	618	16
Carditoidea	“Venericardia”*	linguinodifera	191	16
Carditoidea	“Venericardia”*	linguinodifera	624	19
Carditoidea	“Venericardia”*	linguinodifera	990	16
Carditoidea	“Venericardia”*	linguinodifera	110	16
Carditoidea	“Venericardia”*	linguinodifera	56	16
Carditoidea	“Venericardia”*	linguinodifera	996	69
Carditoidea	“Venericardia”*	linguinodifera	664	16
Carditoidea	“Venericardia”	mediaplata	197	7

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	“Venericardia”	mediaplata	195	70
Carditoidea	“Venericardia”	mediaplata	196	70
Carditoidea	“Venericardia”	mediaplata	198	7
Carditoidea	“Venericardia”	mediaplata	199	7
Carditoidea	“Venericardia”	mediaplata	200	1
Carditoidea	“Venericardia”	mediaplata	201	1
Carditoidea	“Venericardia”	mediaplata	913	7
Carditoidea	“Venericardia”	mediaplata	915	7
Carditoidea	“Venericardia”	mediaplata	916	7
Carditoidea	“Venericardia”	mediaplata	917	7
Carditoidea	“Venericardia”	mediaplata	846	7
Carditoidea	“Venericardia”	mediaplata	918	7
Carditoidea	“Venericardia”	mediaplata	919	7
Carditoidea	“Venericardia”	mediaplata	920	7
Carditoidea	“Venericardia”	mediaplata	921	7
Carditoidea	“Venericardia”	mingoensis	313	70
Carditoidea	“Venericardia”	mingoensis	314	70
Carditoidea	“Venericardia”	moa	451	1
Carditoidea	“Venericardia”	moa	317	1
Carditoidea	“Venericardia”	moa	224	1
Carditoidea	“Venericardia”	moa	318	1
Carditoidea	“Venericardia”	moa	319	1
Carditoidea	“Venericardia”	moa	201	1
Carditoidea	“Venericardia”	moa	317	67
Carditoidea	“Venericardia”	moa	980	1
Carditoidea	“Venericardia”	moa	981	1
Carditoidea	“Venericardia”	moa	982	1
Carditoidea	“Venericardia”	moa	983	1
Carditoidea	“Venericardia”	moa	984	1
Carditoidea	“Venericardia”	moa	997	1
Carditoidea	“Venericardia”	mooreana	12	21

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	“Venericardia”	mooreana	23	21
Carditoidea	“Venericardia”	nanaplata	345	13
Carditoidea	“Venericardia”	nanaplata	68	52
Carditoidea	“Venericardia”	nanaplata	69	14
Carditoidea	“Venericardia”	nanaplata	67	72
Carditoidea	“Venericardia”	nanaplata	193	13
Carditoidea	“Venericardia”	nanaplata	194	14
Carditoidea	“Venericardia”	nanaplata	67	14
Carditoidea	“Venericardia”	nanaplata	633	16
Carditoidea	“Venericardia”	nanaplata	962	13
Carditoidea	“Venericardia”	nanaplata	963	13
Carditoidea	“Venericardia”	nanaplata	966	72
Carditoidea	“Venericardia”	nanaplata	210	52
Carditoidea	“Venericardia”	nasuta	493	51
Carditoidea	“Venericardia”	nasuta	189	113
Carditoidea	“Venericardia”	nasuta	556	31
Carditoidea	“Venericardia”	nasuta	189	31
Carditoidea	“Venericardia”	nasuta	564	31
Carditoidea	“Venericardia”	nasuta	565	32
Carditoidea	“Venericardia”	nasuta	566	33
Carditoidea	“Venericardia”	natchitoches	329	21
Carditoidea	“Venericardia”	natchitoches	60	23
Carditoidea	“Venericardia”	natchitoches	992	21
Carditoidea	“Venericardia”	ocalaedes	622	66
Carditoidea	“Venericardia”	parva	1	---
Carditoidea	“Venericardia”	parva	336	---
Carditoidea	“Venericardia”	parva	438	62
Carditoidea	“Venericardia”	parva	428	33
Carditoidea	“Venericardia”	parva	648	71
Carditoidea	“Venericardia”	parva	438	38
Carditoidea	“Venericardia”	parva	437	48

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	"Venericardia"	parva	1	34
Carditoidea	"Venericardia"	parva	371	34
Carditoidea	"Venericardia"	parva	1	33
Carditoidea	"Venericardia"	parva	611	62
Carditoidea	"Venericardia"	parva	46	34
Carditoidea	"Venericardia"	parva	36	38
Carditoidea	"Venericardia"	parva	48	34
Carditoidea	"Venericardia"	parva	108	33
Carditoidea	"Venericardia"	parva	454	34
Carditoidea	"Venericardia"	perantiqua	366	61
Carditoidea	"Venericardia"	perantiqua	491	61
Carditoidea	"Venericardia"	perantiqua	715	61
Carditoidea	"Venericardia"	perantiqua	358	61
Carditoidea	"Venericardia"	perantiqua	743	61
Carditoidea	"Venericardia"	pilsbryi	69	14
Carditoidea	"Venericardia"	pilsbryi	209	13
Carditoidea	"Venericardia"	pilsbryi	210	14
Carditoidea	"Venericardia"	pilsbryi	67	14
Carditoidea	"Venericardia"	pilsbryi	68	52
Carditoidea	"Venericardia"	pilsbryi	962	13
Carditoidea	"Venericardia"	potapacoensis	204	50
Carditoidea	"Venericardia"	potapacoensis	432	50
Carditoidea	"Venericardia"	potapacoensis	463	50
Carditoidea	"Venericardia"	potapacoensis	477	50
Carditoidea	"Venericardia"	potapacoensis	479	50
Carditoidea	"Venericardia"	potapacoensis	480	50
Carditoidea	"Venericardia"	potapacoensis	481	50
Carditoidea	"Venericardia"	potapacoensis	215	50
Carditoidea	"Venericardia"	potapacoensis	216	50
Carditoidea	"Venericardia"	potapacoensis	217	50
Carditoidea	"Venericardia"	potapacoensis	218	50

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	“Venericardia”	potapacoensis	219	50
Carditoidea	“Venericardia”	potapacoensis	203	50
Carditoidea	“Venericardia”	potapacoensis	202	50
Carditoidea	“Venericardia”	potapacoensis	220	50
Carditoidea	“Venericardia”	potapacoensis	430	50
Carditoidea	“Venericardia”	potapacoensis	948	50
Carditoidea	“Venericardia”*	quadrata	597	38
Carditoidea	“Venericardia”*	quadrata	27	38
Carditoidea	“Venericardia”	regia	216	73
Carditoidea	“Venericardia”	regia	461	73
Carditoidea	“Venericardia”	regia	462	76
Carditoidea	“Venericardia”	regia	465	---
Carditoidea	“Venericardia”	regia	470	73
Carditoidea	“Venericardia”	regia	475	73
Carditoidea	“Venericardia”	regia	220	73
Carditoidea	“Venericardia”	regia	215	73
Carditoidea	“Venericardia”	regia	252	73
Carditoidea	“Venericardia”	regia	253	73
Carditoidea	“Venericardia”	regia	744	73
Carditoidea	“Venericardia”	regia	500	73
Carditoidea	“Venericardia”	regia	745	73
Carditoidea	“Venericardia”	regia	692	73
Carditoidea	“Venericardia”	regia	690	73
Carditoidea	“Venericardia”	regia	841	73
Carditoidea	“Venericardia”	regia	682	73
Carditoidea	“Venericardia”	regia	676	73
Carditoidea	“Venericardia”	regia	842	73
Carditoidea	“Venericardia”	regia	843	73
Carditoidea	“Venericardia”	regia	675	73
Carditoidea	“Venericardia”	regia	947	73
Carditoidea	“Venericardia”	rotunda	331	21

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	“Venericardia”	rotunda	1	71
Carditoidea	“Venericardia”	rotunda	334	23
Carditoidea	“Venericardia”	rotunda	335	33
Carditoidea	“Venericardia”	rotunda	336	---
Carditoidea	“Venericardia”	rotunda	337	23
Carditoidea	“Venericardia”	rotunda	343	59
Carditoidea	“Venericardia”	rotunda	371	34
Carditoidea	“Venericardia”	rotunda	428	33
Carditoidea	“Venericardia”	rotunda	189	---
Carditoidea	“Venericardia”	rotunda	1	34
Carditoidea	“Venericardia”	rotunda	552	28
Carditoidea	“Venericardia”	rotunda	564	31
Carditoidea	“Venericardia”	rotunda	371	33
Carditoidea	“Venericardia”	rotunda	567	34
Carditoidea	“Venericardia”	rotunda	454	34
Carditoidea	“Venericardia”	rotunda	377	59
Carditoidea	“Venericardia”	rotunda	601	56
Carditoidea	“Venericardia”	rotunda	645	23
Carditoidea	“Venericardia”	rotunda	951	112
Carditoidea	“Venericardia”	rotunda	987	86
Carditoidea	“Venericardia”	rotunda	645	57
Carditoidea	“Venericardia”	rotunda	358	61
Carditoidea	“Venericardia”	rotunda	259	23
Carditoidea	“Venericardia”	rotunda	76	34
Carditoidea	“Venericardia”	rotunda	176	47
Carditoidea	“Venericardia”	rotunda	12	21
Carditoidea	“Venericardia”	rotunda	46	34
Carditoidea	“Venericardia”	rotunda	48	34
Carditoidea	“Venericardia”	rotunda	15	59
Carditoidea	“Venericardia”	rotunda	108	33
Carditoidea	“Venericardia”	rotunda	46	33

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	"Venericardia"	rotunda	32	23
Carditoidea	"Venericardia"	rotunda	609	23
Carditoidea	"Venericardia"	rotunda	178	33
Carditoidea	"Venericardia"	rotunda	511	33
Carditoidea	"Venericardia"	rotunda	23	21
Carditoidea	"Venericardia"	rotunda	16	55
Carditoidea	"Venericardia"	sabinensis	627	12
Carditoidea	"Venericardia"	smithii	330	7
Carditoidea	"Venericardia"	smithii	350	7
Carditoidea	"Venericardia"	smithii	354	7
Carditoidea	"Venericardia"	smithii	426	7
Carditoidea	"Venericardia"	smithii	464	7
Carditoidea	"Venericardia"	smithii	474	70
Carditoidea	"Venericardia"	smithii	229	70
Carditoidea	"Venericardia"	smithii	197	7
Carditoidea	"Venericardia"	smithii	230	1
Carditoidea	"Venericardia"	smithii	231	1
Carditoidea	"Venericardia"	smithii	232	1
Carditoidea	"Venericardia"	smithii	233	1
Carditoidea	"Venericardia"	smithii	234	1
Carditoidea	"Venericardia"	smithii	235	1
Carditoidea	"Venericardia"	smithii	236	1
Carditoidea	"Venericardia"	smithii	237	1
Carditoidea	"Venericardia"	smithii	238	1
Carditoidea	"Venericardia"	smithii	240	1
Carditoidea	"Venericardia"	smithii	241	1
Carditoidea	"Venericardia"	smithii	242	1
Carditoidea	"Venericardia"	smithii	243	1
Carditoidea	"Venericardia"	smithii	244	1
Carditoidea	"Venericardia"	smithii	245	1
Carditoidea	"Venericardia"	smithii	246	1

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	“Venericardia”	smithii	225	1
Carditoidea	“Venericardia”	smithii	247	1
Carditoidea	“Venericardia”	smithii	201	1
Carditoidea	“Venericardia”	smithii	248	1
Carditoidea	“Venericardia”	smithii	249	1
Carditoidea	“Venericardia”	smithii	250	2
Carditoidea	“Venericardia”	smithii	251	2
Carditoidea	“Venericardia”	smithii	845	---
Carditoidea	“Venericardia”	smithii	846	7
Carditoidea	“Venericardia”	smithii	847	---
Carditoidea	“Venericardia”	smithii	723	70
Carditoidea	“Venericardia”	smithii	722	70
Carditoidea	“Venericardia”	smithii	848	---
Carditoidea	“Venericardia”	smithii	726	---
Carditoidea	“Venericardia”	smithii	725	70
Carditoidea	“Venericardia”	smithii	849	---
Carditoidea	“Venericardia”	smithii	850	---
Carditoidea	“Venericardia”	smithii	852	70
Carditoidea	“Venericardia”	smithii	851	---
Carditoidea	“Venericardia”	smithii	915	7
Carditoidea	“Venericardia”	smithii	917	7
Carditoidea	“Venericardia”	smithii	918	7
Carditoidea	“Venericardia”	smithii	922	7
Carditoidea	“Venericardia”	smithii	923	7
Carditoidea	“Venericardia”	sp.	472	16
Carditoidea	“Venericardia”	sp.	615	---
Carditoidea	“Venericardia”	sp.	72	38
Carditoidea	“Venericardia”	sp.	79	62
Carditoidea	“Venericardia”	sp.	82	38
Carditoidea	“Venericardia”	sp.	83	38
Carditoidea	“Venericardia”	sp.	74	38

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	“Venericardia”	stewarti	10	33
Carditoidea	“Venericardia”	stewarti	335	33
Carditoidea	“Venericardia”	stewarti	214	21
Carditoidea	“Venericardia”	stewarti	609	23
Carditoidea	“Venericardia”	subquadrata	494	47
Carditoidea	“Venericardia”	subrotunda	494	47
Carditoidea	“Venericardia”	tortidens	10	33
Carditoidea	“Venericardia”	tortidens	1	34
Carditoidea	“Venericardia”	tortidens	108	33
Carditoidea	“Venericardia”	tortidens	498	33
Carditoidea	“Venericardia”	tortidens	609	23
Carditoidea	“Venericardia”	trapaquara	325	55
Carditoidea	“Venericardia”	trapaquara	377	59
Carditoidea	“Venericardia”	trapaquara	643	23
Carditoidea	“Venericardia”	trapaquara	601	57
Carditoidea	“Venericardia”	trapaquara	603	23
Carditoidea	“Venericardia”	trapaquara	608	59
Carditoidea	“Venericardia”	trapaquara	609	23
Carditoidea	“Venericardia”	trapaquara	15	59
Carditoidea	“Venericardia”*	trapaquaroides	183	21
Carditoidea	“Venericardia”*	trapaquaroides	---	---
Carditoidea	“Venericardia”	turneri	66	17
Carditoidea	“Venericardia”	turneri	619	16
Carditoidea	“Venericardia”	turneri	191	16
Carditoidea	“Venericardia”	turneri	110	16
Carditoidea	“Venericardia”	vigintinaria	494	47
Carditoidea	“Venericardia”	whitei	244	67
Carditoidea	“Venericardia”	whitei	245	67
Carditoidea	“Venericardia”	whitei	979	67
Carditoidea	“Venericardia”	wilcoxensis	339	53
Carditoidea	“Venericardia”	wilcoxensis	61	53

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Carditoidea	“Venericardia”	wilcoxensis	340	53
Carditoidea	“Venericardia”	wilcoxensis	341	53
Carditoidea	“Venericardia”	wilcoxensis	197	---
Carditoidea	“Venericardia”	wilcoxensis	482	3
Carditoidea	“Venericardia”	wilcoxensis	61	8
Carditoidea	“Venericardia”	wilcoxensis	924	3
Carditoidea	“Venericardia”	wilcoxensis	911	3
Carditoidea	“Venericardia”	wilcoxensis	912	3
Carditoidea	“Venericardia”	wilcoxensis	925	3
Carditoidea	“Venericardia”	wilcoxensis	926	3
Carditoidea	“Venericardia”	wilcoxensis	927	3
Carditoidea	“Venericardia”	wilcoxensis	928	53
Carditoidea	“Venericardia”	wilcoxensis	929	53
Carditoidea	“Venericardia”	wilcoxensis	930	53
Carditoidea	“Venericardia”	wilcoxensis	931	53
Carditoidea	“Venericardia”	wilcoxensis	932	118
Carditoidea	“Venericardia”	wilcoxensis	933	118
Carditoidea	“Venericardia”	wilcoxensis	934	58
Carditoidea	“Venericardia”	wilcoxensis	935	58
Carditoidea	“Venericardia”	wilcoxensis	999	2
Carditoidea	“Venericardia”	withlacoochensis	623	68
Carditoidea	“Venericardia”	zapatai	291	23
Carditoidea	“Venericardia”	zapatai	292	23
Pectinoidea	“Amusium”	alabamense	61	53
Pectinoidea	“Amusium”	alabamense	340	53
Pectinoidea	“Amusium”	alabamense	667	53
Pectinoidea	“Amusium”	alabamense	668	53
Pectinoidea	“Amusium”	alabamense	746	1
Pectinoidea	“Amusium”	alabamense	747	1
Pectinoidea	“Amusium”	alabamense	749	1
Pectinoidea	“Amusium”	alabamense	748	1

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	“Amusium”	alabamense	322	1
Pectinoidea	“Amusium”	alabamense	751	2
Pectinoidea	“Amusium”	alabamense	752	2
Pectinoidea	“Amusium”	alabamense	997	1
Pectinoidea	“Amusium”	alabamense	1000	53
Pectinoidea	“Amusium”	ocalanum	390	104
Pectinoidea	“Amusium”	ocalanum	391	105
Pectinoidea	“Amusium”	ocalanum	370	106
Pectinoidea	“Amusium”	ocalanum	392	105
Pectinoidea	“Amusium”	ocalanum	393	106
Pectinoidea	“Amusium”	ocalanum	394	66
Pectinoidea	“Amusium”	ocalanum	395	104
Pectinoidea	“Amusium”	ocalanum	396	106
Pectinoidea	“Amusium”	ocalanum	397	104
Pectinoidea	“Amusium”	ocalanum	398	104
Pectinoidea	“Amusium”	ocalanum	399	104
Pectinoidea	“Amusium”	ocalanum	572	104
Pectinoidea	“Amusium”	ocalanum	573	104
Pectinoidea	“Amusium”	ocalanum	574	104
Pectinoidea	“Amusium”	ocalanum	575	104
Pectinoidea	“Amusium”	ocalanum	576	104
Pectinoidea	“Amusium”	ocalanum	577	104
Pectinoidea	“Amusium”	ocalanum	578	104
Pectinoidea	“Amusium”	ocalanum	423	104
Pectinoidea	“Amusium”	ocalanum	579	104
Pectinoidea	“Amusium”	ocalanum	580	104
Pectinoidea	“Amusium”	ocalanum	581	104
Pectinoidea	“Amusium”	ocalanum	669	106
Pectinoidea	“Amusium”	ocalanum	636	66
Pectinoidea	“Amusium”	ocalanum	670	66
Pectinoidea	“Amusium”	ocalanum	864	66

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	“Amusium”	ocalanum	865	66
Pectinoidea	“Amusium”	ocalanum	866	66
Pectinoidea	“Amusium”	ocalanum	405	66
Pectinoidea	“Amusium”	ocalanum	867	108
Pectinoidea	“Amusium”	ocalanum	674	---
Pectinoidea	“Amusium”	ocalanum	490	---
Pectinoidea	“Amusium”	ocalanum	863	79
Pectinoidea	“Amusium”	cf. squamulum	191	16
Pectinoidea	“Amusium”	cf. squamulum	62	16
Pectinoidea	“Amusium”	cf. squamulum	9	23
Pectinoidea	“Amusium”	cf. squamulum	110	16
Pectinoidea	“Amusium”*	zinguli	13	69
Pectinoidea	“Amusium”*	zinguli	996	69
Pectinoidea	“Batequeus”*	ducenticostatus	429	110
Pectinoidea	“Chlamys”	alpha	939	51
Pectinoidea	“Chlamys”	alpha	940	51
Pectinoidea	“Chlamys”	alpha	941	51
Pectinoidea	“Chlamys”*	anatipes	401	107
Pectinoidea	“Chlamys”*	anatipes	402	66
Pectinoidea	“Chlamys”*	anatipes	398	107
Pectinoidea	“Chlamys”*	anatipes	433	43
Pectinoidea	“Chlamys”*	anatipes	---	---
Pectinoidea	“Chlamys”*	anatipes	547	66
Pectinoidea	“Chlamys”*	anatipes	548	---
Pectinoidea	“Chlamys”*	anatipes	546	---
Pectinoidea	“Chlamys”*	anatipes	549	---
Pectinoidea	“Chlamys”*	anatipes	802	41
Pectinoidea	“Chlamys”*	anatipes	804	42
Pectinoidea	“Chlamys”*	anatipes	802	43
Pectinoidea	“Chlamys”*	anatipes	810	44
Pectinoidea	“Chlamys”*	anatipes	75	---

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	“Chlamys”*	anatipes	855	43
Pectinoidea	“Chlamys”*	anatipes	994	---
Pectinoidea	“Chlamys”	beverlyi	65	23
Pectinoidea	“Chlamys”	beverlyi	335	33
Pectinoidea	“Chlamys”	beverlyi	65	33
Pectinoidea	“Chlamys”	beverlyi	335	23
Pectinoidea	“Chlamys”	biddleana	457	75
Pectinoidea	“Chlamys”	biddleana	543	75
Pectinoidea	“Chlamys”	biddleana	544	75
Pectinoidea	“Chlamys”	burlesonensis	333	---
Pectinoidea	“Chlamys”	burlesonensis	329	21
Pectinoidea	“Chlamys”	burlesonensis	347	21
Pectinoidea	“Chlamys”	burlesonensis	324	21
Pectinoidea	“Chlamys”	burlesonensis	363	21
Pectinoidea	“Chlamys”	burlesonensis	411	21
Pectinoidea	“Chlamys”	burlesonensis	6	23
Pectinoidea	“Chlamys”	burlesonensis	599	115
Pectinoidea	“Chlamys”	burlesonensis	600	87
Pectinoidea	“Chlamys”	burlesonensis	12	21
Pectinoidea	“Chlamys”	burlesonensis	377	59
Pectinoidea	“Chlamys”	burlesonensis	15	59
Pectinoidea	“Chlamys”	burlesonensis	23	21
Pectinoidea	“Chlamys”	cainei	3	23
Pectinoidea	“Chlamys”	cainei	4	23
Pectinoidea	“Chlamys”	cainei	601	57
Pectinoidea	“Chlamys”	cawcawensis	376	75
Pectinoidea	“Chlamys”	cawcawensis	404	63
Pectinoidea	“Chlamys”	cawcawensis	5	47
Pectinoidea	“Chlamys”	cawcawensis	516	47
Pectinoidea	“Chlamys”	cawcawensis	1	---
Pectinoidea	“Chlamys”	cawcawensis	517	47

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	“Chlamys”	cawcawensis	515	47
Pectinoidea	“Chlamys”	cawcawensis	563	33
Pectinoidea	“Chlamys”	cawcawensis	557	38
Pectinoidea	“Chlamys”	cawcawensis	558	38
Pectinoidea	“Chlamys”	cawcawensis	582	38
Pectinoidea	“Chlamys”	cawcawensis	559	38
Pectinoidea	“Chlamys”	cawcawensis	560	38
Pectinoidea	“Chlamys”	cawcawensis	550	38
Pectinoidea	“Chlamys”	cawcawensis	454	38
Pectinoidea	“Chlamys”	choctavensis	344	16
Pectinoidea	“Chlamys”	choctavensis	62	16
Pectinoidea	“Chlamys”	choctavensis	427	16
Pectinoidea	“Chlamys”	choctavensis	63	50
Pectinoidea	“Chlamys”	choctavensis	160	16
Pectinoidea	“Chlamys”	choctavensis	208	16
Pectinoidea	“Chlamys”	choctavensis	191	16
Pectinoidea	“Chlamys”	choctavensis	502	50
Pectinoidea	“Chlamys”	choctavensis	216	50
Pectinoidea	“Chlamys”	choctavensis	503	50
Pectinoidea	“Chlamys”	choctavensis	633	16
Pectinoidea	“Chlamys”	choctavensis	673	50
Pectinoidea	“Chlamys”	choctavensis	695	73
Pectinoidea	“Chlamys”	choctavensis	952	16
Pectinoidea	“Chlamys”	choctavensis	953	16
Pectinoidea	“Chlamys”	choctavensis	954	16
Pectinoidea	“Chlamys”	choctavensis	655	16
Pectinoidea	“Chlamys”	choctavensis	955	16
Pectinoidea	“Chlamys”	choctavensis	956	16
Pectinoidea	“Chlamys”	choctavensis	110	16
Pectinoidea	“Chlamys”	choctavensis	56	16
Pectinoidea	“Chlamys”	choctavensis	66	17

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	“Chlamys”	clarkeana	428	23
Pectinoidea	“Chlamys”	clarkeana	428	33
Pectinoidea	“Chlamys”	clarkeana	6	33
Pectinoidea	“Chlamys”	clarkeana	10	33
Pectinoidea	“Chlamys”	clarkeana	555	113
Pectinoidea	“Chlamys”	clarkeana	556	31
Pectinoidea	“Chlamys”	clarkeana	598	87
Pectinoidea	“Chlamys”	clarkeana	609	23
Pectinoidea	“Chlamys”*	clinchfieldensis	410	66
Pectinoidea	“Chlamys”*	clinchfieldensis	593	104
Pectinoidea	“Chlamys”*	clinchfieldensis	574	104
Pectinoidea	“Chlamys”*	clinchfieldensis	575	104
Pectinoidea	“Chlamys”*	clinchfieldensis	576	104
Pectinoidea	“Chlamys”*	clinchfieldensis	868	114
Pectinoidea	“Chlamys”*	clinchfieldensis	868	66
Pectinoidea	“Chlamys”*	clinchfieldensis	587	114
Pectinoidea	“Chlamys”*	clinchfieldensis	587	66
Pectinoidea	“Chlamys”*	clinchfieldensis	869	114
Pectinoidea	“Chlamys”*	clinchfieldensis	869	66
Pectinoidea	“Chlamys”*	clinchfieldensis	870	114
Pectinoidea	“Chlamys”*	clinchfieldensis	405	114
Pectinoidea	“Chlamys”*	clinchfieldensis	405	66
Pectinoidea	“Chlamys”*	clinchfieldensis	560	38
Pectinoidea	“Chlamys”*	clinchfieldensis	871	38
Pectinoidea	“Chlamys”*	clinchfieldensis	512	38
Pectinoidea	“Chlamys”	cocoana	405	108
Pectinoidea	“Chlamys”	cocoana	355	40
Pectinoidea	“Chlamys”	cocoana	---	---
Pectinoidea	“Chlamys”	cocoana	422	40
Pectinoidea	“Chlamys”	cocoana	372	40
Pectinoidea	“Chlamys”	cocoana	809	40

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	“Chlamys”	cocoana	587	114
Pectinoidea	“Chlamys”	cocoana	868	114
Pectinoidea	“Chlamys”	cocoana	872	116
Pectinoidea	“Chlamys”	cocoana	873	116
Pectinoidea	“Chlamys”	cocoana	874	108
Pectinoidea	“Chlamys”	cocoana	867	108
Pectinoidea	“Chlamys”	cocoana	512	38
Pectinoidea	“Chlamys”	cocoana	75	---
Pectinoidea	“Chlamys”	cocoana	875	117
Pectinoidea	“Chlamys”	cocoana	876	66
Pectinoidea	“Chlamys”	cocoana	371	---
Pectinoidea	“Chlamys”	cocoana	970	108
Pectinoidea	“Chlamys”	cookei	364	75
Pectinoidea	“Chlamys”	cookei	456	75
Pectinoidea	“Chlamys”	cookei	535	75
Pectinoidea	“Chlamys”	cookei	455	75
Pectinoidea	“Chlamys”	cookei	536	75
Pectinoidea	“Chlamys”	cookei	459	75
Pectinoidea	“Chlamys”	cookei	527	75
Pectinoidea	“Chlamys”	cookei	831	75
Pectinoidea	“Chlamys”	cookei	832	75
Pectinoidea	“Chlamys”	cookei	833	75
Pectinoidea	“Chlamys”	cookei	521	75
Pectinoidea	“Chlamys”	cookei	834	75
Pectinoidea	“Chlamys”	corvina	79	62
Pectinoidea	“Chlamys”	cushmani	455	75
Pectinoidea	“Chlamys”	cushmani	533	75
Pectinoidea	“Chlamys”	cushmani	534	75
Pectinoidea	“Chlamys”	danvillensis	80	39
Pectinoidea	“Chlamys”	danvillensis	532	48
Pectinoidea	“Chlamys”	danvillensis	583	39

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	“Chlamys”	danvillensis	513	39
Pectinoidea	“Chlamys”	deshayesii	1	34
Pectinoidea	“Chlamys”	deshayesii	376	75
Pectinoidea	“Chlamys”	deshayesii	649	71
Pectinoidea	“Chlamys”	deshayesii	1	---
Pectinoidea	“Chlamys”	deshayesii	506	71
Pectinoidea	“Chlamys”	deshayesii	75	---
Pectinoidea	“Chlamys”	deshayesii	507	---
Pectinoidea	“Chlamys”	deshayesii	371	34
Pectinoidea	“Chlamys”	deshayesii	454	34
Pectinoidea	“Chlamys”	deshayesii	512	38
Pectinoidea	“Chlamys”	deshayesii	557	38
Pectinoidea	“Chlamys”	deshayesii	558	38
Pectinoidea	“Chlamys”	deshayesii	551	38
Pectinoidea	“Chlamys”	deshayesii	559	38
Pectinoidea	“Chlamys”	deshayesii	560	38
Pectinoidea	“Chlamys”	deshayesii	1	38
Pectinoidea	“Chlamys”	deshayesii	454	38
Pectinoidea	“Chlamys”	deshayesii	561	38
Pectinoidea	“Chlamys”	deshayesii	562	38
Pectinoidea	“Chlamys”	deshayesii	81	38
Pectinoidea	“Chlamys”	deshayesii	582	38
Pectinoidea	“Chlamys”	deshayesii	460	75
Pectinoidea	“Chlamys”	deshayesii	838	75
Pectinoidea	“Chlamys”	deshayesii	839	75
Pectinoidea	“Chlamys”	deshayesii	869	---
Pectinoidea	“Chlamys”	deshayesii	550	34
Pectinoidea	“Chlamys”	deshayesii	595	38
Pectinoidea	“Chlamys”	deshayesii	48	34
Pectinoidea	“Chlamys”	deshayesii	513	39
Pectinoidea	“Chlamys”	deshayesii	46	34

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	“Chlamys”*	duncanensis	406	109
Pectinoidea	“Chlamys”*	duncanensis	389	66
Pectinoidea	“Chlamys”*	duncanensis	810	44
Pectinoidea	“Chlamys”*	duncanensis	811	44
Pectinoidea	“Chlamys”*	duncanensis	827	79
Pectinoidea	“Chlamys”*	duncanensis	856	79
Pectinoidea	“Chlamys”*	duncanensis	855	43
Pectinoidea	“Chlamys”*	duncanensis	857	44
Pectinoidea	“Chlamys”*	duncanensis	808	45
Pectinoidea	“Chlamys”*	duncanensis	859	44
Pectinoidea	“Chlamys”*	duncanensis	75	44
Pectinoidea	“Chlamys”*	duncanensis	860	44
Pectinoidea	“Chlamys”*	duncanensis	861	44
Pectinoidea	“Chlamys”*	duncanensis	862	45
Pectinoidea	“Chlamys”*	duncanensis	863	79
Pectinoidea	“Chlamys”*	duncanensis	406	79
Pectinoidea	“Chlamys”*	duncanensis	994	---
Pectinoidea	“Chlamys”	dysoni	674	66
Pectinoidea	“Chlamys”	dysoni	674	48
Pectinoidea	“Chlamys”	greggi	67	72
Pectinoidea	“Chlamys”	greggi	365	---
Pectinoidea	“Chlamys”	greggi	210	14
Pectinoidea	“Chlamys”	greggi	68	52
Pectinoidea	“Chlamys”	greggi	67	14
Pectinoidea	“Chlamys”	greggi	69	14
Pectinoidea	“Chlamys”	greggi	957	72
Pectinoidea	“Chlamys”	greggi	67	52
Pectinoidea	“Chlamys”	incertae	398	104
Pectinoidea	“Chlamys”	incertae	407	104
Pectinoidea	“Chlamys”	incertae	402	66
Pectinoidea	“Chlamys”	incertae	674	66

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	“Chlamys”	indecisa	490	66
Pectinoidea	“Chlamys”	indecisa	545	66
Pectinoidea	“Chlamys”	indecisa	546	---
Pectinoidea	“Chlamys”	johnsoni	204	50
Pectinoidea	“Chlamys”	johnsoni	220	73
Pectinoidea	“Chlamys”	johnsoni	504	76
Pectinoidea	“Chlamys”	johnsoni	675	73
Pectinoidea	“Chlamys”	johnsoni	676	---
Pectinoidea	“Chlamys”	kneiskerni	366	61
Pectinoidea	“Chlamys”	kneiskerni	367	---
Pectinoidea	“Chlamys”	kneiskerni	368	61
Pectinoidea	“Chlamys”	kneiskerni	518	---
Pectinoidea	“Chlamys”	kneiskerni	519	---
Pectinoidea	“Chlamys”	membranosa	400	75
Pectinoidea	“Chlamys”	membranosa	376	75
Pectinoidea	“Chlamys”	membranosa	460	75
Pectinoidea	“Chlamys”	membranosa	520	75
Pectinoidea	“Chlamys”	membranosa	521	75
Pectinoidea	“Chlamys”	membranosa	522	75
Pectinoidea	“Chlamys”	membranosa	523	75
Pectinoidea	“Chlamys”	membranosa	524	75
Pectinoidea	“Chlamys”	membranosa	361	75
Pectinoidea	“Chlamys”	membranosa	459	75
Pectinoidea	“Chlamys”	membranosa	525	75
Pectinoidea	“Chlamys”	membranosa	526	75
Pectinoidea	“Chlamys”	membranosa	527	75
Pectinoidea	“Chlamys”	membranosa	528	75
Pectinoidea	“Chlamys”	membranosa	529	75
Pectinoidea	“Chlamys”	membranosa	530	75
Pectinoidea	“Chlamys”	membranosa	455	75
Pectinoidea	“Chlamys”	membranosa	533	75

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	“Chlamys”	membranosa	835	75
Pectinoidea	“Chlamys”	membranosa	836	75
Pectinoidea	“Chlamys”	membranosa	837	75
Pectinoidea	“Chlamys”	membranosa	969	71
Pectinoidea	“Chlamys”*	menthifontis	621	43
Pectinoidea	“Chlamys”*	menthifontis	804	42
Pectinoidea	“Chlamys”*	menthifontis	805	42
Pectinoidea	“Chlamys”*	menthifontis	447	42
Pectinoidea	“Chlamys”*	menthifontis	812	42
Pectinoidea	“Chlamys”*	menthifontis	806	42
Pectinoidea	“Chlamys”*	menthifontis	444	42
Pectinoidea	“Chlamys”*	menthifontis	813	42
Pectinoidea	“Chlamys”	nupera	74	38
Pectinoidea	“Chlamys”	nupera	77	38
Pectinoidea	“Chlamys”	nupera	323	38
Pectinoidea	“Chlamys”	nupera	537	38
Pectinoidea	“Chlamys”	nupera	538	38
Pectinoidea	“Chlamys”	nupera	539	48
Pectinoidea	“Chlamys”	nupera	540	38
Pectinoidea	“Chlamys”	nupera	72	38
Pectinoidea	“Chlamys”	nupera	541	48
Pectinoidea	“Chlamys”	nupera	542	---
Pectinoidea	“Chlamys”	nupera	584	38
Pectinoidea	“Chlamys”	nupera	558	38
Pectinoidea	“Chlamys”	nupera	585	38
Pectinoidea	“Chlamys”	nupera	551	38
Pectinoidea	“Chlamys”	nupera	586	38
Pectinoidea	“Chlamys”	nupera	582	38
Pectinoidea	“Chlamys”	nupera	560	38
Pectinoidea	“Chlamys”	nupera	1	38
Pectinoidea	“Chlamys”	nupera	454	38

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	"Chlamys"	nupera	587	114
Pectinoidea	"Chlamys"	nupera	485	38
Pectinoidea	"Chlamys"	nupera	81	38
Pectinoidea	"Chlamys"	nupera	537	48
Pectinoidea	"Chlamys"	nupera	538	48
Pectinoidea	"Chlamys"	nupera	903	---
Pectinoidea	"Chlamys"	nupera	904	---
Pectinoidea	"Chlamys"	pulchricosta	3	23
Pectinoidea	"Chlamys"*	redwoodensis	439	45
Pectinoidea	"Chlamys"*	redwoodensis	802	41
Pectinoidea	"Chlamys"*	redwoodensis	440	45
Pectinoidea	"Chlamys"	rigbyi	358	61
Pectinoidea	"Chlamys"	rigbyi	366	61
Pectinoidea	"Chlamys"	seabeensis	628	76
Pectinoidea	"Chlamys"	sheldonae	500	73
Pectinoidea	"Chlamys"	sp.	637	39
Pectinoidea	"Chlamys"	sp.	1	34
Pectinoidea	"Chlamys"	sp.	220	73
Pectinoidea	"Chlamys"	sp.	680	66
Pectinoidea	"Chlamys"	spillmani	392	105
Pectinoidea	"Chlamys"	spillmani	398	66
Pectinoidea	"Chlamys"	spillmani	409	66
Pectinoidea	"Chlamys"	spillmani	71	48
Pectinoidea	"Chlamys"	spillmani	402	66
Pectinoidea	"Chlamys"	spillmani	405	66
Pectinoidea	"Chlamys"	spillmani	413	66
Pectinoidea	"Chlamys"	spillmani	74	38
Pectinoidea	"Chlamys"	spillmani	73	48
Pectinoidea	"Chlamys"	spillmani	70	48
Pectinoidea	"Chlamys"	spillmani	371	39
Pectinoidea	"Chlamys"	spillmani	588	39

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	“Chlamys”	spillmani	589	39
Pectinoidea	“Chlamys”	spillmani	590	39
Pectinoidea	“Chlamys”	spillmani	591	39
Pectinoidea	“Chlamys”	spillmani	592	39
Pectinoidea	“Chlamys”	spillmani	75	39
Pectinoidea	“Chlamys”	spillmani	572	104
Pectinoidea	“Chlamys”	spillmani	593	104
Pectinoidea	“Chlamys”	spillmani	573	104
Pectinoidea	“Chlamys”	spillmani	594	104
Pectinoidea	“Chlamys”	spillmani	576	104
Pectinoidea	“Chlamys”	spillmani	578	104
Pectinoidea	“Chlamys”	spillmani	423	104
Pectinoidea	“Chlamys”	spillmani	605	60
Pectinoidea	“Chlamys”	spillmani	606	39
Pectinoidea	“Chlamys”	spillmani	607	48
Pectinoidea	“Chlamys”	spillmani	75	60
Pectinoidea	“Chlamys”	spillmani	635	48
Pectinoidea	“Chlamys”	spillmani	636	66
Pectinoidea	“Chlamys”	spillmani	410	66
Pectinoidea	“Chlamys”	spillmani	622	48
Pectinoidea	“Chlamys”	spillmani	665	---
Pectinoidea	“Chlamys”	spillmani	541	48
Pectinoidea	“Chlamys”	spillmani	677	66
Pectinoidea	“Chlamys”	spillmani	622	66
Pectinoidea	“Chlamys”	spillmani	866	66
Pectinoidea	“Chlamys”	spillmani	864	66
Pectinoidea	“Chlamys”	spillmani	894	39
Pectinoidea	“Chlamys”	spillmani	433	48
Pectinoidea	“Chlamys”	spillmani	897	66
Pectinoidea	“Chlamys”	spillmani	896	66
Pectinoidea	“Chlamys”	spillmani	898	66

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	"Chlamys"	spillmani	899	66
Pectinoidea	"Chlamys"	spillmani	467	---
Pectinoidea	"Chlamys"	spillmani	900	---
Pectinoidea	"Chlamys"	spillmani	901	---
Pectinoidea	"Chlamys"	spillmani	903	---
Pectinoidea	"Chlamys"	spillmani	904	---
Pectinoidea	"Chlamys"	spillmani	412	43
Pectinoidea	"Chlamys"	spillmani	580	104
Pectinoidea	"Chlamys"	spillmani	670	66
Pectinoidea	"Chlamys"	spillmani	936	66
Pectinoidea	"Chlamys"	spillmani	532	48
Pectinoidea	"Chlamys"	spillmani	355	---
Pectinoidea	"Chlamys"	spillmani	942	---
Pectinoidea	"Chlamys"	spillmani	943	---
Pectinoidea	"Chlamys"	spillmani	323	---
Pectinoidea	"Chlamys"	spillmani	674	---
Pectinoidea	"Chlamys"	spillmani	944	60
Pectinoidea	"Chlamys"	suwaneensis	388	66
Pectinoidea	"Chlamys"	suwaneensis	389	66
Pectinoidea	"Chlamys"	suwaneensis	666	66
Pectinoidea	"Chlamys"	wahtubbeana	332	23
Pectinoidea	"Chlamys"	wahtubbeana	8	23
Pectinoidea	"Chlamys"	wahtubbeana	178	33
Pectinoidea	"Chlamys"	wahtubbeana	434	71
Pectinoidea	"Chlamys"	wahtubbeana	3	23
Pectinoidea	"Chlamys"	wahtubbeana	1	33
Pectinoidea	"Chlamys"	wahtubbeana	4	23
Pectinoidea	"Chlamys"	wahtubbeana	505	23
Pectinoidea	"Chlamys"	wahtubbeana	506	71
Pectinoidea	"Chlamys"	wahtubbeana	9	23
Pectinoidea	"Chlamys"	wahtubbeana	65	23

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	"Chlamys"	wahtubbeana	371	31
Pectinoidea	"Chlamys"	wahtubbeana	371	33
Pectinoidea	"Chlamys"	wahtubbeana	563	33
Pectinoidea	"Chlamys"	wahtubbeana	602	57
Pectinoidea	"Chlamys"	wahtubbeana	603	57
Pectinoidea	"Chlamys"	wahtubbeana	604	23
Pectinoidea	"Chlamys"	wahtubbeana	178	23
Pectinoidea	"Chlamys"	wahtubbeana	679	23
Pectinoidea	"Chlamys"	wahtubbeana	434	23
Pectinoidea	"Chlamys"	wahtubbeana	32	23
Pectinoidea	"Chlamys"	wahtubbeana	509	112
Pectinoidea	"Chlamys"	wahtubbeana	40	23
Pectinoidea	"Eburneopecten"	calvatus	376	75
Pectinoidea	"Eburneopecten"	calvatus	489	63
Pectinoidea	"Eburneopecten"	corneoides	66	17
Pectinoidea	"Eburneopecten"	corneoides	62	16
Pectinoidea	"Eburneopecten"	dalli	204	50
Pectinoidea	"Eburneopecten"	dalli	425	50
Pectinoidea	"Eburneopecten"	dalli	220	73
Pectinoidea	"Eburneopecten"	dalli	695	---
Pectinoidea	"Eburneopecten"	dalli	216	50
Pectinoidea	"Eburneopecten"	frontalis	335	33
Pectinoidea	"Eburneopecten"	frontalis	81	38
Pectinoidea	"Eburneopecten"	frontalis	27	38
Pectinoidea	"Eburneopecten"	hamiltonensis	6	23
Pectinoidea	"Eburneopecten"	hamiltonensis	6	33
Pectinoidea	"Eburneopecten"	hamiltonensis	501	23
Pectinoidea	"Eburneopecten"	hamiltonensis	108	33
Pectinoidea	"Eburneopecten"	hamiltonensis	46	33
Pectinoidea	"Eburneopecten"	hamiltonensis	32	23
Pectinoidea	"Eburneopecten"	hamiltonensis	371	33

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	"Eburneopecten"	hamiltonensis	509	112
Pectinoidea	"Eburneopecten"	hamiltonensis	259	23
Pectinoidea	"Eburneopecten"	scintillatus	349	38
Pectinoidea	"Eburneopecten"	scintillatus	81	38
Pectinoidea	"Eburneopecten"	scintillatus	323	---
Pectinoidea	"Eburneopecten"	scintillatus	74	38
Pectinoidea	"Eburneopecten"	scintillatus	72	38
Pectinoidea	"Eburneopecten"	scintillatus	437	48
Pectinoidea	"Eburneopecten"	scintillatus	7	48
Pectinoidea	"Eburneopecten"	scintillatus	82	38
Pectinoidea	"Eburneopecten"	scintillatus	512	38
Pectinoidea	"Eburneopecten"	scintillatus	595	38
Pectinoidea	"Eburneopecten"	scintillatus	557	38
Pectinoidea	"Eburneopecten"	scintillatus	1	38
Pectinoidea	"Eburneopecten"	scintillatus	596	38
Pectinoidea	"Eburneopecten"	scintillatus	583	39
Pectinoidea	"Eburneopecten"	scintillatus	513	39
Pectinoidea	"Eburneopecten"	scintillatus	485	38
Pectinoidea	"Eburneopecten"	scintillatus	597	38
Pectinoidea	"Eburneopecten"	scintillatus	323	38
Pectinoidea	"Eburneopecten"	scintillatus	541	48
Pectinoidea	"Eburneopecten"	scintillatus	361	75
Pectinoidea	"Eburneopecten"	scintillatus	36	38
Pectinoidea	"Eburneopecten"	scintillatus	27	38
Pectinoidea	"Eburneopecten"	scintillatus	496	38
Pectinoidea	"Eburneopecten"	scintillatus	74	26
Pectinoidea	"Eburneopecten"	scintillatus	74	39
Pectinoidea	"Eburneopecten"	scintillatus	497	26
Pectinoidea	"Eburneopecten"	scintillatus	497	38
Pectinoidea	"Eburneopecten"	sp.	331	21
Pectinoidea	"Eburneopecten"	sp.	329	21

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	“Eburneopecten”	sp.	8	23
Pectinoidea	“Eburneopecten”	sp.	511	33
Pectinoidea	“Eburneopecten”	sp.	556	33
Pectinoidea	“Eburneopecten”	sp.	178	33
Pectinoidea	“Eburneopecten”	sp.	377	59
Pectinoidea	“Eburneopecten”	sp.	601	57
Pectinoidea	“Eburneopecten”	sp.	1	33
Pectinoidea	“Eburneopecten”	sp.	696	59
Pectinoidea	“Eburneopecten”	sp.	3	23
Pectinoidea	“Eburneopecten”	subminutus	422	40
Pectinoidea	“Eburneopecten”	subminutus	323	48
Pectinoidea	“Eburneopecten”	subminutus	801	40
Pectinoidea	“Eburneopecten”	subminutus	638	40
Pectinoidea	“Eburneopecten”	subminutus	802	41
Pectinoidea	“Eburneopecten”	subminutus	803	41
Pectinoidea	“Eburneopecten”	subminutus	804	42
Pectinoidea	“Eburneopecten”	subminutus	805	42
Pectinoidea	“Eburneopecten”	subminutus	447	42
Pectinoidea	“Eburneopecten”	subminutus	806	42
Pectinoidea	“Eburneopecten”	subminutus	440	45
Pectinoidea	“Eburneopecten”	subminutus	807	45
Pectinoidea	“Eburneopecten”	subminutus	808	45
Pectinoidea	“Eburneopecten”	subminutus	448	45
Pectinoidea	“Eburneopecten”	subminutus	74	38
Pectinoidea	“Ostrenomia”	carolinensis	705	---
Pectinoidea	“Pecten”*	byramensis	414	44
Pectinoidea	“Pecten”*	byramensis	415	46
Pectinoidea	“Pecten”*	byramensis	817	44
Pectinoidea	“Pecten”*	byramensis	810	44
Pectinoidea	“Pecten”*	byramensis	621	44
Pectinoidea	“Pecten”*	byramensis	811	44

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	"Pecten"*	byramensis	818	44
Pectinoidea	"Pecten"*	byramensis	819	44
Pectinoidea	"Pecten"*	byramensis	439	44
Pectinoidea	"Pecten"*	byramensis	807	45
Pectinoidea	"Pecten"*	byramensis	440	45
Pectinoidea	"Pecten"*	byramensis	808	45
Pectinoidea	"Pecten"*	byramensis	448	45
Pectinoidea	"Pecten"*	byramensis	820	45
Pectinoidea	"Pecten"*	byramensis	439	45
Pectinoidea	"Pecten"*	byramensis	821	45
Pectinoidea	"Pecten"*	byramensis	822	45
Pectinoidea	"Pecten"*	byramensis	823	45
Pectinoidea	"Pecten"*	byramensis	824	45
Pectinoidea	"Pecten"*	byramensis	414	46
Pectinoidea	"Pecten"*	byramensis	706	51
Pectinoidea	"Pecten"*	byramensis	357	45
Pectinoidea	"Pecten"*	byramensis	887	51
Pectinoidea	"Pecten"*	byramensis	444	44
Pectinoidea	"Pecten"*	byramensis	815	45
Pectinoidea	"Pecten"*	byramensis	815	44
Pectinoidea	"Pecten"*	byramensis	881	44
Pectinoidea	"Pecten"*	byramensis	881	45
Pectinoidea	"Pecten"*	byramensis	883	44
Pectinoidea	"Pecten"*	byramensis	811	45
Pectinoidea	"Pecten"*	byramensis	885	45
Pectinoidea	"Pecten"*	byramensis	859	44
Pectinoidea	"Pecten"*	byramensis	888	45
Pectinoidea	"Pecten"*	byramensis	75	44
Pectinoidea	"Pecten"*	byramensis	75	45
Pectinoidea	"Pecten"*	byramensis	861	44
Pectinoidea	"Pecten"*	byramensis	418	46

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	“Pecten”*	byramensis	889	46
Pectinoidea	“Pecten”*	byramensis	890	44
Pectinoidea	“Pecten”*	byramensis	891	45
Pectinoidea	“Pecten”*	byramensis	862	45
Pectinoidea	“Pecten”*	byramensis	862	46
Pectinoidea	“Pecten”*	byramensis	863	79
Pectinoidea	“Pecten”*	byramensis	892	79
Pectinoidea	“Pecten”*	byramensis	905	45
Pectinoidea	“Pecten”*	byramensis	906	43
Pectinoidea	“Pecten”*	byramensis	886	44
Pectinoidea	“Pecten”*	byramensis	907	---
Pectinoidea	“Pecten”*	byramensis	908	---
Pectinoidea	“Pecten”*	byramensis	995	45
Pectinoidea	“Pecten”	elixatus	620	63
Pectinoidea	“Pecten”*	howei	893	---
Pectinoidea	“Pecten”*	howei	889	46
Pectinoidea	“Pecten”*	howei	891	45
Pectinoidea	“Pecten”*	howei	862	45
Pectinoidea	“Pecten”*	howei	862	46
Pectinoidea	“Pecten”*	howei	75	82
Pectinoidea	“Pecten”*	howei	879	43
Pectinoidea	“Pecten”*	howei	879	79
Pectinoidea	“Pecten”*	howei	863	79
Pectinoidea	“Pecten”*	howei	891	44
Pectinoidea	“Pecten”*	howei	890	44
Pectinoidea	“Pecten”*	howei	75	45
Pectinoidea	“Pecten”*	howei	75	44
Pectinoidea	“Pecten”*	howei	888	45
Pectinoidea	“Pecten”*	howei	885	44
Pectinoidea	“Pecten”*	howei	811	44
Pectinoidea	“Pecten”*	howei	895	43

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	“Pecten”*	howei	419	43
Pectinoidea	“Pecten”*	perplanus	387	43
Pectinoidea	“Pecten”*	perplanus	412	43
Pectinoidea	“Pecten”*	perplanus	416	74
Pectinoidea	“Pecten”*	perplanus	372	40
Pectinoidea	“Pecten”*	perplanus	418	46
Pectinoidea	“Pecten”*	perplanus	415	46
Pectinoidea	“Pecten”*	perplanus	75	40
Pectinoidea	“Pecten”*	perplanus	76	51
Pectinoidea	“Pecten”*	perplanus	78	51
Pectinoidea	“Pecten”*	perplanus	547	74
Pectinoidea	“Pecten”*	perplanus	422	40
Pectinoidea	“Pecten”*	perplanus	638	40
Pectinoidea	“Pecten”*	perplanus	1	---
Pectinoidea	“Pecten”*	perplanus	801	40
Pectinoidea	“Pecten”*	perplanus	809	40
Pectinoidea	“Pecten”*	perplanus	632	40
Pectinoidea	“Pecten”*	perplanus	802	41
Pectinoidea	“Pecten”*	perplanus	877	40
Pectinoidea	“Pecten”*	perplanus	75	43
Pectinoidea	“Pecten”*	perplanus	371	43
Pectinoidea	“Pecten”*	perplanus	878	40
Pectinoidea	“Pecten”*	perplanus	878	43
Pectinoidea	“Pecten”*	perplanus	861	43
Pectinoidea	“Pecten”*	perplanus	879	74
Pectinoidea	“Pecten”*	perplanus	900	---
Pectinoidea	“Pecten”*	perplanus	910	---
Pectinoidea	“Pecten”*	poulsoni	357	51
Pectinoidea	“Pecten”*	poulsoni	417	42
Pectinoidea	“Pecten”*	poulsoni	419	43
Pectinoidea	“Pecten”*	poulsoni	814	42

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	“Pecten”*	poulsoni	802	42
Pectinoidea	“Pecten”*	poulsoni	804	42
Pectinoidea	“Pecten”*	poulsoni	812	42
Pectinoidea	“Pecten”*	poulsoni	447	42
Pectinoidea	“Pecten”*	poulsoni	806	42
Pectinoidea	“Pecten”*	poulsoni	815	42
Pectinoidea	“Pecten”*	poulsoni	802	43
Pectinoidea	“Pecten”*	poulsoni	621	43
Pectinoidea	“Pecten”*	poulsoni	414	43
Pectinoidea	“Pecten”*	poulsoni	447	43
Pectinoidea	“Pecten”*	poulsoni	75	---
Pectinoidea	“Pecten”*	poulsoni	880	42
Pectinoidea	“Pecten”*	poulsoni	881	42
Pectinoidea	“Pecten”*	poulsoni	811	42
Pectinoidea	“Pecten”*	poulsoni	883	43
Pectinoidea	“Pecten”*	poulsoni	857	43
Pectinoidea	“Pecten”*	poulsoni	857	44
Pectinoidea	“Pecten”*	poulsoni	884	42
Pectinoidea	“Pecten”*	poulsoni	884	43
Pectinoidea	“Pecten”*	poulsoni	885	44
Pectinoidea	“Pecten”*	poulsoni	885	43
Pectinoidea	“Pecten”*	poulsoni	886	43
Pectinoidea	“Pecten”*	poulsoni	859	43
Pectinoidea	“Pecten”*	poulsoni	75	43
Pectinoidea	“Pecten”*	poulsoni	75	44
Pectinoidea	“Pecten”*	poulsoni	371	43
Pectinoidea	“Pecten”*	poulsoni	878	43
Pectinoidea	“Pecten”*	poulsoni	909	43
Pectinoidea	“Pecten”	sp.	1	34
Pectinoidea	“Plicatula”*	creola	155	38
Pectinoidea	“Plicatula”	filamentosa	337	23

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	“Plicatula”	filamentosa	329	21
Pectinoidea	“Plicatula”	filamentosa	359	---
Pectinoidea	“Plicatula”	filamentosa	331	21
Pectinoidea	“Plicatula”	filamentosa	332	23
Pectinoidea	“Plicatula”	filamentosa	334	23
Pectinoidea	“Plicatula”	filamentosa	336	---
Pectinoidea	“Plicatula”	filamentosa	66	17
Pectinoidea	“Plicatula”	filamentosa	8	23
Pectinoidea	“Plicatula”	filamentosa	273	23
Pectinoidea	“Plicatula”	filamentosa	360	71
Pectinoidea	“Plicatula”	filamentosa	362	21
Pectinoidea	“Plicatula”	filamentosa	1	34
Pectinoidea	“Plicatula”	filamentosa	370	106
Pectinoidea	“Plicatula”	filamentosa	371	34
Pectinoidea	“Plicatula”	filamentosa	376	75
Pectinoidea	“Plicatula”	filamentosa	158	16
Pectinoidea	“Plicatula”	filamentosa	191	16
Pectinoidea	“Plicatula”	filamentosa	649	71
Pectinoidea	“Plicatula”	filamentosa	62	16
Pectinoidea	“Plicatula”	filamentosa	2	23
Pectinoidea	“Plicatula”	filamentosa	3	23
Pectinoidea	“Plicatula”	filamentosa	4	23
Pectinoidea	“Plicatula”	filamentosa	511	33
Pectinoidea	“Plicatula”	filamentosa	377	59
Pectinoidea	“Plicatula”	filamentosa	603	57
Pectinoidea	“Plicatula”	filamentosa	9	23
Pectinoidea	“Plicatula”	filamentosa	639	23
Pectinoidea	“Plicatula”	filamentosa	640	23
Pectinoidea	“Plicatula”	filamentosa	641	23
Pectinoidea	“Plicatula”	filamentosa	642	23
Pectinoidea	“Plicatula”	filamentosa	643	23

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	“Plicatula”	filamentosa	644	57
Pectinoidea	“Plicatula”	filamentosa	602	57
Pectinoidea	“Plicatula”	filamentosa	696	23
Pectinoidea	“Plicatula”	filamentosa	729	23
Pectinoidea	“Plicatula”	filamentosa	950	112
Pectinoidea	“Plicatula”	filamentosa	46	34
Pectinoidea	“Plicatula”	filamentosa	371	33
Pectinoidea	“Plicatula”	filamentosa	259	23
Pectinoidea	“Plicatula”	filamentosa	178	33
Pectinoidea	“Plicatula”	filamentosa	110	16
Pectinoidea	“Plicatula”	filamentosa	16	55
Pectinoidea	“Plicatula”	filamentosa	57	16
Pectinoidea	“Plicatula”	filamentosa	15	59
Pectinoidea	“Plicatula”	louisiana	74	38
Pectinoidea	“Plicatula”*	pustula	624	69
Pectinoidea	“Plicatula”*	pustula	996	69
Pectinoidea	“Plicatula”	sp.	361	75
Pectinoidea	“Plicatula”	sp.	74	38
Pectinoidea	“Plicatula”	sp.	458	75
Pectinoidea	“Plicatula”	sp.	618	16
Pectinoidea	“Plicatula”	sp.	72	38
Pectinoidea	“Plicatula”*	variplicata	440	45
Pectinoidea	“Plicatula”*	variplicata	801	40
Pectinoidea	“Plicatula”*	variplicata	638	40
Pectinoidea	“Plicatula”*	variplicata	802	41
Pectinoidea	“Spondylus”	dumosus	328	40
Pectinoidea	“Spondylus”	dumosus	355	48
Pectinoidea	“Spondylus”	dumosus	356	40
Pectinoidea	“Spondylus”	dumosus	396	106
Pectinoidea	“Spondylus”	dumosus	422	40
Pectinoidea	“Spondylus”	dumosus	441	40

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	“Spondylus”	dumosus	71	48
Pectinoidea	“Spondylus”	dumosus	75	40
Pectinoidea	“Spondylus”	dumosus	372	40
Pectinoidea	“Spondylus”	dumosus	638	40
Pectinoidea	“Spondylus”	dumosus	801	40
Pectinoidea	“Spondylus”	dumosus	809	40
Pectinoidea	“Spondylus”*	filiaris	442	42
Pectinoidea	“Spondylus”*	filiaris	802	41
Pectinoidea	“Spondylus”*	filiaris	803	41
Pectinoidea	“Spondylus”*	filiaris	814	42
Pectinoidea	“Spondylus”*	filiaris	802	42
Pectinoidea	“Spondylus”*	filiaris	825	42
Pectinoidea	“Spondylus”*	filiaris	440	45
Pectinoidea	“Spondylus”*	filiaris	826	77
Pectinoidea	“Spondylus”*	filiaris	812	42
Pectinoidea	“Spondylus”*	granulocostatus	48	40
Pectinoidea	“Spondylus”	hollisteri	423	106
Pectinoidea	“Spondylus”	hollisteri	370	106
Pectinoidea	“Spondylus”	hollisteri	397	104
Pectinoidea	“Spondylus”	hollisteri	390	104
Pectinoidea	“Spondylus”	hollisteri	573	104
Pectinoidea	“Spondylus”	hollisteri	575	104
Pectinoidea	“Spondylus”	hollisteri	670	66
Pectinoidea	“Spondylus”	hollisteri	636	66
Pectinoidea	“Spondylus”	hollisteri	936	66
Pectinoidea	“Spondylus”	hollisteri	677	66
Pectinoidea	“Spondylus”	lamellacea	376	75
Pectinoidea	“Spondylus”	lamellacea	404	63
Pectinoidea	“Spondylus”	lamellacea	459	75
Pectinoidea	“Spondylus”	lamellacea	524	75
Pectinoidea	“Spondylus”	lamellacea	460	75

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Pectinoidea	“Spondylus”	sp.	66	17
Pectinoidea	“Spondylus”	sp.	390	104
Pectinoidea	“Spondylus”	sp.	370	106
Pectinoidea	“Spondylus”	sp.	420	43
Pectinoidea	“Spondylus”	sp.	421	44
Pectinoidea	“Spondylus”	sp.	401	107
Pectinoidea	“Spondylus”	sp.	396	106
Veneroidea	“Cf. Blagraveia”	gunteri	623	68
Veneroidea	“Cf. Blagraveia”	gunteri	380	80
Veneroidea	“Cf. Blagraveia”	gunteri	379	68
Veneroidea	“Callista”	aequorea	1	71
Veneroidea	“Callista”	aequorea	1	34
Veneroidea	“Callista”	aequorea	371	34
Veneroidea	“Callista”	aequorea	649	71
Veneroidea	“Callista”	aequorea	550	34
Veneroidea	“Callista”	aequorea	454	34
Veneroidea	“Callista”	aequorea	48	34
Veneroidea	“Callista”	aequorea	46	34
Veneroidea	“Callista”	aldrichi	1	71
Veneroidea	“Callista”	aldrichi	1	34
Veneroidea	“Callista”	aldrichi	48	34
Veneroidea	“Callista”	aldrichi	46	34
Veneroidea	“Callista”	annexa	381	66
Veneroidea	“Callista”	annexa	74	38
Veneroidea	“Callista”	annexa	512	38
Veneroidea	“Callista”	annexa	1	38
Veneroidea	“Callista”	annexa	81	38
Veneroidea	“Callista”	annexa	485	38
Veneroidea	“Callista”	annexa	596	38
Veneroidea	“Callista”	annexa	156	38
Veneroidea	“Callista”	annexa	540	38

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Veneroidea	“Callista”	annexa	72	38
Veneroidea	“Callista”	annexa	80	39
Veneroidea	“Callista”	annexa	380	106
Veneroidea	“Callista”	annexa	623	68
Veneroidea	“Callista”	annexa	659	106
Veneroidea	“Callista”	annexa	323	38
Veneroidea	“Callista”	annexa	380	38
Veneroidea	“Callista”	annexa	496	38
Veneroidea	“Callista”	annexa	74	26
Veneroidea	“Callista”	annexa	497	26
Veneroidea	“Callista”	annexa	497	38
Veneroidea	“Callista”	annexa	513	39
Veneroidea	“Callista”	annexa	27	38
Veneroidea	“Callista”	annexa	36	38
Veneroidea	“Callista”*	goniopisthus	447	42
Veneroidea	“Callista”*	goniopisthus	804	42
Veneroidea	“Callista”*	goniopisthus	806	42
Veneroidea	“Callista”	mortoni	1	71
Veneroidea	“Callista”	mortoni	336	71
Veneroidea	“Callista”	mortoni	1	34
Veneroidea	“Callista”	mortoni	371	34
Veneroidea	“Callista”	mortoni	454	34
Veneroidea	“Callista”	mortoni	48	34
Veneroidea	“Callista”	mortoni	46	34
Veneroidea	“Callista”	pearlensis	323	38
Veneroidea	“Callista”	pearlensis	485	38
Veneroidea	“Callista”	pearlensis	74	38
Veneroidea	“Callista”	pearlensis	27	38
Veneroidea	“Callista”	pearlensis	36	38
Veneroidea	“Callista”	perovata	1	71
Veneroidea	“Callista”	perovata	336	---

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Veneroidea	“Callista”	perovata	1	34
Veneroidea	“Callista”	perovata	371	34
Veneroidea	“Callista”	perovata	662	71
Veneroidea	“Callista”	perovata	335	33
Veneroidea	“Callista”	perovata	454	34
Veneroidea	“Callista”	perovata	428	33
Veneroidea	“Callista”	perovata	551	33
Veneroidea	“Callista”	perovata	552	28
Veneroidea	“Callista”	perovata	553	28
Veneroidea	“Callista”	perovata	554	33
Veneroidea	“Callista”	perovata	1	33
Veneroidea	“Callista”	perovata	10	33
Veneroidea	“Callista”	perovata	671	---
Veneroidea	“Callista”	perovata	483	47
Veneroidea	“Callista”	perovata	672	47
Veneroidea	“Callista”	perovata	567	34
Veneroidea	“Callista”	perovata	48	34
Veneroidea	“Callista”	perovata	371	33
Veneroidea	“Callista”	perovata	609	23
Veneroidea	“Callista”	perovata	509	112
Veneroidea	“Callista”	perovata	178	33
Veneroidea	“Callista”	perovata	511	33
Veneroidea	“Callista”	perovata	514	23
Veneroidea	“Callista”	perovata	46	34
Veneroidea	“Callista”	perovata	108	33
Veneroidea	“Callista”	perovata	46	33
Veneroidea	“Callista”*	sobrina	357	51
Veneroidea	“Callista”*	sobrina	372	40
Veneroidea	“Callista”*	sobrina	802	41
Veneroidea	“Callista”*	sobrina	803	41
Veneroidea	“Callista”*	sobrina	802	42

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Veneroidea	"Callista"*	sobrina	804	42
Veneroidea	"Callista"*	sobrina	447	42
Veneroidea	"Callista"*	sobrina	806	42
Veneroidea	"Callista"*	sobrina	417	42
Veneroidea	"Callista"*	sobrina	813	42
Veneroidea	"Callista"*	sobrina	815	42
Veneroidea	"Callista"*	sobrina	807	45
Veneroidea	"Callista"*	sobrina	448	45
Veneroidea	"Callista"*	sobrina	820	45
Veneroidea	"Callista"*	sobrina	439	45
Veneroidea	"Callista"*	sobrina	822	45
Veneroidea	"Callista"*	sobrina	823	45
Veneroidea	"Callista"*	sobrina	977	51
Veneroidea	"Callista"*	sobrina	978	77
Veneroidea	"Callista"*	sobrina	422	40
Veneroidea	"Callista"*	sobrina	995	45
Veneroidea	"Callista"*	sobrina	812	42
Veneroidea	"Chamelea"*	mississippiensis	357	45
Veneroidea	"Chamelea"*	mississippiensis	443	45
Veneroidea	"Chamelea"*	mississippiensis	440	45
Veneroidea	"Chamelea"*	mississippiensis	807	45
Veneroidea	"Chamelea"*	mississippiensis	808	45
Veneroidea	"Chamelea"*	mississippiensis	448	45
Veneroidea	"Chamelea"*	mississippiensis	820	45
Veneroidea	"Chamelea"*	mississippiensis	824	45
Veneroidea	"Chamelea"*	mississippiensis	830	---
Veneroidea	"Chione"*	bainbridgensis	440	45
Veneroidea	"Chione"*	bainbridgensis	448	45
Veneroidea	"Chione"*	bainbridgensis	824	45
Veneroidea	"Chione"*	bainbridgensis	826	77
Veneroidea	"Chione"*	bainbridgensis	828	82

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Veneroidea	“Chione”*	bainbridgensis	971	82
Veneroidea	“Chione”*	bainbridgensis	972	79
Veneroidea	“Chione”*	bainbridgensis	973	79
Veneroidea	“Chione”*	bainbridgensis	974	82
Veneroidea	“Chione”*	bainbridgensis	975	82
Veneroidea	“Chione”*	bainbridgensis	976	82
Veneroidea	“Chione”*	craspedonia	357	51
Veneroidea	“Chione”*	craspedonia	442	42
Veneroidea	“Chione”*	craspedonia	802	41
Veneroidea	“Chione”*	craspedonia	814	42
Veneroidea	“Chione”*	craspedonia	802	42
Veneroidea	“Chione”*	craspedonia	447	42
Veneroidea	“Chione”*	craspedonia	417	42
Veneroidea	“Chione”*	craspedonia	813	42
Veneroidea	“Chione”*	perbrevisformis	448	45
Veneroidea	“Chione”*	perbrevisformis	439	45
Veneroidea	“Chione”*	perbrevisformis	824	45
Veneroidea	“Chione”*	victoria	357	51
Veneroidea	“Chione”*	victoria	357	42
Veneroidea	“Chione”*	victoria	829	40
Veneroidea	“Chione”*	victoria	804	42
Veneroidea	“Chione”*	victoria	805	42
Veneroidea	“Chione”*	victoria	812	42
Veneroidea	“Chione”*	victoria	447	42
Veneroidea	“Chione”*	victoria	806	42
Veneroidea	“Chione”*	victoria	417	42
Veneroidea	“Chione”*	victoria	813	42
Veneroidea	“Chione”*	victoria	422	40
Veneroidea	“Dosiniopsis”	lenticularis	220	73
Veneroidea	“Dosiniopsis”	lenticularis	68	52
Veneroidea	“Dosiniopsis”	lenticularis	253	73

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Veneroidea	“Dosiniopsis”	lenticularis	682	73
Veneroidea	“Dosiniopsis”	lenticularis	500	73
Veneroidea	“Dosiniopsis”	lenticularis	475	73
Veneroidea	“Dosiniopsis”	lenticularis	683	73
Veneroidea	“Dosiniopsis”	lenticularis	216	---
Veneroidea	“Dosiniopsis”	lenticularis	684	---
Veneroidea	“Dosiniopsis”	lenticularis	685	---
Veneroidea	“Dosiniopsis”	lenticularis	686	---
Veneroidea	“Dosiniopsis”	lenticularis	687	73
Veneroidea	“Dosiniopsis”	lenticularis	688	73
Veneroidea	“Dosiniopsis”	lenticularis	689	---
Veneroidea	“Dosiniopsis”	lenticularis	690	---
Veneroidea	“Dosiniopsis”	lenticularis	691	---
Veneroidea	“Dosiniopsis”	lenticularis	692	---
Veneroidea	“Dosiniopsis”	lenticularis	693	---
Veneroidea	“Dosiniopsis”	lenticularis	365	---
Veneroidea	“Dosiniopsis”	lenticularis	220	---
Veneroidea	“Dosiniopsis”	lenticularis	694	---
Veneroidea	“Dosiniopsis”	lenticularis	470	73
Veneroidea	“Dosiniopsis”	lenticularis	945	73
Veneroidea	“Gemma”	sanctimauricensis	65	23
Veneroidea	“Gratelupia”	hydana	335	---
Veneroidea	“Gratelupia”	hydana	336	---
Veneroidea	“Gratelupia”	hydana	1	71
Veneroidea	“Gratelupia”	hydana	1	34
Veneroidea	“Gratelupia”	hydana	371	34
Veneroidea	“Gratelupia”	hydana	46	34
Veneroidea	“Katherinella”	smithvillensis	337	23
Veneroidea	“Katherinella”	smithvillensis	377	59
Veneroidea	“Katherinella”	smithvillensis	12	21
Veneroidea	“Katherinella”	smithvillensis	697	23

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Veneroidea	“Katherinella”	smithvillensis	337	54
Veneroidea	“Katherinella”	smithvillensis	15	59
Veneroidea	“Katherinella”	smithvillensis	23	21
Veneroidea	“Katherinella”	sp.	65	71
Veneroidea	“Katherinella”	texitrina	377	59
Veneroidea	“Katherinella”	texitrina	608	59
Veneroidea	“Katherinella”	trigoniata	83	38
Veneroidea	“Katherinella”	trigoniata	333	---
Veneroidea	“Katherinella”	trigoniata	359	---
Veneroidea	“Katherinella”	trigoniata	1	71
Veneroidea	“Katherinella”	trigoniata	347	21
Veneroidea	“Katherinella”	trigoniata	1	34
Veneroidea	“Katherinella”	trigoniata	300	38
Veneroidea	“Katherinella”	trigoniata	298	38
Veneroidea	“Katherinella”	trigoniata	650	38
Veneroidea	“Katherinella”	trigoniata	438	38
Veneroidea	“Katherinella”	trigoniata	662	71
Veneroidea	“Katherinella”	trigoniata	511	33
Veneroidea	“Katherinella”	trigoniata	178	33
Veneroidea	“Katherinella”	trigoniata	551	33
Veneroidea	“Katherinella”	trigoniata	1	33
Veneroidea	“Katherinella”	trigoniata	6	23
Veneroidea	“Katherinella”	trigoniata	365	---
Veneroidea	“Katherinella”	trigoniata	410	---
Veneroidea	“Katherinella”	trigoniata	698	71
Veneroidea	“Katherinella”	trigoniata	79	62
Veneroidea	“Katherinella”	trigoniata	83	62
Veneroidea	“Katherinella”	trigoniata	437	---
Veneroidea	“Katherinella”	trigoniata	74	38
Veneroidea	“Katherinella”	trigoniata	699	21
Veneroidea	“Katherinella”	trigoniata	369	21

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Veneroidea	“Katherinella”	trigoniata	486	38
Veneroidea	“Katherinella”	trigoniata	48	34
Veneroidea	“Katherinella”	trigoniata	371	34
Veneroidea	“Katherinella”	trigoniata	454	34
Veneroidea	“Katherinella”	trigoniata	46	34
Veneroidea	“Katherinella”	trigoniata	108	33
Veneroidea	“Katherinella”	trigoniata	46	33
Veneroidea	“Katherinella”	trigoniata	23	21
Veneroidea	“Katherinella”	trigoniata	14	54
Veneroidea	“Katherinella”	trinitatis	608	59
Veneroidea	“Katherinella”	trinitatis	377	59
Veneroidea	“Katherinella”	trinitatis	511	33
Veneroidea	“Katherinella”	trinitatis	15	59
Veneroidea	“Macrocallista”	sp.	704	15
Veneroidea	“Macrocallista”	subimpressa	204	50
Veneroidea	“Macrocallista”	subimpressa	63	50
Veneroidea	“Macrocallista”	subimpressa	160	16
Veneroidea	“Macrocallista”	subimpressa	701	50
Veneroidea	“Macrocallista”	subimpressa	503	50
Veneroidea	“Macrocallista”	subimpressa	702	50
Veneroidea	“Macrocallista”	subimpressa	703	50
Veneroidea	“Macrocallista”	subimpressa	217	50
Veneroidea	“Macrocallista”	subimpressa	216	50
Veneroidea	“Macrocallista”	sylvaerupis	62	16
Veneroidea	“Macrocallista”	sylvaerupis	344	16
Veneroidea	“Macrocallista”	sylvaerupis	617	16
Veneroidea	“Macrocallista”	sylvaerupis	191	16
Veneroidea	“Macrocallista”	sylvaerupis	653	16
Veneroidea	“Macrocallista”	sylvaerupis	161	16
Veneroidea	“Macrocallista”	sylvaerupis	166	16
Veneroidea	“Macrocallista”	sylvaerupis	165	16

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Veneroidea	"Macrocallista"	sylvaerupis	633	16
Veneroidea	"Macrocallista"	sylvaerupis	952	16
Veneroidea	"Macrocallista"	sylvaerupis	958	16
Veneroidea	"Macrocallista"	sylvaerupis	953	16
Veneroidea	"Macrocallista"	sylvaerupis	959	16
Veneroidea	"Macrocallista"	sylvaerupis	954	16
Veneroidea	"Macrocallista"	sylvaerupis	655	16
Veneroidea	"Macrocallista"	sylvaerupis	960	16
Veneroidea	"Macrocallista"	sylvaerupis	66	17
Veneroidea	"Macrocallista"	sylvaerupis	110	16
Veneroidea	"Macrocallista"	sylvaerupis	56	16
Veneroidea	"Macrocallista"	sylvaerupis	57	16
Veneroidea	"Macrocallista"	triangulata	168	15
Veneroidea	"Macrocallista"	triangulata	168	16
Veneroidea	"Mercimonia"	mercenaroidea	1	33
Veneroidea	"Mercimonia"	mercenaroidea	1	71
Veneroidea	"Mercimonia"	mercenaroidea	46	33
Veneroidea	"Mercimonia"	mercenaroidea	511	33
Veneroidea	"Mercimonia"	mercenaroidea	483	47
Veneroidea	"Mercimonia"	mercenaroidea	498	33
Veneroidea	"Cf. Miodontiscus"	sp.	62	16
Veneroidea	"Cf. Miodontiscus"	sp.	472	16
Veneroidea	"Pelecyora"	hatchetigbeensis	107	17
Veneroidea	"Pelecyora"	hatchetigbeensis	66	17
Veneroidea	"Pitar"*	aldrichi	446	40
Veneroidea	"Pitar"*	aldrichi	422	40
Veneroidea	"Pitar"*	aldrichi	372	40
Veneroidea	"Pitar"*	aldrichi	809	40
Veneroidea	"Pitar"*	aldrichi	638	40
Veneroidea	"Pitar"*	aldrichi	632	40
Veneroidea	"Pitar"*	aldrichi	802	41

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Veneroidea	“Pitar”*	aldrichi	803	41
Veneroidea	“Pitar”*	aldrichi	804	42
Veneroidea	“Pitar”*	aldrichi	805	42
Veneroidea	“Pitar”*	aldrichi	447	42
Veneroidea	“Pitar”*	aldrichi	806	42
Veneroidea	“Pitar”	amichel	630	84
Veneroidea	“Pitar”	amichel	706	84
Veneroidea	“Pitar”	amichel	708	84
Veneroidea	“Pitar”	amichel	707	84
Veneroidea	“Pitar”	angelinae	629	71
Veneroidea	“Pitar”*	astartiformis	357	51
Veneroidea	“Pitar”*	astartiformis	806	42
Veneroidea	“Pitar”*	astartiformis	823	45
Veneroidea	“Pitar”*	astartiformis	824	45
Veneroidea	“Cf. Pitar”	biboraensis	317	1
Veneroidea	“Pitar”*	calcanea	417	42
Veneroidea	“Pitar”*	calcanea	357	42
Veneroidea	“Pitar”*	calcanea	804	42
Veneroidea	“Pitar”*	calcanea	805	42
Veneroidea	“Pitar”*	calcanea	812	42
Veneroidea	“Pitar”*	calcanea	806	42
Veneroidea	“Pitar”*	calcanea	826	77
Veneroidea	“Pitar”	cornelli	1	71
Veneroidea	“Pitar”	cornelli	1	34
Veneroidea	“Pitar”	cornelli	46	34
Veneroidea	“Pitar”	eversus	220	50
Veneroidea	“Pitar”	eversus	701	50
Veneroidea	“Pitar”	eversus	253	50
Veneroidea	“Pitar”	exiguus	1	34
Veneroidea	“Pitar”	exiguus	46	34
Veneroidea	“Pitar”	gazleyensis	612	20

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Veneroidea	“Cf. Pitar”	hawtofi	225	67
Veneroidea	“Cf. Pitar”	hawtofi	222	67
Veneroidea	“Cf. Pitar”	hawtofi	451	67
Veneroidea	“Cf. Pitar”	hawtofi	223	67
Veneroidea	“Cf. Pitar”	hawtofi	201	67
Veneroidea	“Pitar”*	imitabilis	357	45
Veneroidea	“Pitar”*	imitabilis	440	45
Veneroidea	“Pitar”*	imitabilis	807	45
Veneroidea	“Pitar”*	imitabilis	808	45
Veneroidea	“Pitar”*	imitabilis	448	45
Veneroidea	“Pitar”*	imitabilis	439	45
Veneroidea	“Pitar”*	imitabilis	823	45
Veneroidea	“Pitar”*	imitabilis	824	45
Veneroidea	“Pitar”*	imitabilis	995	45
Veneroidea	“Pitar”	juliae	612	20
Veneroidea	“Cf. Pitar”	kempae	231	1
Veneroidea	“Cf. Pitar”	kempae	230	1
Veneroidea	“Cf. Pitar”	kempae	999	2
Veneroidea	“Pitar”	lenis	204	50
Veneroidea	“Pitar”	lenis	701	50
Veneroidea	“Pitar”	lenis	709	50
Veneroidea	“Pitar”	macbeani	453	47
Veneroidea	“Pitar”	macbeani	554	33
Veneroidea	“Pitar”*	megacostata	445	42
Veneroidea	“Pitar”*	megacostata	802	41
Veneroidea	“Pitar”*	megacostata	803	41
Veneroidea	“Pitar”*	megacostata	804	42
Veneroidea	“Pitar”*	megacostata	447	42
Veneroidea	“Pitar”*	megacostata	806	42
Veneroidea	“Pitar”	nuttali	1	71
Veneroidea	“Pitar”	nuttali	662	71

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Veneroidea	"Pitar"	nuttali	1	34
Veneroidea	"Pitar"	nuttali	564	31
Veneroidea	"Pitar"	nuttali	211	31
Veneroidea	"Pitar"	nuttali	565	32
Veneroidea	"Pitar"	nuttali	511	33
Veneroidea	"Pitar"	nuttali	178	33
Veneroidea	"Pitar"	nuttali	566	33
Veneroidea	"Pitar"	nuttali	1	33
Veneroidea	"Pitar"	nuttali	567	34
Veneroidea	"Pitar"	nuttali	46	34
Veneroidea	"Pitar"	nuttali	211	113
Veneroidea	"Pitar"	nuttalliopsis	62	16
Veneroidea	"Pitar"	nuttalliopsis	67	72
Veneroidea	"Pitar"	nuttalliopsis	344	16
Veneroidea	"Pitar"	nuttalliopsis	69	14
Veneroidea	"Pitar"	nuttalliopsis	210	14
Veneroidea	"Pitar"	nuttalliopsis	68	52
Veneroidea	"Pitar"	nuttalliopsis	616	49
Veneroidea	"Pitar"	nuttalliopsis	617	16
Veneroidea	"Pitar"	nuttalliopsis	618	16
Veneroidea	"Pitar"	nuttalliopsis	158	16
Veneroidea	"Pitar"	nuttalliopsis	653	16
Veneroidea	"Pitar"	nuttalliopsis	191	16
Veneroidea	"Pitar"	nuttalliopsis	161	16
Veneroidea	"Pitar"	nuttalliopsis	166	16
Veneroidea	"Pitar"	nuttalliopsis	656	16
Veneroidea	"Pitar"	nuttalliopsis	655	16
Veneroidea	"Pitar"	nuttalliopsis	67	14
Veneroidea	"Pitar"	nuttalliopsis	157	16
Veneroidea	"Pitar"	nuttalliopsis	710	---
Veneroidea	"Pitar"	nuttalliopsis	365	---

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Veneroidea	“Pitar”	nuttalliopsis	711	15
Veneroidea	“Pitar”	nuttalliopsis	351	12
Veneroidea	“Pitar”	nuttalliopsis	767	11
Veneroidea	“Pitar”	nuttalliopsis	769	11
Veneroidea	“Pitar”	nuttalliopsis	770	11
Veneroidea	“Pitar”	nuttalliopsis	799	11
Veneroidea	“Pitar”	nuttalliopsis	773	11
Veneroidea	“Pitar”	nuttalliopsis	774	11
Veneroidea	“Pitar”	nuttalliopsis	775	11
Veneroidea	“Pitar”	nuttalliopsis	780	12
Veneroidea	“Pitar”	nuttalliopsis	627	12
Veneroidea	“Pitar”	nuttalliopsis	785	12
Veneroidea	“Pitar”	nuttalliopsis	800	12
Veneroidea	“Pitar”	nuttalliopsis	787	12
Veneroidea	“Pitar”	nuttalliopsis	790	12
Veneroidea	“Pitar”	nuttalliopsis	792	12
Veneroidea	“Pitar”	nuttalliopsis	794	12
Veneroidea	“Pitar”	nuttalliopsis	952	16
Veneroidea	“Pitar”	nuttalliopsis	958	16
Veneroidea	“Pitar”	nuttalliopsis	953	16
Veneroidea	“Pitar”	nuttalliopsis	959	16
Veneroidea	“Pitar”	nuttalliopsis	954	16
Veneroidea	“Pitar”	nuttalliopsis	664	16
Veneroidea	“Pitar”	nuttalliopsis	955	16
Veneroidea	“Pitar”	nuttalliopsis	960	16
Veneroidea	“Pitar”	nuttalliopsis	962	13
Veneroidea	“Pitar”	nuttalliopsis	69	52
Veneroidea	“Pitar”	nuttalliopsis	209	13
Veneroidea	“Pitar”	nuttalliopsis	963	13
Veneroidea	“Pitar”	nuttalliopsis	964	13
Veneroidea	“Pitar”	nuttalliopsis	965	52

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Veneroidea	“Pitar”	nuttalliopsis	56	16
Veneroidea	“Pitar”	nuttalliopsis	57	16
Veneroidea	“Pitar”	nuttalliopsis	110	16
Veneroidea	“Pitar”	nuttalliopsis	210	52
Veneroidea	“Pitar”	ovalis	366	61
Veneroidea	“Pitar”	ovalis	715	61
Veneroidea	“Pitar”	ovalis	358	61
Veneroidea	“Pitar”	ovatus	204	50
Veneroidea	“Pitar”	ovatus	63	50
Veneroidea	“Pitar”	ovatus	205	50
Veneroidea	“Pitar”	ovatus	425	50
Veneroidea	“Pitar”	ovatus	430	50
Veneroidea	“Pitar”	ovatus	712	50
Veneroidea	“Pitar”	ovatus	503	50
Veneroidea	“Pitar”	ovatus	701	50
Veneroidea	“Pitar”	ovatus	220	50
Veneroidea	“Pitar”	ovatus	713	---
Veneroidea	“Pitar”	ovatus	502	---
Veneroidea	“Pitar”	ovatus	219	50
Veneroidea	“Pitar”	ovatus	216	---
Veneroidea	“Pitar”	ovatus	217	---
Veneroidea	“Pitar”*	perbrevis	357	51
Veneroidea	“Pitar”*	perbrevis	357	45
Veneroidea	“Pitar”*	perbrevis	448	45
Veneroidea	“Pitar”	petropolitanus	377	59
Veneroidea	“Pitar”	petropolitanus	601	56
Veneroidea	“Pitar”	petropolitanus	371	33
Veneroidea	“Pitar”	petropolitanus	609	23
Veneroidea	“Pitar”	petropolitanus	14	54
Veneroidea	“Pitar”	petropolitanus	15	59
Veneroidea	“Pitar”	poulsoni	1	71

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Veneroidea	“Pitar”	poulsoni	1	34
Veneroidea	“Pitar”	poulsoni	46	34
Veneroidea	“Pitar”*	protena	443	42
Veneroidea	“Pitar”*	protena	444	42
Veneroidea	“Pitar”*	protena	812	42
Veneroidea	“Pitar”*	protena	806	42
Veneroidea	“Pitar”*	protena	417	42
Veneroidea	“Pitar”*	protena	813	42
Veneroidea	“Pitar”*	protena	448	45
Veneroidea	“Pitar”	pteleinus	315	67
Veneroidea	“Pitar”	pteleinus	245	67
Veneroidea	“Pitar”	pteleinus	241	1
Veneroidea	“Pitar”	pteleinus	753	1
Veneroidea	“Pitar”	pteleinus	242	1
Veneroidea	“Pitar”	pteleinus	244	1
Veneroidea	“Pitar”	pteleinus	999	2
Veneroidea	“Pitar”	pyga	63	50
Veneroidea	“Pitar”	pyga	716	73
Veneroidea	“Pitar”	pyga	220	73
Veneroidea	“Pitar”	pyga	682	73
Veneroidea	“Pitar”	pyga	717	73
Veneroidea	“Pitar”	pyga	676	73
Veneroidea	“Pitar”	pyga	675	73
Veneroidea	“Pitar”	pyga	718	73
Veneroidea	“Pitar”	pyga	500	73
Veneroidea	“Pitar”	pyga	216	73
Veneroidea	“Pitar”	pyga	683	73
Veneroidea	“Pitar”	pyga	719	73
Veneroidea	“Pitar”	pyga	684	73
Veneroidea	“Pitar”	pyga	687	73
Veneroidea	“Pitar”	pyga	686	73

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Veneroidea	“Pitar”	pyga	685	73
Veneroidea	“Pitar”	pyga	688	73
Veneroidea	“Pitar”	pyga	720	73
Veneroidea	“Pitar”	pyga	693	73
Veneroidea	“Pitar”	pyga	844	73
Veneroidea	“Pitar”	pyga	945	73
Veneroidea	“Pitar”	pyga	946	73
Veneroidea	“Pitar”	ripleyanus	341	53
Veneroidea	“Pitar”	ripleyanus	354	7
Veneroidea	“Pitar”	ripleyanus	721	70
Veneroidea	“Pitar”	ripleyanus	722	70
Veneroidea	“Pitar”	ripleyanus	723	70
Veneroidea	“Pitar”	ripleyanus	724	70
Veneroidea	“Pitar”	ripleyanus	725	70
Veneroidea	“Pitar”	ripleyanus	726	70
Veneroidea	“Pitar”	ripleyanus	727	70
Veneroidea	“Pitar”	ripleyanus	853	---
Veneroidea	“Pitar”	ripleyanus	854	---
Veneroidea	“Pitar”	ripleyanus	911	3
Veneroidea	“Pitar”	ripleyanus	912	3
Veneroidea	“Pitar”	ripleyanus	846	7
Veneroidea	“Pitar”	ripleyanus	931	53
Veneroidea	“Pitar”	securiformis	323	48
Veneroidea	“Pitar”	securiformis	74	38
Veneroidea	“Pitar”	securiformis	81	38
Veneroidea	“Pitar”	securiformis	349	38
Veneroidea	“Pitar”	securiformis	512	38
Veneroidea	“Pitar”	securiformis	596	38
Veneroidea	“Pitar”	securiformis	485	38
Veneroidea	“Pitar”	securiformis	486	38
Veneroidea	“Pitar”	securiformis	597	38

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Veneroidea	"Pitar"	securiformis	657	39
Veneroidea	"Pitar"	securiformis	72	38
Veneroidea	"Pitar"	securiformis	540	38
Veneroidea	"Pitar"	securiformis	80	39
Veneroidea	"Pitar"	securiformis	349	62
Veneroidea	"Pitar"	securiformis	840	75
Veneroidea	"Pitar"	securiformis	496	38
Veneroidea	"Pitar"	securiformis	74	26
Veneroidea	"Pitar"	securiformis	74	39
Veneroidea	"Pitar"	securiformis	497	26
Veneroidea	"Pitar"	securiformis	497	38
Veneroidea	"Pitar"	securiformis	513	39
Veneroidea	"Pitar"	securiformis	27	38
Veneroidea	"Pitar"	securiformis	36	38
Veneroidea	"Pitar"*	semipunctata	357	51
Veneroidea	"Pitar"*	semipunctata	440	45
Veneroidea	"Pitar"*	semipunctata	439	45
Veneroidea	"Pitar"*	semipunctata	448	45
Veneroidea	"Pitar"*	semipunctata	995	45
Veneroidea	"Pitar"*	silicifluvia	631	77
Veneroidea	"Pitar"*	silicifluvia	357	42
Veneroidea	"Pitar"	sp.	10	33
Veneroidea	"Pitar"	texacola	353	71
Veneroidea	"Pitar"	texacola	331	21
Veneroidea	"Pitar"	texacola	346	---
Veneroidea	"Pitar"	texacola	12	21
Veneroidea	"Pitar"	texacola	324	21
Veneroidea	"Pitar"	texacola	348	23
Veneroidea	"Pitar"	texacola	369	19
Veneroidea	"Pitar"	texacola	658	85
Veneroidea	"Pitar"	texacola	601	57

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Veneroidea	"Pitar"	texacola	602	57
Veneroidea	"Pitar"	texacola	641	21
Veneroidea	"Pitar"	texacola	23	21
Veneroidea	"Pitar"	texibrazus	189	113
Veneroidea	"Pitar"	texibrazus	211	113
Veneroidea	"Pitar"	texibrazus	377	59
Veneroidea	"Pitar"	texibrazus	15	59
Veneroidea	"Pitar"	tornadonis	337	23
Veneroidea	"Pitar"	tornadonis	377	59
Veneroidea	"Pitar"	tornadonis	348	23
Veneroidea	"Pitar"	tornadonis	754	23
Veneroidea	"Pitar"	tornadonis	32	23
Veneroidea	"Pitar"	tornadonis	14	54
Veneroidea	"Pitar"	tornadonis	15	59
Veneroidea	"Pitar"*	turneri	13	69
Veneroidea	"Pitar"*	turneri	996	69
Veneroidea	"Pitar"	vespertinus	---	---
Veneroidea	"Pitar"	vetus	358	65
Veneroidea	"Pitar"	vetus	715	61
Veneroidea	"Pitar"	vetus	728	---
Veneroidea	"Rhabdopitaria"	astartoides	662	71
Veneroidea	"Rhabdopitaria"	astartoides	608	59
Veneroidea	"Rhabdopitaria"	astartoides	613	59
Veneroidea	"Rhabdopitaria"	astartoides	731	59
Veneroidea	"Rhabdopitaria"	astartoides	732	59
Veneroidea	"Rhabdopitaria"	astartoides	733	59
Veneroidea	"Rhabdopitaria"	discoidalis	1	34
Veneroidea	"Rhabdopitaria"	discoidalis	46	34
Veneroidea	"Rhabdopitaria"	pricei	612	20
Veneroidea	"Rhabdopitaria"	subcrassa	1	71
Veneroidea	"Rhabdopitaria"	subcrassa	1	34

Table C.5. Occurrences of species in the Carditoidea, Pectinoidea, and Veneroidea in the Gulf and Atlantic Coastal Plains in the Paleogene, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Species	LocalityID	StratID
Veneroidea	"Rhabdopitaria"	subcrassa	498	33
Veneroidea	"Rhabdopitaria"	subcrassa	46	34
Veneroidea	"Rhabdopitaria"	texangelina	614	59
Veneroidea	"Rhabdopitaria"	winnensis	64	23
Veneroidea	"Rhabdopitaria"	winnensis	735	23
Veneroidea	"Sinodia"	eocaenica	377	59
Veneroidea	"Sinodia"	eocaenica	15	59
Veneroidea	"Textivenus"	retisculpta	1	34
Veneroidea	"Textivenus"	retisculpta	46	34
Veneroidea	"Ventricolaria"*	ucuttana	632	40
Veneroidea	"Ventricolaria"*	ucuttana	801	40
Veneroidea	"Ventricolaria"*	ucuttana	422	40
Veneroidea	"Ventricolaria"*	ucuttana	372	40
Veneroidea	"Ventricolaria"*	ucuttana	809	40
Veneroidea	"Ventricolaria"*	ucuttana	440	45
Veneroidea	"Ventricolaria"*	ucuttana	808	45
Veneroidea	"Venus"	jacksonensis	323	38

Table C.6. Bulk samples used to estimate the abundances of Paleogene bivalve species. Data were collected through fieldwork by the author, use of existing collections, and literature compilation. Except where noted, data from literature sources were downloaded from the Paleobiology Database (PBDB) and the relevant PBDB collection numbers are provided. Full citations and relevant metadata for PBDB collections can be accessed at http://paleodb.org. Columns are:

1. SampleID
2. LocalityID: matches LocalityID in Table C.4
3. StratID: matches StratID in Table C.3
4. Data source
5. PBDB Number(s): Paleobiology Database collection numbers. Multiple samples at a locality from the same lithostratigraphic unit were pooled whenever possible.
6. N: total sample size of bivalve specimens

SampleID	LocalityID	StratID	Data source	PBDB Number(s)	N
12	14	54	Harnik Thesis Collections	---	857
14	15	59	Harnik Thesis Collections	---	301
17	16	55	Harnik Thesis Collections	---	1467
38	23	21	Harnik Thesis Collections	---	550
47	27	38	Harnik Thesis Collections	---	1109
60	32	23	Harnik Thesis Collections	---	218
75	36	38	Harnik Thesis Collections	---	1258
90	40	23	Harnik Thesis Collections	---	235
109	46	34	Harnik Thesis Collections	---	1244
131	56	16	Harnik Thesis Collections	---	3541
136	57	16	Harnik Thesis Collections	---	913
219	48	34	Harnik Thesis Collections	---	1177
254	108	33	Harnik Thesis Collections	---	411

Table C.6. Bulk samples used to estimate the abundances of Paleogene bivalve species, continued.

SampleID	LocalityID	StratID	Data source	PBDB Number(s)	N
263	110	16	Harnik Thesis Collections	---	933
268	46	33	Harnik Thesis Collections	---	766
280	74	38	Harnik Thesis Collections	---	411
286	74	38	Harnik Thesis Collections	---	684
292	371	34	Swindel 1986	---	3266
296	1	34	Swindel 1986	---	38688
297	454	34	Swindel 1986	---	12821
298	495	38	Elder 1981	---	5679
299	422	40	Hansen et al. 2004	---	2719
300	496	38	PBDB	1282-1285	2374
301	156	38	PBDB	1286-1293	4333
302	74	26	PBDB	1294	755
303	74	38	PBDB	1413-1415	1478
304	74	39	PBDB	1416	344
305	72	38	PBDB	1417-1420	2745
306	497	26	PBDB	1429	1029
307	497	38	PBDB	1430-1433	5538
308	81	38	PBDB	1434	1424
309	498	33	PBDB	1435	1324
310	499	33	PBDB	1436-1439	3143
311	371	33	PBDB	1440-1442	2533
312	609	23	PBDB	1443-1444	1630
313	509	112	PBDB	1445-1448	4771
315	259	23	PBDB	1454-1455	878
316	178	33	PBDB	2416-2417	752.5
317	511	33	PBDB	2418-2423, 6788	3456.5
318	178	33	PBDB	2440-2441, 2443	498.5
319	512	38	PBDB	3503	174

Table C.6. Bulk samples used to estimate the abundances of Paleogene bivalve species, continued.

SampleID	LocalityID	StratID	Data source	PBDB Number(s)	N
320	513	39	PBDB	3539	395
321	377	59	PBDB	7437-739	2414
322	514	23	PBDB	44408, 44410, 44517	510
324	74	38	Harnik Thesis Collections		1099
325	915	7	PBDB	2809	226
326	917	7	PBDB	2814	151
327	846	7	PBDB	2815	87
328	911	3	PBDB	2859	163
329	912	3	PBDB	2862	228
330	931	53	PBDB	2919	207
331	934	58	PBDB	2923	70
332	595	38	PBDB	3504	77
333	995	45	PBDB	66307-66336	7332
334	996	69	PBDB	83950, 84337, 84325	1366
335	804	42	PBDB	5867	312
336	805	42	PBDB	5941	502
337	812	42	PBDB	5942	107
338	997	1	PBDB	5570, 5584	1541
339	997	1	PBDB	5585, 5602	1545
340	962	13	PBDB	80367	535
341	963	13	PBDB	80387	274
342	964	13	PBDB	80421	120
344	67	72	PBDB	80495	362
345	952	16	PBDB	80764	226
346	655	16	PBDB	80779	333
347	664	16	PBDB	80786	155
348	66	17	PBDB	80790, 80792	738
349	552	28	PBDB	81179	179
350	553	28	PBDB	81182	175
351	569	113	PBDB	81190	124

Table C.6. Bulk samples used to estimate the abundances of Paleogene bivalve species, continued.

SampleID	LocalityID	StratID	Data source	PBDB Number(s)	N
352	211	113	PBDB	81191	188
353	555	31	PBDB	81206	207
354	564	31	PBDB	81209	111
355	554	33	PBDB	81253	120
357	999	2	PBDB	85315	169
358	210	52	PBDB	85320, 85322	118
359	1000	53	PBDB	86172, 86175	395
360	68	52	PBDB	86176, 86179	154

Table C.7. Bulk-sample abundance data for Paleogene bivalve species. Data were collected through fieldwork by the author, use of existing collections, and literature compilation. More detailed discussion of sampling and counting protocols is summarized in the Methods sections of Chapters Two, Three, and Four. Note "NonClade umbos" indicates the number of bivalve specimens in a sample from clades other than the Carditoidea, Pectinoidea, and Veneroidea. Columns are:

1. SampleID: matches SampleID in Table C.6
2. Superfamily: assignments are taken from Palmer and Brann (1965) and the bivalve volume of the Treatise on Invertebrate Paleontology (Moore 1969-1971), and were used to group species into target clades for analysis
3. Genus: names are taken from Palmer and Brann (1965) and were not evaluated here for congruence with more recent systematic treatments of the genus nor used in any of the analyses presented herein. All genus names are accordingly presented in quotes; see Appendix D for a partially updated working taxonomy for bivalve species in the Carditoidea, Pectinoidea, and Veneroidea. Paleocene and Eocene species described after the publication of Palmer and Brann's (1965) compendium, and Oligocene species described by Dockery (1982), are indicated with an asterisk next to the genus assignment.
4. Species: names are taken from Palmer and Brann (1965), with additions and modifications from Heaslip (1968), Glawe (1969; 1974), Allen (1970), Dockery (1980; 1982; 1997), Campbell (1995), and Garvie (1996)
5. Number of Individuals
6. Relative Abundance: abundance of bivalves species relative to the total number of bivalve specimens in the sample
7. List-Only: Yes, indicates species known only from faunal lists at the locality but absent in the current quantitative sample of individuals. The abundance of these species was estimated as 1/N.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
12	---	NonClade	umbos	813	0.9487	---
12	Carditoidea	"Venericardia"	densata	20	0.0233	---
12	Veneroidea	"Katherinella"	trigoniata	9	0.0105	---
12	Veneroidea	"Pitar"	petropolitanus	5	0.0058	---
12	Veneroidea	Venerid	indet	5	0.0058	---
12	Carditoidea	"Venericardia"	sp.	3	0.0035	---
12	Pectinoidea	"Eburneopecten"	sp.	1	0.0012	---
12	Veneroidea	"Pitar"	tornadonis	1	0.0012	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
14	---	NonClade	umbos	282	0.9369	---
14	Carditoidea	“Venericardia”	rotunda	7	0.0233	---
14	Carditoidea	“Venericardia”	densata	2	0.0066	---
14	Carditoidea	“Venericardia”	trapaquara	1	0.0033	Yes
14	Pectinoidea	“Chlamys”	burlesonensis	1	0.0033	Yes
14	Pectinoidea	“Plicatula”	filamentosa	1	0.0033	Yes
14	Veneroidea	“Katherinella”	smithvillensis	1	0.0033	Yes
14	Veneroidea	“Katherinella”	trinitatis	1	0.0033	Yes
14	Veneroidea	“Pitar”	petropolitanus	1	0.0033	Yes
14	Veneroidea	“Pitar”	texibrazus	1	0.0033	Yes
14	Veneroidea	“Pitar”	tornadonis	1	0.0033	Yes
14	Veneroidea	“Sinodia”	eocaenica	1	0.0033	Yes
14	Veneroidea	Venerid	indet	1	0.0033	---
17	---	NonClade	umbos	1260	0.8589	---
17	Carditoidea	“Venericardia”	rotunda	189	0.1288	---
17	Pectinoidea	“Plicatula”	filamentosa	12	0.0082	---
17	Pectinoidea	“Eburneopecten”	sp.	3	0.0020	---
17	Carditoidea	“Venericardia”	sp.	2	0.0014	---
17	Veneroidea	Venerid	indet	1	0.0007	---
38	---	NonClade	umbos	343	0.6236	---
38	Carditoidea	“Venericardia”	rotunda	188	0.3418	---
38	Carditoidea	“Venericardia”	flabellum	9	0.0164	---
38	Carditoidea	“Venericardia”	coloradonis	4	0.0073	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
38	Carditoidea	“Venericardia”	densata	1	0.0018	Yes
38	Carditoidea	“Venericardia”	mooreana	1	0.0018	Yes
38	Pectinoidea	“Chlamys”	burlesonensis	1	0.0018	Yes
38	Veneroidea	“Katherinella”	smithvillensis	1	0.0018	Yes
38	Veneroidea	“Katherinella”	trigoniata	1	0.0018	---
38	Veneroidea	“Pitar”	texacola	1	0.0018	Yes
47	---	NonClade	umbos	964	0.8693	---
47	Pectinoidea	“Eburneopecten”	scintillatus	130	0.1172	---
47	Carditoidea	“Venericardia”	diversidentata	4	0.0036	---
47	Veneroidea	“Callista”	annexa	4	0.0036	---
47	Pectinoidea	“Eburneopecten”	frontalis	3	0.0027	---
47	Carditoidea	“Venericardia”*	quadrata	1	0.0009	---
47	Carditoidea	“Venericardia”	apodensata	1	0.0009	---
47	Veneroidea	“Callista”	pearlensis	1	0.0009	---
47	Veneroidea	“Pitar”	securiformis	1	0.0009	---
60	---	NonClade	umbos	172	0.7890	---
60	Carditoidea	“Venericardia”	rotunda	18	0.0826	---
60	Pectinoidea	“Eburneopecten”	hamiltonensis	13	0.0596	---
60	Carditoidea	“Venericardia”	coloradonis	9	0.0413	---
60	Pectinoidea	“Chlamys”	wahtubbeana	5	0.0229	---
60	Veneroidea	“Pitar”	tornadonis	1	0.0046	---
75	---	NonClade	umbos	1178	0.9364	---
75	Veneroidea	“Callista”	annexa	44	0.0350	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
75	Carditoidea	“Venericardia”	diversidentata	9	0.0072	---
75	Carditoidea	“Venericardia”	parva	8	0.0064	---
75	Carditoidea	“Venericardia”	apodensata	5	0.0040	---
75	Pectinoidea	“Eburneopecten”	scintillatus	5	0.0040	---
75	Veneroidea	“Callista”	sp.	4	0.0032	---
75	Veneroidea	“Callista”	pearlensis	2	0.0016	---
75	Veneroidea	“Pitar”	securiformis	2	0.0016	---
75	Carditoidea	“Carditamera”*	williamsi	1	0.0008	Yes
90	---	NonClade	umbos	203	0.8638	---
90	Carditoidea	“Venericardia”	coloradonis	12	0.0511	---
90	Pectinoidea	“Chlamys”	wahtubbeana	10	0.0426	---
90	Pectinoidea	“Chlamys”	sp.	6	0.0255	---
90	Carditoidea	“Venericardia”	sp.	2	0.0085	---
90	Veneroidea	Venerid	indet	2	0.0085	---
109	---	NonClade	umbos	957	0.7693	---
109	Carditoidea	“Venericardia”	parva	72	0.0579	---
109	Veneroidea	“Callista”	aequorea	53	0.0426	---
109	Carditoidea	“Venericardia”	alticostata	41	0.0330	---
109	Veneroidea	“Callista”	perovata	34	0.0273	---
109	Carditoidea	“Venericardia”	rotunda	30	0.0241	---
109	Veneroidea	“Callista”	sp.	18	0.0145	---
109	Veneroidea	Venerid	indet	13	0.0105	---
109	Veneroidea	“Katherinella”	trigoniata	3	0.0024	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
109	Veneroidea	“Pitar”	poulsoni	3	0.0024	---
109	Veneroidea	“Pitar”	sp.	3	0.0024	---
109	Pectinoidea	“Plicatula”	filamentosa	2	0.0016	---
109	Carditoidea	“Venericardia”	aldrichi	1	0.0008	Yes
109	Carditoidea	“Venericardia”	angustoscrobis	1	0.0008	Yes
109	Carditoidea	“Venericardia”	claiboplata	1	0.0008	Yes
109	Carditoidea	“Venericardia”	complexicosta	1	0.0008	Yes
109	Carditoidea	“Venericardia”	inflatior	1	0.0008	Yes
109	Pectinoidea	“Chlamys”	deshayesii	1	0.0008	Yes
109	Veneroidea	“Callista”	aldrichi	1	0.0008	---
109	Veneroidea	“Callista”	mortoni	1	0.0008	Yes
109	Veneroidea	“Gratelupia”	hydana	1	0.0008	Yes
109	Veneroidea	“Pitar”	cornelli	1	0.0008	Yes
109	Veneroidea	“Pitar”	exiguus	1	0.0008	Yes
109	Veneroidea	“Pitar”	nuttali	1	0.0008	Yes
109	Veneroidea	“Rhabdopitaria”	discoidalis	1	0.0008	Yes
109	Veneroidea	“Rhabdopitaria”	subcrassa	1	0.0008	Yes
109	Veneroidea	“Textivenus”	retisculpta	1	0.0008	Yes
131	---	NonClade	umbos	1952	0.5513	---
131	Carditoidea	“Venericardia”	bashiplata	1078	0.3044	---
131	Veneroidea	“Macrocallista”	sylvaerupis	354	0.1000	---
131	Carditoidea	“Venericardia”	sp.	75	0.0212	---
131	Veneroidea	Venerid	indet	61	0.0172	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
131	Veneroidea	“Pitar”	nuttalliopsis	16	0.0045	---
131	Carditoidea	“Venericardia”	gulielmi	1	0.0003	---
131	Carditoidea	“Venericardia”	horatiana	1	0.0003	Yes
131	Carditoidea	“Venericardia”*	linguinodifera	1	0.0003	---
131	Carditoidea	“Venericardia”	n. sp.	1	0.0003	---
131	Pectinoidea	“Chlamys”	choctavensis	1	0.0003	Yes
136	Veneroidea	“Macrocallista”	sylvaerupis	347	0.3801	---
136	---	NonClade	umbos	303	0.3319	---
136	Carditoidea	“Venericardia”	bashiplata	173	0.1895	---
136	Veneroidea	“Pitar”	nuttalliopsis	51	0.0559	---
136	Carditoidea	“Venericardia”	sp.	20	0.0219	---
136	Veneroidea	Venerid	indet	18	0.0197	---
136	Pectinoidea	“Plicatula”	filamentosa	1	0.0011	---
219	---	NonClade	umbos	779	0.6619	---
219	Veneroidea	“Callista”	mortoni	226	0.1920	---
219	Veneroidea	“Callista”	aequorea	66	0.0561	---
219	Carditoidea	“Venericardia”	parva	41	0.0348	---
219	Carditoidea	“Venericardia”	rotunda	25	0.0212	---
219	Carditoidea	“Venericardia”	alticostata	13	0.0110	---
219	Pectinoidea	“Chlamys”	deshayesii	12	0.0102	---
219	Veneroidea	“Callista”	perovata	6	0.0051	---
219	Veneroidea	“Katherinella”	trigoniata	5	0.0042	---
219	Veneroidea	“Callista”	aldrichi	3	0.0025	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
219	Carditoidea	“Venericardia”	claiboplata	1	0.0008	Yes
254	---	NonClade	umbos	343	0.8345	---
254	Carditoidea	“Venericardia”	rotunda	19	0.0462	---
254	Veneroidea	“Katherinella”	trigoniata	16	0.0389	---
254	Carditoidea	“Venericardia”	densata	15	0.0365	---
254	Veneroidea	“Callista”	perovata	13	0.0316	---
254	Carditoidea	“Venericardia”	claiboplata	1	0.0024	---
254	Carditoidea	“Venericardia”	parva	1	0.0024	---
254	Carditoidea	“Venericardia”	tortidens	1	0.0024	---
254	Pectinoidea	“Eburneopecten”	hamiltonensis	1	0.0024	---
254	Veneroidea	Venerid	indet	1	0.0024	---
263	---	NonClade	umbos	491	0.5263	---
263	Veneroidea	“Macrocallista”	sylvaerupis	364	0.3901	---
263	Veneroidea	Venerid	indet	44	0.0472	---
263	Carditoidea	“Venericardia”	horatiana	14	0.0150	---
263	Pectinoidea	“Amusium”	Cf. squamulum	8	0.0086	---
263	Carditoidea	“Venericardia”	sp.	5	0.0054	---
263	Pectinoidea	“Chlamys”	choctavensis	2	0.0021	---
263	Carditoidea	“Venericardia”	bashiplata	1	0.0011	---
263	Carditoidea	“Venericardia”*	linguinodifera	1	0.0011	---
263	Carditoidea	“Venericardia”	turneri	1	0.0011	Yes
263	Pectinoidea	“Plicatula”	filamentosa	1	0.0011	---
263	Veneroidea	“Pitar”	nuttalliopsis	1	0.0011	Yes

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
268	---	NonClade	umbos	417	0.5444	---
268	Carditoidea	“Venericardia”	rotunda	276	0.3603	---
268	Veneroidea	“Callista”	perovata	31	0.0405	---
268	Carditoidea	“Venericardia”	densata	23	0.0300	---
268	Veneroidea	Venerid	indet	9	0.0117	---
268	Pectinoidea	“Eburneopecten”	hamiltonensis	5	0.0065	---
268	Veneroidea	“Katherinella”	trigoniata	5	0.0065	---
280	---	NonClade	umbos	332	0.8078	---
280	Carditoidea	“Venericardia”	diversidentata	42	0.1022	---
280	Veneroidea	Venerid	indet	9	0.0219	---
280	Carditoidea	“Venericardia”	inflatior	7	0.0170	---
280	Pectinoidea	“Eburneopecten”	scintillatus	7	0.0170	---
280	Carditoidea	“Venericardia”	sp.	5	0.0122	---
280	Veneroidea	“Pitar”	securiformis	3	0.0073	---
280	Carditoidea	“Venericardia”	apodensata	2	0.0049	---
280	Pectinoidea	“Eburneopecten”	subminutus	2	0.0049	---
280	Pectinoidea	“Chlamys”	nupera	1	0.0024	---
280	Veneroidea	“Callista”	sp.	1	0.0024	---
286	---	NonClade	umbos	523	0.7646	---
286	Carditoidea	“Venericardia”	diversidentata	81	0.1184	---
286	Carditoidea	“Venericardia”	inflatior	24	0.0351	---
286	Carditoidea	“Venericardia”	sp.	12	0.0175	---
286	Pectinoidea	“Eburneopecten”	scintillatus	11	0.0161	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
286	Veneroidea	“Callista”	annexa	8	0.0117	---
286	Veneroidea	“Callista”	pearlensis	7	0.0102	---
286	Carditoidea	“Venericardia”	apodensata	5	0.0073	---
286	Pectinoidea	“Chlamys”	nupera	5	0.0073	---
286	Veneroidea	Venerid	indet	4	0.0058	---
286	Pectinoidea	“Chlamys”	sp.	2	0.0029	---
286	Pectinoidea	“Eburneopecten”	subminutus	2	0.0029	---
292	---	NonClade	umbos	1385	0.4241	---
292	Veneroidea	“Callista”	aequorea	920	0.2817	---
292	Carditoidea	“Venericardia”	parva	482	0.1476	---
292	Veneroidea	“Callista”	perovata	291	0.0891	---
292	Veneroidea	“Callista”	mortoni	71	0.0217	---
292	Carditoidea	“Venericardia”	rotunda	70	0.0214	---
292	Carditoidea	“Venericardia”	alticostata	27	0.0083	---
292	Veneroidea	“Katherinella”	trigoniata	10	0.0031	---
292	Pectinoidea	“Plicatula”	filamentosa	3	0.0009	---
292	Carditoidea	“Venericardia”	aldrichi	2	0.0006	---
292	Pectinoidea	“Chlamys”	deshayesii	2	0.0006	---
292	Carditoidea	“Venericardia”	claiboplata	1	0.0003	---
292	Carditoidea	“Venericardia”	complexicosta	1	0.0003	---
292	Veneroidea	“Gratelupia”	hydana	1	0.0003	Yes
296	---	NonClade	umbos	22129	0.5720	---
296	Carditoidea	“Venericardia”	parva	7941	0.2053	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
296	Veneroidea	“Callista”	aequorea	5642	0.1458	---
296	Carditoidea	“Venericardia”	rotunda	902	0.0233	---
296	Veneroidea	“Callista”	mortoni	715	0.0185	---
296	Carditoidea	“Venericardia”	alticostata	676	0.0175	---
296	Veneroidea	“Callista”	perovata	487	0.0126	---
296	Pectinoidea	“Plicatula”	filamentosa	123	0.0032	---
296	Veneroidea	“Katherinella”	trigoniata	28	0.0007	---
296	Carditoidea	“Venericardia”	aldrichi	17	0.0004	---
296	Pectinoidea	“Chlamys”	deshayesii	7	0.0002	---
296	Veneroidea	“Gratelupia”	hydana	6	0.0002	---
296	Carditoidea	“Venericardia”	complexicosta	4	0.0001	---
296	Carditoidea	“Venericardia”	angustoscrobis	1	0.0000	Yes
296	Carditoidea	“Venericardia”	claiboplata	1	0.0000	Yes
296	Carditoidea	“Venericardia”	inflatior	1	0.0000	Yes
296	Veneroidea	“Callista”	aldrichi	1	0.0000	Yes
296	Veneroidea	“Pitar”	cornelli	1	0.0000	Yes
296	Veneroidea	“Pitar”	exiguus	1	0.0000	Yes
296	Veneroidea	“Pitar”	nuttali	1	0.0000	---
296	Veneroidea	“Pitar”	poulsoni	1	0.0000	Yes
296	Veneroidea	“Rhabdopitaria”	discoidalis	1	0.0000	Yes
296	Veneroidea	“Rhabdopitaria”	subcrassa	1	0.0000	Yes
296	Veneroidea	“Textivenus”	retisculpta	1	0.0000	Yes
297	---	NonClade	umbos	7571	0.5905	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
297	Veneroidea	“Callista”	aequorea	3461	0.2699	---
297	Carditoidea	“Venericardia”	parva	812	0.0633	---
297	Carditoidea	“Venericardia”	rotunda	450	0.0351	---
297	Veneroidea	“Callista”	mortoni	403	0.0314	---
297	Veneroidea	“Katherinella”	trigoniata	92	0.0072	---
297	Pectinoidea	“Chlamys”	deshayesii	22	0.0017	---
297	Carditoidea	“Venericardia”	alticostata	8	0.0006	---
297	Carditoidea	“Venericardia”	claiboplata	1	0.0001	Yes
297	Veneroidea	“Callista”	perovata	1	0.0001	Yes
298	---	NonClade	umbos	5211	0.9176	---
298	Pectinoidea	“Eburneopecten”	scintillatus	248	0.0437	---
298	Carditoidea	“Venericardia”	diversidentata	146	0.0257	---
298	Pectinoidea	“Chlamys”	nupera	35	0.0062	---
298	Veneroidea	“Callista”	annexa	26	0.0046	---
298	Carditoidea	“Venericardia”	inflatior	10	0.0018	---
298	Veneroidea	“Pitar”	securiformis	2	0.0004	---
298	Carditoidea	“Venericardia”	apodensata	1	0.0002	Yes
299	---	NonClade	umbos	2568	0.9445	---
299	Pectinoidea	“Eburneopecten”	subminutus	103	0.0379	---
299	Pectinoidea	“Chlamys”	cocoana	23	0.0085	---
299	Veneroidea	“Pitar”*	aldrichi	10	0.0037	---
299	Carditoidea	“Venericardia”*	carsonensis	5	0.0018	---
299	Pectinoidea	“Spondylus”	dumosus	5	0.0018	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
299	Veneroidea	“Chione”*	victoria	3	0.0011	---
299	Pectinoidea	“Pecten”*	perplanus	1	0.0004	---
299	Veneroidea	“Callista”*	sobrina	1	0.0004	Yes
300	---	NonClade	umbos	1935	0.8151	---
300	Carditoidea	“Venericardia”	diversidentata	198	0.0834	---
300	Veneroidea	“Callista”	annexa	77	0.0324	---
300	Carditoidea	“Venericardia”	apodensata	53	0.0223	---
300	Pectinoidea	“Eburneopecten”	scintillatus	39	0.0164	---
300	Veneroidea	“Pitar”	securiformis	39	0.0164	---
300	Carditoidea	“Venericardia”	sp.	33	0.0139	---
301	---	NonClade	umbos	3737	0.8625	---
301	Carditoidea	“Venericardia”	diversidentata	174	0.0402	---
301	Veneroidea	“Callista”	annexa	165	0.0381	---
301	Pectinoidea	“Eburneopecten”	scintillatus	97	0.0224	---
301	Carditoidea	“Venericardia”	inflatior	82	0.0189	---
301	Carditoidea	“Venericardia”	sp.	30	0.0069	---
301	Carditoidea	“Venericardia”	apodensata	23	0.0053	---
301	Veneroidea	“Pitar”	securiformis	19	0.0044	---
301	Carditoidea	“Venericardia”	parva	6	0.0014	---
302	---	NonClade	umbos	717	0.9497	---
302	Veneroidea	“Callista”	annexa	18	0.0238	---
302	Carditoidea	“Venericardia”	sp.	8	0.0106	---
302	Carditoidea	“Venericardia”	diversidentata	8	0.0106	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
302	Veneroidea	“Pitar”	securiformis	2	0.0026	---
302	Carditoidea	“Venericardia”	inflatior	1	0.0013	---
302	Pectinoidea	“Eburneopecten”	scintillatus	1	0.0013	---
303	---	NonClade	umbos	1346	0.9107	---
303	Carditoidea	“Venericardia”	diversidentata	60	0.0406	---
303	Pectinoidea	“Eburneopecten”	scintillatus	59	0.0399	---
303	Carditoidea	“Venericardia”	inflatior	5	0.0034	---
303	Carditoidea	“Venericardia”	sp.	2	0.0014	---
303	Carditoidea	“Venericardia”	apodensata	1	0.0007	Yes
303	Carditoidea	“Venericardia”	klimacodes	1	0.0007	Yes
303	Pectinoidea	“Chlamys”	nupera	1	0.0007	---
303	Pectinoidea	“Chlamys”	spillmani	1	0.0007	Yes
303	Veneroidea	“Callista”	annexa	1	0.0007	---
303	Veneroidea	“Pitar”	securiformis	1	0.0007	Yes
304	---	NonClade	umbos	338	0.9826	---
304	Pectinoidea	“Eburneopecten”	scintillatus	5	0.0145	---
304	Veneroidea	“Pitar”	securiformis	1	0.0029	---
305	---	NonClade	umbos	2500	0.9107	---
305	Carditoidea	“Venericardia”	diversidentata	195	0.0710	---
305	Pectinoidea	“Eburneopecten”	scintillatus	38	0.0138	---
305	Pectinoidea	“Chlamys”	nupera	9	0.0033	---
305	Carditoidea	“Venericardia”	inflatior	2	0.0007	---
305	Carditoidea	“Venericardia”	apodensata	1	0.0004	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
306	---	NonClade	umbos	948	0.9213	---
306	Pectinoidea	“Eburneopecten”	scintillatus	38	0.0369	---
306	Veneroidea	“Callista”	annexa	19	0.0185	---
306	Carditoidea	“Venericardia”	inflatior	16	0.0155	---
306	Veneroidea	“Pitar”	securiformis	6	0.0058	---
306	Carditoidea	“Venericardia”	sp.	1	0.0010	---
306	Carditoidea	“Venericardia”	diversidentata	1	0.0010	---
307	---	NonClade	umbos	5134	0.9270	---
307	Pectinoidea	“Eburneopecten”	scintillatus	278	0.0502	---
307	Carditoidea	“Venericardia”	inflatior	52	0.0094	---
307	Carditoidea	“Venericardia”	diversidentata	31	0.0056	---
307	Veneroidea	“Callista”	annexa	28	0.0051	---
307	Veneroidea	“Pitar”	securiformis	15	0.0027	---
308	---	NonClade	umbos	1327	0.9319	---
308	Pectinoidea	“Eburneopecten”	scintillatus	77	0.0541	---
308	Veneroidea	“Pitar”	securiformis	6	0.0042	---
308	Carditoidea	“Venericardia”	inflatior	5	0.0035	---
308	Carditoidea	“Venericardia”	diversidentata	3	0.0021	---
308	Veneroidea	“Callista”	annexa	3	0.0021	---
308	Carditoidea	“Venericardia”	apodensata	1	0.0007	Yes
308	Pectinoidea	“Chlamys”	deshayesii	1	0.0007	Yes
308	Pectinoidea	“Chlamys”	nupera	1	0.0007	---
309	---	NonClade	umbos	1288	0.9728	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
309	Carditoidea	“Venericardia”	densata	22	0.0166	---
309	Carditoidea	“Venericardia”	tortidens	8	0.0060	---
309	Veneroidea	“Mercimonia”	mercenaroidea	5	0.0038	---
309	Veneroidea	“Rhabdopitaria”	subcrassa	1	0.0008	---
310	---	NonClade	umbos	2941	0.9357	---
310	Carditoidea	“Venericardia”	densata	140	0.0445	---
310	Veneroidea	“Pitar”	sp.	43	0.0137	---
310	Veneroidea	“Callista”	sp.	11	0.0035	---
310	Pectinoidea	“Eburneopecten”	hamiltonensis	8	0.0025	---
311	---	NonClade	umbos	2041	0.8058	---
311	Carditoidea	“Venericardia”	densata	137	0.0541	---
311	Veneroidea	“Pitar”	petropolitanus	135	0.0533	---
311	Veneroidea	“Callista”	perovata	62	0.0245	---
311	Carditoidea	“Venericardia”	alticostata	55	0.0217	---
311	Pectinoidea	“Eburneopecten”	hamiltonensis	49	0.0193	---
311	Pectinoidea	“Chlamys”	wahtubbeana	28	0.0111	---
311	Veneroidea	“Pitar”	sp.	17	0.0067	---
311	Pectinoidea	“Plicatula”	filamentosa	8	0.0032	---
311	Carditoidea	“Venericardia”	rotunda	1	0.0004	Yes
312	---	NonClade	umbos	1313	0.8055	---
312	Carditoidea	“Venericardia”	rotunda	128	0.0785	---
312	Veneroidea	“Pitar”	petropolitanus	73	0.0448	---
312	Pectinoidea	“Chlamys”	clarkeana	59	0.0362	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
312	Veneroidea	“Callista”	perovata	41	0.0252	---
312	Carditoidea	“Venericardia”	tortidens	11	0.0067	---
312	Carditoidea	“Venericardia”	trapaquara	3	0.0018	---
312	Carditoidea	“Venericardia”	stewarti	2	0.0012	---
313	---	NonClade	umbos	3432	0.7193	---
313	Veneroidea	“Callista”	perovata	1049	0.2199	---
313	Carditoidea	“Venericardia”	densata	136	0.0285	---
313	Pectinoidea	“Eburneopecten”	hamiltonensis	117	0.0245	---
313	Carditoidea	“Venericardia”	sp.	20	0.0042	---
313	Pectinoidea	“Chlamys”	wahtubbeana	8	0.0017	---
313	Veneroidea	“Pitar”	sp.	8	0.0017	---
313	Pectinoidea	“Plicatula”	sp.	1	0.0002	---
315	---	NonClade	umbos	525	0.5979	---
315	Carditoidea	“Venericardia”	alticostata	338	0.3850	---
315	Pectinoidea	“Plicatula”	filamentosa	9	0.0103	---
315	Pectinoidea	“Eburneopecten”	hamiltonensis	4	0.0046	---
315	Carditoidea	“Venericardia”	coloradonis	1	0.0011	Yes
315	Carditoidea	“Venericardia”	densata	1	0.0011	Yes
316	---	NonClade	umbos	611.5	0.8126	---
316	Carditoidea	“Venericardia”	rotunda	100	0.1329	---
316	Pectinoidea	“Eburneopecten”	sp.	17	0.0226	---
316	Veneroidea	“Callista”	perovata	9	0.0120	---
316	Carditoidea	“Venericardia”	sp.	6	0.0080	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
316	Pectinoidea	“Plicatula”	filamentosa	2	0.0027	---
316	Veneroidea	“Pitar”	sp.	2	0.0027	---
316	Carditoidea	“Venericardia”	claiboplata	1	0.0013	Yes
316	Carditoidea	“Venericardia”	densata	1	0.0013	Yes
316	Pectinoidea	“Chlamys”	wahtubbeana	1	0.0013	Yes
316	Veneroidea	“Katherinella”	trigoniata	1	0.0013	Yes
316	Veneroidea	“Pitar”	nuttali	1	0.0013	Yes
317	---	NonClade	umbos	3162	0.9148	---
317	Carditoidea	“Venericardia”	rotunda	235.5	0.0681	---
317	Carditoidea	“Venericardia”	sp.	19	0.0055	---
317	Pectinoidea	“Eburneopecten”	sp.	17.5	0.0051	---
317	Veneroidea	“Katherinella”	trinitatis	13.5	0.0039	---
317	Veneroidea	“Callista”	perovata	3	0.0009	---
317	Carditoidea	“Venericardia”	complexicosta	1	0.0003	Yes
317	Carditoidea	“Venericardia”	densata	1	0.0003	Yes
317	Pectinoidea	“Plicatula”	filamentosa	1	0.0003	---
317	Veneroidea	“Katherinella”	trigoniata	1	0.0003	Yes
317	Veneroidea	“Mercimonia”	mercenaroidea	1	0.0003	Yes
317	Veneroidea	“Pitar”	nuttali	1	0.0003	Yes
318	---	NonClade	umbos	416	0.8345	---
318	Carditoidea	“Venericardia”	rotunda	61	0.1224	---
318	Pectinoidea	“Eburneopecten”	sp.	16	0.0321	---
318	Carditoidea	“Venericardia”	sp.	5.5	0.0110	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
319	---	NonClade	umbos	89	0.5115	---
319	Veneroidea	“Callista”	annexa	55	0.3161	---
319	Carditoidea	“Venericardia”	diversidentata	9	0.0517	---
319	Pectinoidea	“Eburneopecten”	scintillatus	8	0.0460	---
319	Carditoidea	“Venericardia”	sp.	6	0.0345	---
319	Veneroidea	“Pitar”	securiformis	4	0.0230	---
319	Carditoidea	“Venericardia”	apodensata	2	0.0115	---
319	Pectinoidea	“Chlamys”	deshayesii	1	0.0057	Yes
320	---	NonClade	umbos	226	0.5722	---
320	Pectinoidea	“Chlamys”	danvillensis	100	0.2532	---
320	Carditoidea	“Venericardia”	diversidentata	23	0.0582	---
320	Pectinoidea	“Eburneopecten”	scintillatus	21	0.0532	---
320	Veneroidea	“Callista”	annexa	14	0.0354	---
320	Veneroidea	“Callista”	sp.	7	0.0177	---
320	Pectinoidea	“Chlamys”	deshayesii	1	0.0025	---
320	Pectinoidea	“Chlamys”	sp.	1	0.0025	---
320	Pectinoidea	“Pecten”	sp.	1	0.0025	---
320	Veneroidea	“Pitar”	securiformis	1	0.0025	---
321	---	NonClade	umbos	2230	0.9238	---
321	Carditoidea	“Venericardia”	densata	156	0.0646	---
321	Veneroidea	“Katherinella”	smithvillensis	18	0.0075	---
321	Carditoidea	“Venericardia”	rotunda	1	0.0004	---
321	Carditoidea	“Venericardia”	trapaquara	1	0.0004	Yes

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
321	Pectinoidea	“Chlamys”	burlesonensis	1	0.0004	Yes
321	Pectinoidea	“Eburneopecten”	sp.	1	0.0004	Yes
321	Pectinoidea	“Plicatula”	filamentosa	1	0.0004	Yes
321	Veneroidea	“Katherinella”	texitrina	1	0.0004	Yes
321	Veneroidea	“Katherinella”	trinitatis	1	0.0004	---
321	Veneroidea	“Pitar”	petropolitanus	1	0.0004	Yes
321	Veneroidea	“Pitar”	texibrazus	1	0.0004	Yes
321	Veneroidea	“Pitar”	tornadonis	1	0.0004	Yes
322	---	NonClade	umbos	350	0.6863	---
322	Pectinoidea	“Eburneopecten”	sp.	87	0.1706	---
322	Veneroidea	“Callista”	perovata	39	0.0765	---
322	Carditoidea	“Venericardia”	densata	33	0.0647	---
322	Carditoidea	“Venericardia”	sp.	1	0.0020	---
324	---	NonClade	umbos	855	0.7780	---
324	Carditoidea	“Venericardia”	diversidentata	123	0.1119	---
324	Carditoidea	“Venericardia”	inflatior	31	0.0282	---
324	Pectinoidea	“Eburneopecten”	scintillatus	18	0.0164	---
324	Carditoidea	“Venericardia”	sp.	17	0.0155	---
324	Veneroidea	Venerid	indet	13	0.0118	---
324	Veneroidea	“Callista”	annexa	8	0.0073	---
324	Carditoidea	“Venericardia”	apodensata	7	0.0064	---
324	Veneroidea	“Callista”	pearlensis	7	0.0064	---
324	Pectinoidea	“Chlamys”	nupera	6	0.0055	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
324	Pectinoidea	“Eburneopecten”	subminutus	4	0.0036	---
324	Veneroidea	“Pitar”	securiformis	3	0.0027	---
324	Pectinoidea	“Chlamys”	sp.	2	0.0018	---
324	Carditoidea	“Venericardia”	klimacodes	1	0.0009	Yes
324	Pectinoidea	“Chlamys”	spillmani	1	0.0009	Yes
324	Pectinoidea	“Plicatula”	louisiana	1	0.0009	Yes
324	Veneroidea	“Callista”	sp.	1	0.0009	---
324	Veneroidea	“Katherinella”	trigoniata	1	0.0009	Yes
325	---	NonClade	umbos	193	0.8540	---
325	Carditoidea	“Venericardia”	sp.	24	0.1062	---
325	Carditoidea	“Venericardia”	mediaplata	6	0.0265	---
325	Carditoidea	“Venericardia”	smithii	3	0.0133	---
326	---	NonClade	umbos	138	0.9139	---
326	Carditoidea	“Venericardia”	mediaplata	8	0.0530	---
326	Carditoidea	“Venericardia”	smithii	5	0.0331	---
327	---	NonClade	umbos	49	0.5632	---
327	Carditoidea	“Venericardia”	smithii	20	0.2299	---
327	Carditoidea	“Venericardia”	mediaplata	11	0.1264	---
327	Veneroidea	“Pitar”	ripleyanus	7	0.0805	---
328	---	NonClade	umbos	119	0.7301	---
328	Carditoidea	“Venericardia”	wilcoxensis	27	0.1656	---
328	Veneroidea	“Pitar”	ripleyanus	17	0.1043	---
329	---	NonClade	umbos	211	0.9254	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
329	Carditoidea	“Venericardia”	wilcoxensis	12	0.0526	---
329	Veneroidea	“Pitar”	ripleyanus	5	0.0219	---
330	---	NonClade	umbos	112	0.5411	---
330	Carditoidea	“Venericardia”	wilcoxensis	93	0.4493	---
330	Veneroidea	“Pitar”	ripleyanus	2	0.0097	---
331	Carditoidea	“Venericardia”	wilcoxensis	36	0.5143	---
331	---	NonClade	umbos	31	0.4429	---
331	Veneroidea	“Pitar”	sp.	3	0.0429	---
332	Pectinoidea	“Eburneopecten”	scintillatus	65	0.8442	---
332	---	NonClade	umbos	9	0.1169	---
332	Pectinoidea	“Chlamys”	deshayesii	3	0.0390	---
333	---	NonClade	umbos	6545.5	0.8927	---
333	Pectinoidea	“Pecten”*	byramensis	572	0.0780	---
333	Veneroidea	“Callista”*	sobrina	155.5	0.0212	---
333	Veneroidea	“Pitar”*	imitabilis	37.5	0.0051	---
333	Veneroidea	“Pitar”*	semipunctata	21.5	0.0029	---
334	---	NonClade	umbos	1115	0.8163	---
334	Pectinoidea	“Plicatula”*	pustula	78	0.0571	---
334	Carditoidea	“Venericardia”*	linguinodifera	63	0.0461	---
334	Carditoidea	“Venericardia”	densata	51	0.0373	---
334	Veneroidea	“Pitar”	sp.	23	0.0168	---
334	Pectinoidea	“Amusium”*	zinguli	18	0.0132	---
334	Carditoidea	“Venericardia”	sp.	11	0.0081	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
334	Carditoidea	“Venericardia”	coloradonis	4	0.0029	---
334	Veneroidea	“Pitar”*	turneri	2	0.0015	---
334	Pectinoidea	“Chlamys”	sp.	1	0.0007	---
335	---	NonClade	umbos	213	0.6827	---
335	Pectinoidea	“Pecten”*	poulsoni	51	0.1635	---
335	Pectinoidea	“Eburneopecten”	subminutus	19	0.0609	---
335	Veneroidea	“Pitar”*	aldrichi	9	0.0288	---
335	Veneroidea	“Callista”*	sobrina	4	0.0128	---
335	Veneroidea	“Chione”*	victoria	4	0.0128	---
335	Veneroidea	“Pitar”*	calcanea	4	0.0128	---
335	Carditoidea	“Venericardia”*	carsonensis	2	0.0064	---
335	Veneroidea	“Callista”*	goniopisthus	2	0.0064	---
335	Veneroidea	“Pitar”*	megacostata	2	0.0064	---
335	Pectinoidea	“Chlamys”*	anatipes	1	0.0032	---
335	Pectinoidea	“Chlamys”*	menthifontis	1	0.0032	---
336	---	NonClade	umbos	415	0.8267	---
336	Carditoidea	“Venericardia”*	carsonensis	42	0.0837	---
336	Pectinoidea	“Eburneopecten”	subminutus	20	0.0398	---
336	Veneroidea	“Pitar”*	aldrichi	10	0.0199	---
336	Veneroidea	“Pitar”*	calcanea	7	0.0139	---
336	Pectinoidea	“Chlamys”*	menthifontis	5	0.0100	---
336	Veneroidea	“Chione”*	victoria	3	0.0060	---
337	---	NonClade	umbos	68	0.6355	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
337	Veneroidea	“Callista”*	sobrina	15	0.1402	---
337	Pectinoidea	“Pecten”*	poulsoni	14	0.1308	---
337	Carditoidea	“Venericardia”*	carsonensis	3	0.0280	---
337	Veneroidea	“Pitar”*	calcanea	3	0.0280	---
337	Pectinoidea	“Chlamys”*	menthifontis	1	0.0093	Yes
337	Pectinoidea	“Spondylus”*	filiaris	1	0.0093	---
337	Veneroidea	“Chione”*	victoria	1	0.0093	---
337	Veneroidea	“Pitar”*	protena	1	0.0093	---
338	---	NonClade	umbos	1531	0.9935	---
338	Pectinoidea	“Amusium”	alabamense	10	0.0065	---
339	---	NonClade	umbos	1180	0.7638	---
339	Pectinoidea	“Amusium”	alabamense	204	0.1320	---
339	Carditoidea	“Venericardia”	eoa	103	0.0667	---
339	Carditoidea	“Venericardia”	bulla	28	0.0181	---
339	Carditoidea	“Venericardia”	moa	28	0.0181	---
339	Veneroidea	“Pitar”	sp.	2	0.0013	---
340	---	NonClade	umbos	345	0.6449	---
340	Carditoidea	“Venericardia”	aposmithii	77	0.1439	---
340	Carditoidea	“Venericardia”	nanaplata	65	0.1215	---
340	Veneroidea	“Pitar”	nuttalliopsis	44	0.0822	---
340	Carditoidea	“Venericardia”	sp.	2	0.0037	---
340	Carditoidea	“Venericardia”	pilsbryi	1	0.0019	---
340	Veneroidea	“Pitar”	sp.	1	0.0019	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
341	---	NonClade	umbos	181	0.6606	---
341	Veneroidea	“Pitar”	nuttalliopsis	62	0.2263	---
341	Carditoidea	“Venericardia”	sp.	23	0.0839	---
341	Carditoidea	“Venericardia”	aposmithii	7	0.0255	---
341	Carditoidea	“Venericardia”	nanaplata	1	0.0036	---
342	Carditoidea	“Venericardia”	aposmithii	95	0.7917	---
342	---	NonClade	umbos	19	0.1583	---
342	Veneroidea	“Pitar”	nuttalliopsis	6	0.0500	---
344	---	NonClade	umbos	170	0.4696	---
344	Carditoidea	“Venericardia”	nanaplata	105	0.2901	---
344	Veneroidea	“Pitar”	nuttalliopsis	69	0.1906	---
344	Pectinoidea	“Chlamys”	greggi	8	0.0221	---
344	Carditoidea	“Venericardia”	aposmithii	6	0.0166	---
344	Carditoidea	“Venericardia”	greggiana	4	0.0110	---
345	Veneroidea	“Macrocallista”	sylvaerupis	135	0.5973	---
345	---	NonClade	umbos	48	0.2124	---
345	Veneroidea	“Pitar”	nuttalliopsis	26	0.1150	---
345	Carditoidea	“Venericardia”	bashiplata	11	0.0487	---
345	Carditoidea	“Venericardia”	horatiana	4	0.0177	---
345	Pectinoidea	“Chlamys”	choctavensis	2	0.0088	---
346	---	NonClade	umbos	167	0.5015	---
346	Veneroidea	“Pitar”	nuttalliopsis	94	0.2823	---
346	Carditoidea	“Venericardia”	bashiplata	53	0.1592	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
346	Carditoidea	“Venericardia”	sp.	8	0.0240	---
346	Veneroidea	“Macrocallista”	sylvaerupis	6	0.0180	---
346	Pectinoidea	“Chlamys”	choctavensis	3	0.0090	---
346	Carditoidea	“Venericardia”	horatiana	2	0.0060	---
347	Veneroidea	“Pitar”	nuttalliopsis	126	0.8129	---
347	Carditoidea	“Venericardia”	horatiana	18	0.1161	---
347	Carditoidea	“Venericardia”	bashiplata	7	0.0452	---
347	---	NonClade	umbos	3	0.0194	---
347	Carditoidea	“Venericardia”*	linguinodifera	1	0.0065	Yes
348	Carditoidea	“Venericardia”	hatcheplata	405	0.5488	---
348	Veneroidea	“Pelecyora”	hatchetigbeensis	163	0.2209	---
348	---	NonClade	umbos	98	0.1328	---
348	Pectinoidea	“Eburneopecten”	corneoides	40	0.0542	---
348	Pectinoidea	“Plicatula”	filamentosa	14	0.0190	---
348	Carditoidea	“Venericardia”	turneri	9	0.0122	---
348	Veneroidea	“Macrocallista”	sylvaerupis	6	0.0081	---
348	Carditoidea	“Venericardia”	horatiana	1	0.0014	Yes
348	Carditoidea	“Venericardia”*	linguinodifera	1	0.0014	Yes
348	Pectinoidea	“Chlamys”	choctavensis	1	0.0014	---
349	---	NonClade	umbos	120	0.6704	---
349	Veneroidea	“Callista”	perovata	45	0.2514	---
349	Carditoidea	“Venericardia”	cookei	8	0.0447	---
349	Carditoidea	“Venericardia”	claiboplata	5	0.0279	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
349	Carditoidea	“Venericardia”	rotunda	1	0.0056	---
350	Carditoidea	“Venericardia”	cookei	146	0.8343	---
350	---	NonClade	umbos	14	0.0800	---
350	Carditoidea	“Venericardia”	claiboplata	8	0.0457	---
350	Veneroidea	“Callista”	perovata	7	0.0400	---
351	---	NonClade	umbos	113	0.9113	---
351	Carditoidea	“Venericardia”	cookei	9	0.0726	---
351	Carditoidea	“Venericardia”	claiboplata	2	0.0161	---
352	---	NonClade	umbos	149	0.7926	---
352	Carditoidea	“Venericardia”	cookei	22	0.1170	---
352	Carditoidea	“Venericardia”	sp.	9	0.0479	---
352	Veneroidea	“Pitar”	texibrazus	4	0.0213	---
352	Carditoidea	“Venericardia”	claiboplata	3	0.0160	---
352	Veneroidea	“Pitar”	nuttali	1	0.0053	Yes
353	---	NonClade	umbos	205	0.9903	---
353	Carditoidea	“Venericardia”	densata	2	0.0097	---
354	---	NonClade	umbos	62	0.5586	---
354	Veneroidea	“Pitar”	nuttali	25	0.2252	---
354	Carditoidea	“Venericardia”	sp.	11	0.0991	---
354	Carditoidea	“Venericardia”	nasuta	7	0.0631	---
354	Carditoidea	“Venericardia”	rotunda	3	0.0270	---
354	Carditoidea	“Venericardia”	claiboplata	2	0.0180	---
354	Pectinoidea	“Chlamys”	sp.	1	0.0090	---

Table C.7. Bulk-sample abundance data for Paleogene bivalve species, continued.

SampleID	Superfamily	Genus assignment in Palmer and Brann (1965)	Species	Number of Individuals	Relative Abundance	List-Only
355	---	NonClade	umbos	113	0.9417	---
355	Carditoidea	“Venericardia”	sp.	3	0.0250	---
355	Veneroidea	“Callista”	perovata	2	0.0167	---
355	Carditoidea	“Venericardia”	claiboplata	1	0.0083	---
355	Veneroidea	“Pitar”	macbeani	1	0.0083	---
357	---	NonClade	umbos	131	0.7751	---
357	Carditoidea	“Venericardia”	wilcoxensis	19	0.1124	---
357	Veneroidea	“Cf. Pitar”	kempae	11	0.0651	---
357	Carditoidea	“Venericardia”	bulla	6	0.0355	---
357	Veneroidea	“Pitar”	pteleinus	2	0.0118	---
358	---	NonClade	umbos	93	0.7881	---
358	Veneroidea	“Pitar”	nuttalliopsis	23	0.1949	---
358	Carditoidea	“Venericardia”	aposmithii	1	0.0085	---
358	Carditoidea	“Venericardia”	nanaplata	1	0.0085	---
359	Pectinoidea	“Amusium”	alabamense	218	0.5519	---
359	---	NonClade	umbos	133	0.3367	---
359	Carditoidea	“Venericardia”	sp.	44	0.1114	---
360	---	NonClade	umbos	114	0.7403	---
360	Veneroidea	“Pitar”	nuttalliopsis	30	0.1948	---
360	Carditoidea	“Venericardia”	greggiana	7	0.0455	---
360	Pectinoidea	“Chlamys”	greggi	3	0.0195	---

APPENDIX D

TAXONOMIC FRAMEWORK

INTRODUCTION

This section presents the taxonomic framework used for bivalve species in the Carditoidea, Pectinoidea, and Veneroidea in Chapters Two, Three, and Four. Names in the first column (“Superfamily”) are taken from Palmer and Brann (1965) and the bivalve volume of the Treatise on Invertebrate Paleontology (Moore 1969-1971), and were used to group species into target clades for analysis. Names in the second column (“Genus…”) are taken from Palmer and Brann (1965) and were not evaluated here for congruence with more recent systematic treatments of the genus nor used in any of the analyses presented herein. All genus names are accordingly presented in quotes. Names in the third column (“Subgenus…”) are taken from Palmer and Brann (1965), Heaslip (1968), Glawe (1969; 1974), Allen (1970), Dockery (1980; 1982; 1997), Campbell (1995), and Garvie (1996). Names in the fourth column (“Species”) are taken from Palmer and Brann (1965), with additions and modifications from Heaslip (1968), Glawe (1969; 1974), Allen (1970), Dockery (1980; 1982; 1997), Campbell (1995), and Garvie (1996). Paleocene and Eocene species described after the publication of Palmer and Brann’s (1965) compendium, and Oligocene species described by Dockery (1982), are indicated with an asterisk next to the genus assignment.

Table D.1. Taxonomic framework for species in the Carditoidea, Pectinoidea, and Veneroidea used in Chapters Two, Three, and Four.

Superfamily	Genus assignment in Palmer and Brann (1965)	Subgenus of Palmer and Brann (1965), or genus or subgenus as updated by subsequent author	Species
Carditoidea	“Carditamera”*		williamsi
Carditoidea	“Carditella”*		aldrichi
Carditoidea	“Cf. Miodontiscus”		aldrichianus
Carditoidea	“Cf. Miodontiscus”		timothii
Carditoidea	"Venericardia"	Pleuromeris	aldrichi
Carditoidea	"Venericardia"	Clabornicardia	alticostata
Carditoidea	"Venericardia"*	Baluchicardia	amplicrenata
Carditoidea	"Venericardia"	Venericor	angustoscrobis
Carditoidea	"Venericardia"	Venericor	apodensata
Carditoidea	"Venericardia"	Venericor	aposmithii
Carditoidea	"Venericardia"	Venericor	ascia
Carditoidea	"Venericardia"	Venericor	bashiplata
Carditoidea	"Venericardia"		bilineata
Carditoidea	"Venericardia"	Claibornicardia	blandingi
Carditoidea	"Venericardia"	Baluchicardia	bulla
Carditoidea	"Venericardia"		carolinensis
Carditoidea	"Venericardia"*	Rotundicardia	carsonensis
Carditoidea	"Venericardia"	Venericor	claiboplata
Carditoidea	"Venericardia"	Venericor?	claviger
Carditoidea	"Venericardia"	Claibornicardia	coloradonis

Table D.1. Taxonomic framework for species in the Carditoidea, Pectinoidea, and Veneroidea used in Chapters Two, Three, and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Subgenus of Palmer and Brann (1965), or genus or subgenus as updated by subsequent author	Species
Carditoidea	"Venericardia"	Clairbornicardia	complexicosta
Carditoidea	"Venericardia"	Venericor	cookei
Carditoidea	"Venericardia"	Rotundicardia	crenaea
Carditoidea	"Venericardia"	Venericor	densata
Carditoidea	"Venericardia"	Rotundicardia	diversidentata
Carditoidea	"Venericardia"	Rotundicardia	eoa
Carditoidea	"Venericardia"	Rotundicardia	eutawcolens
Carditoidea	"Venericardia"	Rotundicardia	flabellum
Carditoidea	"Venericardia"	Baluchicardia	francescae
Carditoidea	"Venericardia"	Venericor	gardnerae
Carditoidea	"Venericardia"	Baluchicardia	greggiana
Carditoidea	"Venericardia"		gulielmi
Carditoidea	"Venericardia"	Venericor	hatcheplata
Carditoidea	"Venericardia"	Baluchicardia	hesperia
Carditoidea	"Venericardia"	Venericor	hijuana
Carditoidea	"Venericardia"	Leuroactis	horatiana
Carditoidea	"Venericardia"	Pleuromeris	inflatior
Carditoidea	"Venericardia"		intermedia
Carditoidea	"Venericardia"	Venericor	jewelli
Carditoidea	"Venericardia"	Venericor	klimacodes
Carditoidea	"Venericardia"	Pleuromeris	leonensis
Carditoidea	"Venericardia"*	Claibornicardia	linguinodifera

Table D.1. Taxonomic framework for species in the Carditoidea, Pectinoidea, and Veneroidea used in Chapters Two, Three, and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Subgenus of Palmer and Brann (1965), or genus or subgenus as updated by subsequent author	Species
Carditoidea	"Venericardia"	Venericor	mediaplata
Carditoidea	"Venericardia"	Venericor?	mingoensis
Carditoidea	"Venericardia"	Baluchicardia	moa
Carditoidea	"Venericardia"	Venericor	mooreana
Carditoidea	"Venericardia"	Venericor	nanaplata
Carditoidea	"Venericardia"	Clairbornicardia	nasuta
Carditoidea	"Venericardia"	Clairbornicardia	natchitoches
Carditoidea	"Venericardia"		ocalaedes
Carditoidea	"Venericardia"	Pleuromeris	parva
Carditoidea	"Venericardia"	Clairbornicardia	perantiqua
Carditoidea	"Venericardia"	Leuroactis	pilsbryi
Carditoidea	"Venericardia"	Venericor	potapacoensis
Carditoidea	“Venericardia”*	Pleuromeris	quadrata
Carditoidea	"Venericardia"	Venericor	regia
Carditoidea	"Venericardia"	Rotundicardia	rotunda
Carditoidea	"Venericardia"	Venericor	sabinensis
Carditoidea	"Venericardia"	Venericor	smithii
Carditoidea	"Venericardia"	Clairbornicardia	sp.
Carditoidea	"Venericardia"	Pleuromeris	sp.
Carditoidea	"Venericardia"	Venericor	stewarti
Carditoidea	"Venericardia"		subquadrata
Carditoidea	"Venericardia"		subrotunda

Table D.1. Taxonomic framework for species in the Carditoidea, Pectinoidea, and Veneroidea used in Chapters Two, Three, and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Subgenus of Palmer and Brann (1965), or genus or subgenus as updated by subsequent author	Species
Carditoidea	"Venericardia"	Pleuromeris	tortidens
Carditoidea	"Venericardia"	Clabornicardia	trapaquara
Carditoidea	"Venericardia"*	Claibornicardia	trapaquaroides
Carditoidea	"Venericardia"	Venericor	turneri
Carditoidea	"Venericardia"		vigintinaria
Carditoidea	"Venericardia"	Baluchicardia	whitei
Carditoidea	"Venericardia"	Baluchicardia	wilcoxensis
Carditoidea	"Venericardia"		withlacoochensis
Carditoidea	"Venericardia"	Venericor	zapatai
Pectinoidea	"Amusium"	Propeamussium	alabamense
Pectinoidea	"Amusium"		ocalanum
Pectinoidea	"Amusium"		cf. squamulum
Pectinoidea	"Amusium"*	Propeamussium	zinguli
Pectinoidea	"Batequeus"*		ducenticostatus
Pectinoidea	"Chlamys"	Lyropecten	alpha
Pectinoidea	"Chlamys"*	Anatipopecten	anatipes
Pectinoidea	"Chlamys"		beverlyi
Pectinoidea	"Chlamys"		biddleana
Pectinoidea	"Chlamys"		burlesonensis
Pectinoidea	"Chlamys"		cainei
Pectinoidea	"Chlamys"		cawcawensis
Pectinoidea	"Chlamys"		choctavensis

Table D.1. Taxonomic framework for species in the Carditoidea, Pectinoidea, and Veneroidea used in Chapters Two, Three, and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Subgenus of Palmer and Brann (1965), or genus or subgenus as updated by subsequent author	Species
Pectinoidea	"Chlamys"		clarkeana
Pectinoidea	"Chlamys"*	Aequipecten	clinchfieldensis
Pectinoidea	"Chlamys"		cocoana
Pectinoidea	"Chlamys"		cookei
Pectinoidea	"Chlamys"		corvina
Pectinoidea	"Chlamys"		cushmani
Pectinoidea	"Chlamys"		danvillensis
Pectinoidea	"Chlamys"		deshayesii
Pectinoidea	"Chlamys"*	Lyropecten	duncanensis
Pectinoidea	"Chlamys"		dysoni
Pectinoidea	"Chlamys"		greggi
Pectinoidea	"Chlamys"		incertae
Pectinoidea	"Chlamys"		indecisa
Pectinoidea	"Chlamys"		johnsoni
Pectinoidea	"Chlamys"		kneiskerni
Pectinoidea	"Chlamys"		membranosa
Pectinoidea	"Chlamys"*	Lyropecten	menthifontis
Pectinoidea	"Chlamys"		nupera
Pectinoidea	"Chlamys"		pulchricosta
Pectinoidea	"Chlamys"*	Aequipecten	redwoodensis
Pectinoidea	"Chlamys"		rigbyi
Pectinoidea	"Chlamys"		seabeensis

Table D.1. Taxonomic framework for species in the Carditoidea, Pectinoidea, and Veneroidea used in Chapters Two, Three, and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Subgenus of Palmer and Brann (1965), or genus or subgenus as updated by subsequent author	Species
Pectinoidea	"Chlamys"		sheldonae
Pectinoidea	"Chlamys"		sp.
Pectinoidea	"Chlamys"		spillmani
Pectinoidea	“Chlamys”	Aequipecten	suwaneensis
Pectinoidea	"Chlamys"		trentensis
Pectinoidea	"Chlamys"		wahtubbeana
Pectinoidea	“Eburneopecten”		calvatus
Pectinoidea	“Eburneopecten”		corneoides
Pectinoidea	“Eburneopecten”		dalli
Pectinoidea	“Eburneopecten”		frontalis
Pectinoidea	“Eburneopecten”		hamiltonensis
Pectinoidea	“Eburneopecten”		scintillatus
Pectinoidea	“Eburneopecten”		sp.
Pectinoidea	“Eburneopecten”		subminutus
Pectinoidea	“Ostrenomia”		carolinensis
Pectinoidea	"Pecten"*		byramensis
Pectinoidea	"Pecten"		elixatus
Pectinoidea	"Pecten"*		howei
Pectinoidea	"Pecten"*		perplanus
Pectinoidea	"Pecten"*		poulsoni
Pectinoidea	"Pecten"		sp.
Pectinoidea	“Plicatula”*		creola

Table D.1. Taxonomic framework for species in the Carditoidea, Pectinoidea, and Veneroidea used in Chapters Two, Three, and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Subgenus of Palmer and Brann (1965), or genus or subgenus as updated by subsequent author	Species
Pectinoidea	“Plicatula”		filamentosa
Pectinoidea	“Plicatula”		louisiana
Pectinoidea	“Plicatula”*		pustula
Pectinoidea	“Plicatula”		sp.
Pectinoidea	“Plicatula”*		variplicata
Pectinoidea	“Spondylus”		dumosus
Pectinoidea	“Spondylus”*		filiaris
Pectinoidea	“Spondylus”*		granulocostatus
Pectinoidea	“Spondylus”		hollisteri
Pectinoidea	“Spondylus”		lamellacea
Pectinoidea	“Spondylus”		sp.
Veneroidea	“Cf. Blagraveia”		gunteri
Veneroidea	"Callista"	Costacallista	aequorea
Veneroidea	"Callista"	Costacallista	aldrichi
Veneroidea	“Callista”	Callista	annexa
Veneroidea	“Callista”*	Callista	goniopisthus
Veneroidea	"Callista"	Costacallista	mortoni
Veneroidea	"Callista"	Costacallista	pearlensis
Veneroidea	“Callista”	Callista	perovata
Veneroidea	“Callista”*	Callista	sobrina
Veneroidea	"Callista"		sp.
Veneroidea	“Chamelea”*		mississippiensis

Table D.1. Taxonomic framework for species in the Carditoidea, Pectinoidea, and Veneroidea used in Chapters Two, Three, and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Subgenus of Palmer and Brann (1965), or genus or subgenus as updated by subsequent author	Species
Veneroidea	"Chione"*		bainbridgensis
Veneroidea	"Chione"*		craspedonia
Veneroidea	"Chione"*		perbrevisformis
Veneroidea	"Chione"*	Lirophora	victoria
Veneroidea	“Dosiniopsis”		lenticularis
Veneroidea	“Gemma”		sanctimauricensis
Veneroidea	"Gratelupia"	Cytheriopsis	hydana
Veneroidea	“Katherinella”		smithvillensis
Veneroidea	“Katherinella”		sp.
Veneroidea	“Katherinella”		texitrina
Veneroidea	“Katherinella”		trigoniata
Veneroidea	“Katherinella”		trinitatis
Veneroidea	“Macrocallista”		sp.
Veneroidea	“Macrocallista”		subimpressa
Veneroidea	“Macrocallista”		sylvaerupis
Veneroidea	“Macrocallista”		triangulata
Veneroidea	“Mercimonia”		mercenaroidea
Veneroidea	“Pelecyora”		hatchetigbeensis
Veneroidea	“Pitar”*		aldrichi
Veneroidea	"Pitar"	Agriopoma	amichel
Veneroidea	“Pitar”		angelinae
Veneroidea	"Pitar"*	Lamelliconcha	astartiformis

Table D.1. Taxonomic framework for species in the Carditoidea, Pectinoidea, and Veneroidea used in Chapters Two, Three, and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Subgenus of Palmer and Brann (1965), or genus or subgenus as updated by subsequent author	Species
Veneroidea	“Cf. Pitar”		biboraensis
Veneroidea	"Pitar"*	Lamelliconcha	calcanea
Veneroidea	“Pitar”	Pitar	cornelli
Veneroidea	“Pitar”		eversus
Veneroidea	“Pitar”		exiguus
Veneroidea	“Pitar”		gazleyensis
Veneroidea	“Cf. Pitar”		hawtofi
Veneroidea	"Pitar"*	Lamelliconcha	imitabilis
Veneroidea	“Pitar”		juliae
Veneroidea	“Cf. Pitar”		kempae
Veneroidea	“Pitar”		lenis
Veneroidea	"Pitar"	Lamelliconcha	macbeani
Veneroidea	"Pitar"*	Lamelliconcha	megacostata
Veneroidea	“Pitar”	Pitar	nuttali
Veneroidea	“Pitar”	Pitar	nuttalliopsis
Veneroidea	“Pitar”		ovalis
Veneroidea	“Pitar”	Pitar	ovatus
Veneroidea	"Pitar"*	Lamelliconcha	perbrevis
Veneroidea	"Pitar"	Calpitaria	petropolitanus
Veneroidea	“Pitar”		poulsoni
Veneroidea	"Pitar"*	Lamelliconcha	protena
Veneroidea	“Pitar”		pteleinus

Table D.1. Taxonomic framework for species in the Carditoidea, Pectinoidea, and Veneroidea used in Chapters Two, Three, and Four, continued.

Superfamily	Genus assignment in Palmer and Brann (1965)	Subgenus of Palmer and Brann (1965), or genus or subgenus as updated by subsequent author	Species
Veneroidea	“Pitar”	Pitar	pyga
Veneroidea	“Pitar”		ripleyanus
Veneroidea	“Pitar”	Pitar	securiformis
Veneroidea	"Pitar"*	Hyphantosoma	semipunctata
Veneroidea	"Pitar"*	Lamelliconcha	silicifluvia
Veneroidea	“Pitar”		sp.
Veneroidea	"Pitar"	Calpitaria	texacola
Veneroidea	"Pitar"	Calpitaria	texibrazus
Veneroidea	"Pitar"	Calpitaria	tornadonis
Veneroidea	"Pitar"*	Calpitaria	turneri
Veneroidea	“Pitar”		vespertinus
Veneroidea	“Pitar”		vetus
Veneroidea	“Rhabdopitaria”		astartoides
Veneroidea	“Rhabdopitaria”		discoidalis
Veneroidea	“Rhabdopitaria”		pricei
Veneroidea	“Rhabdopitaria”		subcrassa
Veneroidea	“Rhabdopitaria”		texangelina
Veneroidea	“Rhabdopitaria”		winnensis
Veneroidea	“Sinodia”	Sinodia	eocaenica
Veneroidea	“Textivenus”		retisculpta
Veneroidea	“Ventricolaria”*		ucuttana
Veneroidea	"Venus"	Indet	jacksonensis

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