Paleontological Contributions

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A Synoptical Classification of the Bivalvia (Mollusca)

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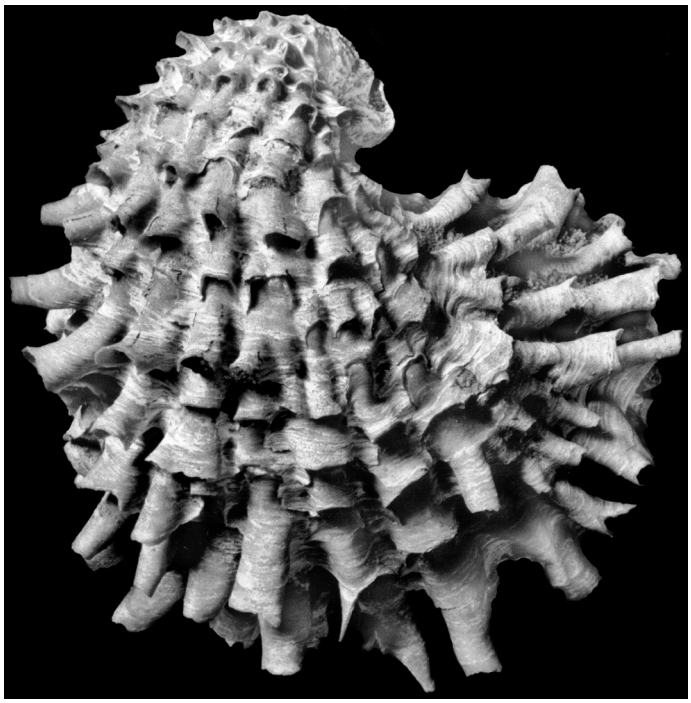

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Cover illustration: *Exogyra costata* Say, 1820, left valve, University of North Carolina 8264; Upper Cretaceous, Peedee Formation, milepost 49, near Donohue Landing, Cape Fear River, North Carolina; maximum shell length (left to right) = 6.1 cm (new).

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PREFACE

Joseph G. Carter, Cristian R. Altaba, David C. Campbell, Peter J. Harries, and Peter Skelton

The following classification summarizes the suprageneric taxonomy of the Bivalvia for the upcoming revision of the Bivalvia volumes of the *Treatise on Invertebrate Paleontology,* Part N. The development of this classification began with Carter (1990a), Campbell, Hoekstra, and Carter (1995, 1998), Campbell (2000, 2003), and Carter, Campbell, and Campbell (2000, 2006), who, with assistance from the United States National Science Foundation, conducted large-scale morphological phylogenetic analyses of mostly Paleozoic bivalves, as well as molecular phylogenetic analyses of living bivalves. During the past several years, their initial phylogenetic framework has been revised and greatly expanded through collaboration with many students of bivalve biology and paleontology, many of whom are coauthors. During this process, all available sources of phylogenetic information, including molecular, anatomical, shell morphological, shell microstructural, bio- and paleobiogeographic as well as stratigraphic, have been integrated into the classification. The more recent sources of phylogenetic information include, but are not limited to, Carter (1990a), Malchus (1990), J. Schneider (1995, 1998a, 1998b, 2002), T. Waller (1998), Hautmann (1999, 2001a, 2001b), Giribet and Wheeler (2002), Giribet and Distel (2003), Dreyer, Steiner, and Harper (2003), Matsumoto (2003), Harper, Dreyer, and Steiner (2006), Kappner and Bieler (2006), Mikkelsen and others (2006), Neulinger and others (2006), Taylor and Glover (2006), Kříž (2007), B. Morton (2007), Taylor, Williams, and Glover (2007), Taylor and others (2007), Giribet (2008), and Kirkendale (2009). This work has also benefited from the nomenclator of bivalve families by Bouchet and Rocroi (2010) and its accompanying classification by Bieler, Carter, and Coan (2010).

This classification strives to indicate the most likely phylogenetic position for each taxon. Uncertainty is indicated by a question mark before the name of the taxon. Many of the higher taxa continue to undergo major taxonomic revision. This is especially true for the superfamilies Sphaerioidea and Veneroidea, and the orders Pectinida and Unionida. Because of this state of flux, some parts of the classification represent a compromise between opposing points of view. Placement of the Trigonioidoidea is especially problematic. This Mesozoic superfamily has traditionally been placed in the order Unionida, as a possible derivative of the superfamily Unionoidea (see Cox, 1952; Sha, 1992, 1993; Gu, 1998; Guo, 1998; Bieler, Carter, & Coan, 2010). However, Chen Jin-hua (2009) summarized evidence that Trigonioidoidea was derived instead from the superfamily Trigonioidea. Arguments for these alternatives appear equally strong, so we presently list the Trigonioidoidea, with question, under both the Trigoniida and Unionida, with the contents of the superfamily indicated under the Trigoniida.

Typified Versus Descriptive Names

The present classification gives preference to typified names over descriptive names above the family-group, following the recommendation by Stys and Kerzhner (1975) and Starobogatov (1991). Typified names are more useful than descriptive names, because their

[1]Author information provided in Appendix 4, p. 29 herein.

root indicates taxonomic affiliation and their suffix can be modified to reflect taxonomic rank. Descriptive names can be advantageous for indicating a key morphological feature, but this feature may not characterize all members of the group (e.g., the Palaeotaxodonta), and descriptive names indicate nothing about the phylogenetic placement of the taxon.

We agree with Dubois (2005) that adoption of a descriptive name should be guided by the spirit of priority and adherence to original definition. The term original definition is presently interpreted in a phylogenetic sense to mean the monophyletic clade defined by the original members of the taxon, their common ancestor, and all of its descendants. We have, therefore, not formally adopted the terms Palaeoheterodonta and Heterodonta, the original definitions of which have no useful phylogenetic equivalent in the present classification. These descriptive names, as well as the phylogenetically more useful Euheterodonta and Nepiomorphia, are, however, placed in the classification in bold-face type after their synonymous, or approximately synonymous, typified name. The descriptive names Autobranchia, Protobranchia, Pteriomorphia, and Heteroconchia are presently formally adopted. Grobben's (1894) Autolamellibranchiata is herein replaced with the shorter, more euphonic Autobranchia, following C. M. Kolesnikov (1977), T. Waller (1978), Naumov (2006), and Bieler, Carter, and Coan (2010).

Authorship and Priority of Nomina above the Family-Group

The ICZN (1999) *Code* does not regulate taxon names above the family-group. Previous workers have used various guidelines to determine the composition, authorship, and priority of such names. Some have based these names on the oldest valid and available included family-group name in the group, or the first publication to define the group in a modern sense, or the oldest valid and available typified name above the family-group. We have adopted the latter guideline, with separate authorship and priority for names above and within the family-group. For example, the hyporder name Antipleuroidei Kříž, 2007, is presently adopted, even though it contains the superfamily Dualinoidea Conrath, 1887, because order Antipleuroida Kříž, 2007 is the oldest valid and available typified name above the family-group for this clade. Similarly, Hippuritida Newell, 1965, is adopted for an order that includes some families established as early as 1847 and 1848. In cases where a new name above the family-group is needed, but an appropriate typified root name above the family-group is not available, the earliest valid and available typified name in the family-group is used as the root, but with a new publication date. Separate priority for names above and within the family-group is preferred because it allows for the retention of a number of widely used but otherwise lesser priority names above the family-group, such as order Hippuritida.

Typified names above the family-group, which are based on a junior generic synonym or homonym, are presently regarded as unavailable and are disregarded for purposes of priority. This is a departure from the ICZN (1999) *Code* rules for family-group names. For example, *Anatina* Lamarck, 1818, is a junior homonym of *Anatina* Schumacher, 1817. Consequently, the suborder Anatinacea P. Fischer, 1887, based on *Anatina* Lamarck, 1818, is not available and has no bearing on the priority of any other typified name above the family-group. Also, the suborder Saxicavoidea Morretes, 1949, is unavailable because it is based on *Saxicava* Fleuriau de Bellevue, 1802, a junior synonym of *Hiatella* Bosc *ex* Daudin MS, 1801, and the suborder Saxicavoidea has no bearing on the priority of the presently adopted order Hiatellida. However, typified names above the family-group are not presently regarded as unavailable on the basis that their nominal family-group name is a junior synonym of another family-group name. For example, the suborder Leptonidina Dall, 1889, is available despite the fact that its nominal family-group name, Leptonidae J. Gray, 1847b, is now a junior synonym of Lasaeidae J. Gray, 1842.

Priority is presently given to the higher ranking of two or more simultaneously published typified or descriptive names above the family-group. This is an extension of Article 24.1 of the ICZN (1999) *Code* for family-group names. For example, order Pectinacea J. Gray, 1854a, has priority over the simultaneously established (unspecified rank above family-group but below suborder) Anomiaina J. Gray, 1854a. Changes in the rank, spelling, and/or taxonomic composition of a descriptive name are not presently considered to be a valid basis for changing the author and date of the descriptive name.

Paraphyletic and polyphyletic taxa. Paraphyletic higher taxa are unavoidable in a classification that includes ancestors and descendants. This is illustrated by J. Schneider's (1995, 1998a, 1998b, 2002) revision of the superfamily Cardioidea. Schneider reduced superfamily Tridacnoidea to subfamily Tridacninae within Cardiidae to elimininate paraphyly of Cardioidea with respect to Tridacnoidea. However, this reduction in rank merely shifted paraphyly from Cardioidea to its subfamily Cerastodermatinae, the ancestral stock group for Tridacninae. Building a taxonomy that includes living and extinct taxa presents a dilemma: choosing between explicitly recognizing paraphyletic taxa or multiplying supraspecific taxa beyond reasonable bounds (Cela-Conde & Altaba, 2002; Altaba, 2009). We favor an evolutionary classification that, being based upon cladistic analysis, does not dismiss evidence and reflects ancestor-descendant relationships. Paraphyletic taxa are indicated in the classification by an exclamation point (!) after the name.

Polyphyletic taxa are avoided in the classification, except in rare instances where the polyphyly is limited to descendants of the same genus, originating at about the same time. For example, the subfamily Lymnocardiinae is believed to contain more than one tribe derived, in the Miocene, from *Cerastoderma* of the subfamily Cerastodermatinae. In this case, Lymnocardiinae is also paraphyletic because it does not include *Cerastoderma,* the common ancestor of all its members.

Linnean Ranks and Suffixes for Names above the Family-Group

The present classification utilizes an increased number of Linnean ranks to adequately portray phylogenetic relationships. The number of Linnean ranks reflects a substantial increase in suprageneric taxa described over the past 50 years, and the fact that morphological and molecular phylogenetics have made possible a detailed phylogenetic framework for the Bivalvia. In order to minimize the number of Linnean ranks, we have not ranked the clade Eubivalvia and certain clades in more intensively studied groups, such as the Pectinoidea, Radiolitoidea, and Cardioidea. Those preferring a simpler classification can achieve this by disregarding some of the less familiar ranks, such as subcohort, infrasubcohort, megaorder, hyporder, minorder, epifamily, and series. Such condensation of the classification will hide some phylogenetic relationships, but it might be better suited for some summary and discussion purposes. The present

Linnean synopsis does not show ancestor-descendant relationships, but these are identified in the phylogenetic classification under preparation for the revised Bivalvia *Treatise.*

There is currently no consensus on suffixes for typified names above the family-group. The proposal by Rohdendorf (1977) for general zoology is compared in Table 1 with the classifications of the Bivalvia by Cox and others (1969, 1971), Starobogatov (1984, 1992), Waterhouse (2008), and that used herein.

The suffix -ia is commonly used for bivalve subclasses and infraclasses, e.g., Protobranchia, Autobranchia, Pteriomorphia, and Heteroconchia (T. Waller, 1978; Amler, 1999). The suffix -ata was used by Blainville (1825, 1827) and by Grobben (1894) for orders (Lamellibranchiata and Autolamellibranchiata, respectively), and by Grobben (1892), Keen (1963), and Pojeta (1978) for subclasses (Protobranchiata, Anomalodesmata, and Lucinata, respectively).

Cohort and subcohort are generally inserted between class-group and ordinal-group names, although cohort has been used below the ordinal level for dinosaurs (e.g., Benton, 2005). The ranks subcohort, megaorder, hyporder, minorder, epifamily, and series have not been used before for the Bivalvia. Megaorder, hyporder, and minorder have been used for tetrapods, although at varying ranks in the case of hyporder and minorder (cf. Novacek, 1986; Sereno, 1986, 1999; E. Gaffney & Meylan, 1988; van Valen, 1994; McKenna & Bell, 1997; Benton, 2005).

Waterhouse (2000, 2001, 2008) suggested using -idina for suborders rather than the -ina of some earlier authors, because -ina is reserved for subtribes by Article 29.2 of the ICZN (1999) *Code*. The subordinal suffix -oidina, advocated by Waller in T. Waller and Stanley (2005, p. 8), is presently rejected because -idina is more consistent with the -ida ordinal ending adopted by Scarlato and Starobogatov (1969, 1979a), Waterhouse (2008), and Bieler, Carter, and Coan (2010). The suffix -oid, as in nuculoid and pterioid, is retained for informal reference to orders, to avoid confusion with informal references to families, such as nuculids and pteriids.

The rank epifamily, with the suffix -oidae, has been used between superfamily and family for reptiles (Bour & Dubois, 1984; de la Fuente, 2003; van der Meijdin & others, 2005) and for insects (M. Engel, 2005). The term series has been used between superfamily and family for Lepidoptera.

New Taxa

New taxon names are formally proposed in Appendices 1 and 2 (p. 19–27 herein). This excludes rank and/or spelling changes of previously established suprageneric taxa, which will be documented in the Introduction volume to the revised Bivalvia *Treatise*.

CLASSIFICATION FORMAT

The present classification of the Bivalvia differs from previous ones in its uniform priority basis for determining names above the family-group, more consistent use of typified rather than descriptive names above the family-group, and labelling of paraphyletic taxa. Details of the classification format are described below.

Taxon Order

The nominotypical family, subfamily, or tribe is listed first within each superfamily, family, or subfamily, respectively. This is followed by the remaining members of the group in alphabetical order. At higher taxonomic ranks, simpler clades are generally listed before more complex clades.

Table 1. Suffixes for taxonomic ranks.

	Cox & others (1969, 1971)	Rohdendorf (1977)	Starobogatov (1984, 1992)	Waterhouse (2008)	Herein
Subclass	---	-ona	-iones	---	-ia
Infraclass	---	-ones	-ioni	---	-ia
Cohort	---	-iformes	-omorphi	---	-omorphi
Subcohort	---	---	---	---	-ioni
Infrasubcohort	---	---	---	---	-idia
Megaorder	---	---	---	---	-ata
Superorder	---	-idea	-iformii	-idia	-iformii
Order	-oida	-ida	-iformes	-ida	-ida
Suborder	-ina	-ina	-oidei	-idina	-idina
Hyporder	---	---	---	---	-oidei
Minorder	---	---	---	---	-oitei
Superfamily*	-acea	---	-oidea	-oidea	-oidea
Epifamily	---	---	---	---	-oidae
Series	---	---	---	---	-itae
Family*	-idae	-idae	-idae	-idae	-idae
Subfamily*	-inae	-inae	-inae	-inae	-inae
Tribe*	---	---	---	---	-ini
Subtribe*	---	---	---	---	-ina

*suffix mandated by the ICZN (1999) *Code.*

Paraphyletic Taxa

Paraphyletic taxa are indicated by an exclamation point after the name, e.g., Grade Euprotobranchia!.

Extinct Taxa

Extinct taxa are indicated by the symbol • before the name, e.g., •Family Actinodontidae.

Taxonomically Isolated Plesions and Paraphyletic Taxa

Some plesions and some paraphyletic taxa are taxonomically isolated in the sense that they lack membership in one or more expected, immediately higher Linnean ranks, e.g., the family Palaeocarditidae placed within the suborder Cardiidina without an intervening hyporder, minorder, or superfamily. Such isolated plesions and paraphyletic taxa are presently labelled plesions and paraplesions, respectively, to emphasize their deviation from the normal Linnean hierarchy.

Taxon Dates and References

Where two references are given for a taxon, e.g., Glycymerididae Dall, 1908 (Leach in J. Gray, 1847a), the second one indicates the source of date priority. See Bouchet and Rocroi (2010) for documentation.

Informal Descriptive Names

Commonly used descriptive names that are not presently formally adopted but have exact phylogenetic equivalents in the present classification are placed in bold face type after their correlative typified name, e.g., **Eupteriomorphia, Foliobranchia, Euheterodonta, Neoheterodontei, Nepiomorphia, Palaeotaxodonta.** Commonly used descriptive names that are not presently formally adopted and have no exact phylogenetic equivalent in the present classification (as determined by their original composition) are placed in **bold-face type** and *italics* after their most compatible typified name, e.g., ***Palaeoheterodonta, Heterodonta.*** The taxonomically widely dispersed taxa formerly assigned to the Anomalodesmata are indicated by underlining.

ABSTRACT OF CLASSIFICATION

To more clearly illustrate the major structure of the classification, the following abstract includes only the higher taxonomic ranks and their higher ranking paraplesions. A more detailed abstract, which includes all taxa at or above the rank of superfamily, plus all plesions and paraplesions, is provided in Appendix 3 (p. 27 herein). Symbols: • = extinct; ! = paraphyletic; underlining = former members of Anomalodesmata; ? = taxonomic placement uncertain.

Class Bivalvia Linnaeus, 1758 in 1758–1759
- •Grade Euprotobranchia! Nevesskaja, 2009
  - •Order Fordillida! Pojeta, 1975
  - •Order Tuarangiida MacKinnon, 1982
- Clade Eubivalvia Carter, *nov.*
  - Subclass Protobranchia Pelseneer, 1889 (=**Palaeotaxodonta** Korobkov, 1954)
    - Superorder Nuculiformii! Dall, 1889 (=**Foliobranchia** Ménégaux, 1889)
      - Order Nuculida! Dall, 1889
      - Order Solemyida Dall, 1889
    - Superorder Nuculaniformii Carter, Campbell, & Campbell, 2000
      - Order Nuculanida Carter, Campbell, & Campbell, 2000
      - •Order Afghanodesmatida! Carter, *nov.*
  - Subclass Autobranchia Grobben, 1894
    - Infraclass Pteriomorphia Beurlen, 1944
      - Cohort Mytilomorphi! Férussac, 1822 in 1821–1822
        - Order Mytilida! Férussac, 1822 in 1821–1822
        - •Order Colpomyida Carter, *nov.*
      - Cohort Ostreomorphi Férussac, 1822 in 1821–1822
        - Subcohort Arcioni J. Gray, 1854a
          - •Order Cyrtodontida! Scarlato & Starobogatov in Nevesskaja & others, 1971
            - •Suborder Cyrtodontidina! Scarlato & Starobogatov in Nevesskaja & others, 1971
            - •Suborder Praecardiidina Newell, 1965 (=**Nepiomorphia** Kříž, 2007)
              - •Hyporder Praecardioidei Newell, 1965
              - •Hyporder Antipleuroidei Kříž, 2007
          - Order Arcida J. Gray, 1854a
        - Subcohort Ostreioni Férussac, 1822 in 1821–1822
          - •Megaorder Myalinata H. Paul, 1939
            - •Order Myalinida H. Paul, 1939
          - Megaorder Ostreata Férussac, 1822 in 1821–1822
            - Superorder Ostreiformii Férussac, 1822 in 1821–1822 (=**Eupteriomorphia** Boss, 1982)
              - Order Ostreida Férussac, 1822 in 1821–1822
                - Suborder Ostreidina Férussac, 1822 in 1821–1822
                - Suborder Malleidina! J. Gray, 1854a
              - Order Pectinida J. Gray, 1854a
                - (paraplesion) •Superfamily Leiopectinoidea! Krasilova, 1959
                - Suborder Pectinidina J. Gray, 1854a
                - Suborder Anomiidina J. Gray, 1854a
                  - Hyporder Anomioidei J. Gray, 1854a
                    - •(paraplesion) Superfamily Pseudomonotoidea! Newell, 1938
                    - Minorder Anomioitei J. Gray, 1854a
                    - Minorder Dimyoitei Ridewood, 1903
                  - •Hyporder Aviculopectinoidei Starobogatov, 1992
                  - Hyporder Limoidei R. Moore in Moore, Lalicker, & Fischer, 1952
                  - •Hyporder Monotoidei Waterhouse, 2001
                - Suborder Entoliidina Hautmann, *nov.*
    - Infraclass Heteroconchia Hertwig, 1895
      - Cohort Uniomorphi J. Gray, 1854a (=***Palaeoheterodonta*** of authors)
        - Subcohort Unioni J. Gray, 1854a
          - (paraplesion) •Superfamily Lyrodesmatoidea! P. Fischer, 1886
          - Megaorder Unioniata J. Gray, 1854a
            - Order Trigoniida! Dall, 1889
            - Order Unionida J. Gray, 1854a
              - Suborder Unionidina J. Gray, 1854a
              - Suborder Hyriidina Hoeh & others, 2009
              - •Suborder Silesunionidina! Skawina & Dzik, 2011
      - Cohort Cardiomorphi Férussac, 1822 in 1821–1822 (=***Heterodonta*** of authors)
        - Subcohort Carditioni Dall, 1889
          - •Order Actinodontida! Deschaseaux, 1952
          - Order Carditida Dall, 1889
        - Subcohort Cardioni Férussac, 1822 in 1821–1822 (=**Euheterodonta** Giribet & Distel, 2003)

Infrasubcohort Lucinidia J. Gray, 1854a
(paraplesion) •Superfamily Babinkoidea! Horný, 1960
Order Lucinida J. Gray, 1854a
Infrasubcohort Cardiidia Férussac, 1822 in 1821–1822
(paraplesion) •Superfamily Grammysioidea! S. A. Miller, 1877
Megaorder Cardiata Férussac, 1822 in 1821–1822 (=**Neoheterodontei** Taylor & others, 2007)
Superorder Pholadiformii J. Gray, 1854a
Order Pholadida J. Gray, 1854a
Superorder Cardiiformii Férussac, 1822 in 1821–1822
•Order Modiomorphida! Newell, 1969c
•Order Megalodontida Starobogatov, 1992
•Order Hippuritida Newell, 1965
Order Cardiida Férussac, 1822 in 1821–1822
(paraplesion) •Superfamily Kalenteroidea! Marwick, 1953
Suborder Cardiidina Férussac, 1822 in 1821–1822
(paraplesion) •Family Palaeocarditidae! Chavan, 1969b
Hyporder Cardioidei Férussac, 1822 in 1821–1822
Hyporder Veneroidei J. Gray, 1854a
Minorder Veneroitei J. Gray, 1854a
Minorder Dreissenoitei R. Moore in Moore, Lalicker, & Fischer, 1952
Suborder Gastrochaenidina Morretes, 1949
•Suborder Anthracosiidina Silantiev & Carter, 2011
Suborder Leptonidina Dall, 1889
Megaorder Poromyata Ridewood, 1903
Order Poromyida Ridewood, 1903
Order Pandorida R. Stewart, 1930
Order Pholadomyida! Newell, 1965
Order Thraciida Carter, *nov.*
Megaorder Solenata Dall, 1889
Order Solenida Dall, 1889
Order Hiatellida Carter, *nov.*

DETAILED CLASSIFICATION

Class Bivalvia Linnaeus, 1758 in 1758–1759
•Grade Euprotobranchia! Nevesskaja, 2009
•Order Fordillida! Pojeta, 1975
•Superfamily Fordilloidea! Pojeta, 1975
•Family Fordillidae! Pojeta, 1975
•Family Camyidae! Hinz-Schallreuter, 2000
•Order Tuarangiida MacKinnon, 1982
•Family Tuarangiidae MacKinnon, 1982
Clade Eubivalvia Carter, *nov.*
Subclass Protobranchia Pelseneer, 1889 (=**Palaeotaxodonta** Korobkov, 1954)
Superorder Nuculiformii! Dall, 1889 (=**Foliobranchia** Ménégaux, 1889)
Order Nuculida! Dall, 1889
Superfamily Nuculoidea! J. Gray, 1824
Family Nuculidae! J. Gray, 1824
Subfamily Nuculinae J. Gray, 1824
Subfamily Nuculominae! Maxwell, 1988
•Subfamily Palaeonuculinae! Carter, 2001
•Family Praenuculidae! McAlester, 1969
•Subfamily Praenuculinae! McAlester, 1969
•Subfamily Concavodontidae Sánchez, 1999
Superfamily Pristiglomoidea Sanders & Allen, 1973
Family Pristiglomidae Sanders & Allen, 1973
Order Solemyida Dall, 1889
Superfamily Solemyoidea! J. Gray, 1840b
Family Solemyidae J. Gray, 1840b
Subfamily Solemyinae J. Gray, 1840b
Subfamily Janacekiinae! Růžička & Řehoř in Hajkr & others, 1978
•Family Clinopisthidae! Pojeta, 1988
•Family Ctenodontidae Wöhrmann, 1893
•Family Ovatoconchidae! Carter, *nov.*
Superfamily Manzanelloidea Chronic, 1952
Family Manzanellidae Chronic, 1952
Superorder Nuculaniformii Carter, Campbell, & Campbell, 2000

- •Order Afghanodesmatida! Carter, *nov.*
  - •Superfamily Tironuculoidea Babin in Babin & others, 1982
    - •Family Tironuculidae Babin in Babin & others, 1982
      - •Subfamily Tironuculinae! Babin in Babin & others, 1982
      - •Subfamily Natasiinae Sánchez, 1997
    - •Family Nucularcidae Pojeta & Stott, 2007
    - •Family Similodontidae! Carter & Pojeta, *nov.*
  - •Superfamily Afghanodesmatoidea! Scarlato & Starobogatov, 1979a
    - •Family Afghanodesmatidae Scarlato & Starobogatov, 1979a
    - •Family Eritropidae! Cope, 2000
  - Order Nuculanida Carter, Campbell, & Campbell, 2000
    - Superfamily Malletioidea! H. Adams & A. Adams, 1858 (d'Orbigny, 1846)
      - Family Malletiidae! H. Adams & A. Adams, 1858 (d'Orbigny, 1846)
      - •Family Cucullellidae! P. Fischer, 1886
        - •Subfamily Cucullellinae P. Fischer, 1886
        - •Subfamily Palaeoneilinae! Babin, 1966
      - •Family Pseudocyrtodontidae Maillieux, 1939
      - •Family Strabidae Prantl & Růžička, 1954
      - Family Tindariidae Verrill & Bush, 1897
        - Subfamily Tindariinae! Verrill & Bush, 1897
        - Subfamily Neilonellinae Schileyko, 1989
    - Superfamily Nuculanoidea H. Adams & A. Adams, 1858 (J. Gray, 1854a)
      - Family Nuculanidae! H. Adams & A. Adams, 1858 (J. Gray, 1854a)
      - •Family Isoarcidae Keen, 1969b
      - Family Phaseolidae Scarlato & Starobogatov in Nevesskaja & others, 1971
        - Subfamily Phaseolinae Scarlato & Starobogatov in Nevesskaja & others, 1971
        - Subfamily Siliculinae! J. A. Allen & Sanders, 1973
      - •Family Polidevciidae! Kumpera, Prantl, & Růžička, 1960
      - Family Sareptidae Stoliczka, 1870 in 1870–1871
        - Subfamily Sareptinae! Stoliczka, 1870 in 1870–1871
        - Subfamily Yoldiellinae J. A. Allen & Hannah, 1986
        - Subfamily Yoldiinae Dall, 1908
      - Family Zealedidae Scarlato & Starobogatov, 1979a
        - Subfamily Zealedinae Scarlato & Starobogatov, 1979a
        - Subfamily Parayoldiellinae Filatova & Schileyko, 1984
- Subclass Autobranchia Grobben, 1894
  - Infraclass Pteriomorphia Beurlen, 1944
    - Cohort Mytilomorphi! Férussac, 1822 in 1821–1822
      - Order Mytilida! Férussac, 1822 in 1821–1822
        - •Superfamily Modiolopsoidea! P. Fischer, 1886
          - •Family Modiolopsidae! P. Fischer, 1886
          - •Family Goniophorinidae Sánchez, 2006
        - Superfamily Mytiloidea Rafinesque, 1815
          - Family Mytilidae! Rafinesque, 1815
            - Subfamily Mytilinae Rafinesque, 1815
              - Tribe Mytilini! Rafinesque, 1815
              - Tribe Adulini Scarlato & Starobogatov, 1979b
              - Tribe Aulacomyini Carter, *nov.*
            - Subfamily Arcuatulinae Scarlato & Starobogatov, 1979b
            - Subfamily Bathymodiolinae Kenk & Wilson, 1985
            - Subfamily Lithophaginae H. Adams & A. Adams, 1857 (J. Gray, 1854a)
              - Tribe Lithophagini H. Adams & A. Adams, 1857 (J. Gray, 1854a)
              - Tribe Botulini Scarlato & Starobogatov, 1979b
            - Subfamily Modiolinae! G. Termier & H. Termier, 1950
            - •Subfamily Xenomytilinae Squires & Saul, 2006
          - Family Crenellidae J. Gray, 1840b
            - Subfamily Crenellinae J. Gray, 1840b
              - Tribe Crenellini! J. Gray, 1840b
              - Tribe Dacrydiini Ockelmann, 1983
            - Subfamily Musculinae Iredale, 1939
          - Family Septiferidae Scarlato & Starobogatov, 1979b
            - Subfamily Septiferinae! Scarlato & Starobogatov, 1979b
            - Subfamily Limnoperninae Scarlato & Starobogatov, 1979b
        - •Order Colpomyida Carter, *nov.*
          - •Superfamily Colpomyoidea Pojeta & Gilbert-Tomlinson, 1977
            - •Family Colpomyidae! Pojeta & Gilbert-Tomlinson, 1977
            - •Family Evyanidae Carter, Campbell, & Campbell, 2000

Cohort Ostreomorphi Férussac, 1822 in 1821–1822
(plesion) •Family Matheriidae Scarlato & Starobogatov, 1979a
(plesion) •Family Ischyrodontidae Scarlato & Starobogatov, 1979a
Subcohort Arcioni! J. Gray, 1854a
•Order Cyrtodontida! Scarlato & Starobogatov in Nevesskaja & others, 1971
•Suborder Cyrtodontidina! Scarlato & Starobogatov in Nevesskaja & others, 1971
•Superfamily Cyrtodontoidea! Ulrich in Ulrich & Scofield, 1894
•Family Cyrtodontidae! Ulrich in Ulrich & Scofield, 1894
•Subfamily Cyrtodontinae! Ulrich in Ulrich & Scofield, 1894
•Subfamily Ptychodesmatinae Scarlato & Starobogatov, 1984
•Superfamily Falcatodontoidea Cope, 1996
•Family Falcatodontidae Cope, 1996
•Superfamily Pichlerioidea Scarlato & Starobogatov, 1979a
•Family Pichleriidae Scarlato & Starobogatov, 1979a
•Suborder Praecardiidina Newell, 1965 (=**Nepiomorphia** Kříž, 2007)
•Hyporder Praecardioidei Newell, 1965
•Superfamily Praecardioidea R. Hoernes, 1884
•Family Praecardiidae! R. Hoernes, 1884
•Family Buchiolidae Grimm, 1998
•Superfamily Cardioloidea R. Hoernes, 1884
•Family Cardiolidae R. Hoernes, 1884
•Family Slavidae Kříž, 1982
•Hyporder Antipleuroidei Kříž, 2007
•Superfamily Dualinoidea Conrath, 1887
•Family Dualinidae! Conrath, 1887
•Subfamily Dualininae! Conrath, 1887
•Subfamily Loxopteriinae Nagel-Myers, Amler, & Becker, 2009
•Family Praelucinidae Conrath, 1887
•Family Stolidotidae! Starobogatov, 1977
•Family Spanilidae Kříž, 2007
Order Arcida J. Gray, 1854a
•Superfamily Glyptarcoidea Cope, 1996
•Family Glyptarcidae Cope, 1996
•?Family Pucamyidae Sánchez in Sánchez & Benedetto, 2007
Superfamily Arcoidea Lamarck, 1809
Family Arcidae Lamarck, 1809
Subfamily Arcinae! Lamarck, 1809
Subfamily Anadarinae Reinhart, 1935
Subfamily Noetiinae R. Stewart, 1930
Tribe Noetiini R. Stewart, 1930
Tribe Striarcini MacNeil, 1937
•Tribe Trinacriini MacNeil, 1937
•Family Catamarcaiidae Cope, 2000
Family Cucullaeidae! R. Stewart, 1930
•Family Frejidae! Ratter & Cope, 1998
Family Glycymerididae Dall, 1908 (Leach in J. Gray, 1847a)
Subfamily Glycymeridinae Dall, 1908 (Leach in J. Gray, 1847a)
•Subfamily Arcullaeinae! Newell, 1969a
•Family Parallelodontidae! Dall, 1898
•Subfamily Parallelodontinae Dall, 1898
•Subfamily Grammatodontinae! L. Stephenson, 1941
•Tribe Grammatodontini! L. Stephenson, 1941
•Tribe Catellini Scarlato & Starobogatov, 1979b
•Tribe Nemodontini L. Stephenson *ex* MacNeil MS, 1941
Superfamily Limopsoidea Dall, 1895a
Family Limopsidae Dall, 1895a
Superfamily Philobryoidea Félix Bernard, 1897
Family Philobryidae Félix Bernard, 1897
Subcohort Ostreioni Férussac, 1822 in 1821–1822
•Megaorder Myalinata H. Paul, 1939
•Order Myalinida H. Paul, 1939
•Superfamily Alatoconchoidea H. Termier, Termier, & Lapparent, 1974
•Family Alatoconchidae H. Termier, Termier, & Lapparent, 1974
•Family Saikraconchidae Yancey & Ozaki, 1986
•Superfamily Ambonychioidea! S. A. Miller, 1877
•Family Ambonychiidae! S. A. Miller, 1877
•Family Lunulacardiidae P. Fischer, 1887

- • Subfamily Lunulacardiinae P. Fischer, 1887
- •Subfamily Pterochaeniinae Fang & Ding, 1993
- •Family Monopteriidae Newell, 1969b
- •Family Mysidiellidae Cox, 1964
- •Family Myalinidae! Frech, 1891
- •Family Ramonalinidae Yancey, Wilson, & Mione, 2009
- •Superfamily Inoceramoidea C. Giebel, 1852
- •Family Inoceramidae C. Giebel, 1852
- •Subfamily Inoceraminae C. Giebel, 1852
- •Subfamily Coloniceraminae Pochialaynen, 1985
- •Subfamily Sachalinoceraminae Zonova, 1984
- •Family Atomodesmatidae! Waterhouse, 1976
- •Subfamily Atomodesmatinae! Waterhouse, 1976
- •Subfamily Malimanininae Waterhouse, 2001
- •Subfamily Permoceraminae! Waterhouse, 2008
- •Family Kolymiidae V. Kuznetsov, 1973
- •Family Retroceramidae! Koschelkina, 1980
- •Superfamily Prokopievskioidea H. Vokes, 1967
- •Family Prokopievskiidae H. Vokes, 1967
- •Subfamily Prokopievskiinae H. Vokes, 1967
- •Subfamily Abiellinae Starobogatov, 1970
- •Subfamily Concinellinae Silantiev, *nov.*
- •Subfamily Kinerkaellinae Scarlato & Starobogatov, 1979a
- •Family Anadontellidae Silantiev, *nov.*
- •Family Naiaditidae Scarlato & Starobogatov, 1979a

Megaorder Ostreata Férussac, 1822 in 1821–1822
(plesion) •Family Myodakryotidae Tunnicliff, 1987
Superorder Ostreiformii Férussac, 1822 in 1821–1822 (=**Eupteriomorphia** Boss, 1982)
Order Ostreida Férussac, 1822 in 1821–1822
Suborder Ostreidina Férussac, 1822 in 1821–1822
Superfamily Ostreoidea Rafinesque, 1815
Family Ostreidae Rafinesque, 1815
Subfamily Ostreinae Rafinesque, 1815
Tribe Ostreini Rafinesque, 1815
Tribe Pustulostreini Harry, 1985
Tribe Undulostreini Harry, 1985
Subfamily Lophinae Vialov, 1936
Tribe Lophini Vialov, 1936
Tribe Myrakeenini Harry, 1985
•Family Arctostreidae Vialov, 1983
•Subfamily Arctostreinae! Vialov, 1983
•Subfamily Palaeolophinae! Malchus, 1990
•?Family Eligmidae T. Gill, 1871
Family Flemingostreidae! Stenzel, 1971
•Subfamily Flemingostreinae! Stenzel, 1971
•Tribe Flemingostreini! Stenzel, 1971
•Tribe Ambigostreini Malchus, 1990
•Tribe Curvostreini Malchus, 1990
Subfamily Crassostreinae Scarlato & Starobogatov, 1979a
Tribe Crassostreini Scarlato & Starobogatov, 1979a
Tribe Striostreini Harry, 1985
•Tribe Turkostreini Malchus, 1990
•Subfamily Liostreinae! Vialov, 1983
Family Gryphaeidae! Vialov, 1936
•Subfamily Gryphaeinae! Vialov, 1936
•Subfamily Exogyrinae Vialov, 1936
•Tribe Exogyrini Vialov, 1936
•Tribe Amphidonteini Vialov, 1983
•Subfamily Gryphaeostreinae Stenzel, 1971
Subfamily Pycnodonteinae Stenzel, 1959
•Tribe Pycnodonteini Stenzel, 1959
Tribe Hyotissini Scarlato & Starobogatov, 1979b
Tribe Neopycnodonteini Harry, 1985
Suborder Malleidina! J. Gray, 1854a
(paraplesion) •Family Pterineidae! F. Meek, 1864b
Superfamily Pinnoidea Leach, 1819
Family Pinnidae Leach, 1819

•Superfamily Posidonioidea Neumayr, 1891
•Family Posidoniidae! Neumayr, 1891
•Family Aulacomyellidae! Ichikawa, 1958
•Subfamily Aulacomyellinae Ichikawa, 1958
•Subfamily Positrinae! Waterhouse, 2008
•Family Daonellidae Neumayr, 1891
•Family Halobiidae Kittl, 1912
Superfamily Pterioidea! J. Gray, 1847b (Goldfuss, 1820)
Family Pteriidae J. Gray, 1847b (Goldfuss, 1820)
Subfamily Pteriinae! J. Gray, 1847b (Goldfuss, 1820)
•Subfamily Dattinae M. Healey, 1908
•Family Bakevelliidae! W. King, 1850
•?Family Cassianellidae Ichikawa, 1958
•?Family Kochiidae Frech, 1891
Family Malleidae Lamarck, 1818
Subfamily Malleinae Lamarck, 1818
Subfamily Isognomoninae! Woodring, 1925 (J. Fleming, 1828)
Subfamily Pulvinitinae L. Stephenson, 1941
•Family Pergamidiidae Cox, 1964
•Subfamily Pergamidiinae Cox, 1964
•?Subfamily Oretiinae Waterhouse, 2008
•Family Plicatostylidae Lupher & Packard, 1929
•Family Vlastidae! Neumayr, 1891
•Subfamily Vlastinae Neumayr, 1891
•Subfamily Praeostreinae! Kříž, 1966
•Superfamily Rhombopterioidea! Korobkov in Eberzin, 1960
•Family Rhombopteriidae! Korobkov in Eberzin, 1960
•Family Umburridae! P. A. Johnston, 1991
Order Pectinida J. Gray, 1854a
(paraplesion) •Superfamily Leiopectinoidea! Krasilova, 1959
•Family Leiopectinidae! Krasilova, 1959
Suborder Pectinidina J. Gray, 1854a
Superfamily Pectinoidea Rafinesque, 1815
Epifamily Pectinoidae Rafinesque, 1815
Family Pectinidae! Rafinesque, 1815
Subfamily Pectininae Rafinesque, 1815
Tribe Pectinini Rafinesque, 1815
Tribe Aequipectinini! Nordsieck, 1969
Tribe Amusiini Ridewood, 1903
Tribe Austrochlamydini Jonkers, 2003
Tribe Decatopectinini T. Waller, 1986
Subfamily Camptonectinae Habe, 1977
Subfamily Palliolinae Korobkov in Eberzin, 1960
Tribe Palliolini Korobkov in Eberzin, 1960
Tribe Adamussiini Habe, 1977
•Tribe Eburneopectinini T. Waller, 2006
Tribe Mesopeplini T. Waller, 2006
•Tribe Pseudentoliini T. Waller, 2006
•Tribe Serripectinini T. Waller, 2006
Subfamily Pedinae! Bronn, 1862
Tribe Pedini Bronn, 1862
Tribe Chlamydini! Teppner, 1922
Tribe Crassadomini T. Waller, 1993
Tribe Fortipectinini K. Masuda, 1963
Subtribe Fortipectinina K. Masuda, 1963
Subtribe Patinopectinina Habe, 1977
Tribe Mimachlamydini! T. Waller, 1993
•Subfamily Pseudopectininae! Kasum-Zade, 2003
•Subfamily Weylinae Kasum-Zade, 2003
•Family Pleuronectitidae! Hautmann, *nov.*
Family Spondylidae J. Gray, 1826
Subfamily Spondylinae J. Gray, 1826
•Subfamily Spondylopectininae! Kasum-Zade & Romanov, 1987
•Epifamily Neitheoidae Sobetski, 1960
•Family Neitheidae Sobetski, 1960
•Family Tosapectinidae! Trushchelev, 1984
Suborder Anomiidina J. Gray, 1854a

Hyporder Anomioidei J. Gray, 1854a
•(plesion) ?Family Saharopteriidae G. Termier & H. Termier in Pareyn, Termier, & Termier, 1972
•(paraplesion) Superfamily Pseudomonotoidea! Newell, 1938
•Family Pseudomonotidae! Newell, 1938
Minorder Anomioitei J. Gray, 1854a
Superfamily Anomioidea Rafinesque, 1815
Family Anomiidae! Rafinesque, 1815
Subfamily Anomiinae! Rafinesque, 1815
Subfamily Heteranomiinae Scarlato & Starobogatov, 1979a
•Family Permanomiidae Carter, 1990a
Family Placunidae Rafinesque, 1815
Minorder Dimyoitei Ridewood, 1903
Superfamily Dimyoidea P. Fischer, 1886
Family Dimyidae P. Fischer, 1886
Superfamily Plicatuloidea J. Gray, 1854b
Family Plicatulidae! J. Gray, 1854b
•Family Chondrodontidae Freneix, 1960
•Superfamily Prospondyloidea! Pchelintseva, 1960
•Family Prospondylidae! Pchelintseva, 1960
•Subfamily Prospondylinae! Pchelintseva, 1960
•Subfamily Pegmavalvulinae! Waterhouse, 2008
•Hyporder Aviculopectinoidei! Starobogatov, 1992
•Superfamily Aviculopectinoidea! F. Meek & Hayden, 1865
•Family Aviculopectinidae! F. Meek & Hayden, 1865
•Subfamily Aviculopectininae! F. Meek & Hayden, 1865
•Subfamily Echiniferipectininae Waterhouse, 2008
•Subfamily Hayasakapectininae! Boyd & Newell, 2000
•Subfamily Spyridopectininae Waterhouse, 2008
•Family Deltopectinidae Dickins, 1957
•Subfamily Deltopectininae! Dickins, 1957
•Subfamily Cyrtorostrinae Newell & Boyd, 1995
•Subfamily Squamuliferipectininae Waterhouse, 2008
•Family Limatulinidae! Waterhouse, 2001
•Superfamily Chaenocardioidea S. A. Miller, 1889
•Family Chaenocardiidae! S. A. Miller, 1889
•Family Streblochondriidae Newell, 1938
•Subfamily Streblochondriinae Newell, 1938
•Subfamily Guizhoupectininae M. Astafieva, 1994
•Subfamily Orbiculopectininae Waterhouse, 2001
•Tribe Orbiculopectinini Waterhouse, 2001
•Tribe Eocamptonectini Waterhouse, 2001
•Subfamily Saturnopectininae D. Campbell, *nov.*
•Subfamily Streblopteriinae Waterhouse, 2008
•Superfamily Heteropectinoidea! Beurlen, 1954
•Family Heteropectinidae! Beurlen, 1954
•Subfamily Heteropectininae! Beurlen, 1954
•Subfamily Cassianoidinae Newell & Boyd, 1995
•Subfamily Etheripectininae! Waterhouse, 1982
•Subfamily Girtypectininae Waterhouse, 2008
•Family Annuliconchidae Astafieva, 1995
•Family Antijaniridae Hautmann, *nov*.
•Family Hunanopectinidae! Yin Hong-fu, 1985
•Subfamily Hunanopectininae Yin Hong-fu, 1985
•Tribe Hunanopectinini Yin Hong-fu, 1985
•Tribe Furcatiini Waterhouse, 2001
•Subfamily Asoellinae! Begg & Campbell, 1986
•Family Limipectinidae Newell & Boyd, 1990
•Subfamily Limipectininae Newell & Boyd, 1990
•Subfamily Acanthopectininae Newell & Boyd, 1995
•Tribe Acanthopectinini Newell & Boyd, 1995
•Tribe Costatoplicatinini Waterhouse, 2008
•Tribe Lamnipectinini Waterhouse, 2008
•Family Ornithopectinidae Hautmann, *nov.*
•Superfamily Pterinopectinoidea! Newell, 1938
•Family Pterinopectinidae! Newell, 1938
•Subfamily Pterinopectininae! Newell, 1938
•Subfamily Pterinopectinellinae Waterhouse, 2008

•Subfamily Tesseratiinae Waterhouse, 2008
•Family Claraiidae Gavrilova, 1996
•Subfamily Claraiinae! Gavrilova, 1996
•Subfamily Chuluariinae Waterhouse, 2008
•Family Natalissimidae! Waterhouse, 2008
•Subfamily Natalissiminae! Waterhouse, 2008
•Subfamily Pseudaviculopectininae! Waterhouse, 2008
Hyporder Limoidei R. Moore in Moore, Lalicker, & Fischer, 1952
Superfamily Limoidea Rafinesque, 1815
Family Limidae! Rafinesque, 1815
Subfamily Liminae Rafinesque, 1815
•Subfamily Ctenostreoninae Kasum-Zade, 2003
Subfamily Limatulinae! Kasum-Zade, 2003
Tribe Limatulini! Kasum-Zade, 2003
•Tribe Calcicaniculariini Waterhouse, 2008
•Subfamily Plagiostominae Kasum-Zade, 2003
Family Isolimeidae Kasum-Zade, 2003
•Hyporder Monotoidei Waterhouse, 2001
•Superfamily Buchioidea! Cox, 1953 (P. Fischer, 1886)
•Family Buchiidae Cox, 1953 (P. Fischer, 1886)
•Family Dolponellidae Waterhouse, 2001
•Family Monotidae! P. Fischer, 1886
•Subfamily Monotinae P. Fischer, 1886
•Subfamily Otapiriinae! Waterhouse, 1982
•Superfamily Eurydesmatoidea! Reed, 1932
•Family Eurydesmatidae! Reed, 1932
•Family Manticulidae Waterhouse, 2008
•Superfamily Oxytomoidea Ichikawa, 1958
•Family Oxytomidae Ichikawa, 1958
•Subfamily Oxytominae! Ichikawa, 1958
•Subfamily Maccoyellinae Waterhouse, 2008
Suborder Entoliidina! Hautmann, *nov*.
Superfamily Entolioidea! Teppner, 1922
Family Entoliidae Teppner, 1922
•Subfamily Entoliinae Teppner, 1922
•Subfamily Palaeoentoliinae! Romanov, 1985
Subfamily Syncyclonematinae T. Waller, 1978
•Family Entolioidesidae Kasum-Zade, 2003
•Subfamily Entolioidesinae! Kasum-Zade, 2003
•Subfamily Calvaentoliinae Kasum-Zade, 2003
•Family Pernopectinidae! Newell, 1938
Family Propeamussiidae Abbott, 1954
•Superfamily Euchondrioidea! Newell, 1938
•Family Euchondriidae! Newell, 1938
Infraclass Heteroconchia Hertwig, 1895
Cohort Uniomorphi J. Gray, 1854a (=***Palaeoheterodonta*** of authors)
(plesion) •Family Thoraliidae N. Morris, 1980
Subcohort Unioni J. Gray, 1854a
(paraplesion) •Superfamily Lyrodesmatoidea! P. Fischer, 1886
•Family Lyrodesmatidae! P. Fischer, 1886
•?Family Pseudarcidae Scarlato & Starobogatov, 1979a
Megaorder Unionata J. Gray, 1854a
Order Trigoniida! Dall, 1889
Superfamily Trigonioidea! Lamarck, 1819
Family Trigoniidae! Lamarck, 1819
Subfamily Trigoniinae Lamarck, 1819
•Subfamily Minetrigoniinae T. Kobayashi, 1954
•Subfamily Nototrigoniinae Skwarko, 1963
•Subfamily Pleurotrigoniinae van Hoepen, 1929
•Subfamily Neuquenitrigoniinae H. Leanza, 1993
•Subfamily Psilotrigoniinae C. Fleming, 1987
•Family Eoschizodidae Newell & Boyd, 1975
•Family Groeberellidae Pérez, Reyes, & Damborenea, 1995
•Family Myophoriidae! Bronn, 1849 in 1848–1849
•Family Prosogyrotrigoniidae T. Kobayashi, 1954
•Subfamily Prosogyotrigoniinae T. Kobayashi, 1954
•Subfamily Praegoniinae C. Fleming, 1962

- •Family Scaphellinidae Newell & Ciriacks, 1962
- •Family Schizodidae! Newell & Boyd, 1975
  - •Subfamily Schizodinae! Newell & Boyd, 1975
  - •Subfamily Eoastartinae Newell & Boyd, 1975
  - •Subfamily Sinodorinae Pojeta & Zhang, 1984
- •Superfamily Myophorelloidea T. Kobayashi, 1954
  - •Epifamily Myophorelloidae T. Kobayashi, 1954
    - •Family Myophorellidae T. Kobayashi, 1954
      - •Subfamily Myophorellinae T. Kobayashi, 1954
        - •Tribe Myophorellini! T. Kobayashi, 1954
        - •Tribe Steinmanellini M. Cooper, 1991
      - •Subfamily Vaugoniinae T. Kobayashi, 1954
        - •Tribe Vaugoniini T. Kobayashi, 1954
        - •Tribe Quadratotrigoniini Saveliev, 1958
    - •Family Buchotrigoniidae H. Leanza, 1993
      - •Subfamily Buchotrigoniinae H. Leanza, 1993
      - •Subfamily Syrotrigoniinae Perez & Reyes, 1997
    - •Family Laevitrigoniidae Saveliev, 1958
      - •Subfamily Laevitrigoniinae Saveliev, 1958
      - •Subfamily Frenguelliellinae! Nakano, 1960
  - •Epifamily Megatrigonioidae van Hoepen, 1929
    - •Series Megatrigoniitae van Hoepen, 1929
      - •Family Megatrigoniidae van Hoepen, 1929
        - •Subfamily Megatrigoniinae van Hoepen, 1929
          - •Tribe Megatrigoniini van Hoepen, 1929
          - •Tribe Apiotrigoniini Tashiro, 1979
            - •Subtribe Apiotrigoniina Tashiro, 1979
            - •Subtribe Heterotrigoniina M. Cooper, 1991
        - •Subfamily Pterotrigoniinae van Hoepen, 1929
          - •Tribe Pterotrigoniini! van Hoepen, 1929
          - •Tribe Scabrotrigoniini M. Cooper, 1989
      - •Family Iotrigoniidae Saveliev, 1958
    - •Series Rutitrigoniitae van Hoepen, 1929
      - •Family Rutitrigoniidae van Hoepen, 1929
- •Superfamily Pseudocardinioidea Martinson, 1961
  - •Family Pseudocardiniidae Martinson, 1961
  - •?Family Utschamiellidae! C. M. Kolesnikov, 1977
- •?Superfamily Trigonioidoidea Cox, 1952 (or in Unionida?)
  - •Family Trigonioididae! Cox, 1952
    - •Subfamily Trigonioidinae Cox, 1952
    - •Subfamily Peregrinoconchinae! Gu Zhi-wei & others in Ma & others, 1976
  - •Family Nakamuranaiadidae Guo, 1981
  - •Family Nippononaiidae Chen Jin-hua, 1987
    - •Subfamily Nippononaiinae! Chen Jin-hua, 1987
    - •Subfamily Sinonaiinae Chen Jin-hua, 1987
  - •Family Plicatounionidae Chen Jin-hua, 1987
  - •Family Pseudohyriidae T. Kobayashi, 1968
- •Superfamily Trigonodoidea! Modell, 1942
  - •Family Trigonodidae! Modell, 1942
  - •Family Desertellidae Dechaseaux, 1947

Order Unionida J. Gray, 1854a
- Suborder Unionidina J. Gray, 1854a
  - Superfamily Unionoidea Rafinesque, 1820
    - Family Unionidae Rafinesque, 1820
      - Subfamily Unioninae Rafinesque, 1820
        - Tribe Unionini Rafinesque, 1820
        - Tribe Anodontini Rafinesque, 1820
      - Subfamily Ambleminae Rafinesque, 1820
        - Tribe Amblemini Rafinesque, 1820
        - Tribe Lampsilini Ihering, 1901
        - Tribe Pleurobemini Hannibal, 1912
        - Tribe Quadrulini Ihering, 1901
      - Subfamily Gonideinae Ortmann, 1916
      - Subfamily Modellnaiinae Brandt, 1974
      - Subfamily Parreysiinae Henderson, 1935
      - •Subfamily Qiyangiinae Chen Jin-hua, 1983
      - Subfamily Rectidentinae Modell, 1942

Family Margaritiferidae Henderson, 1929
•Family Sancticarolitidae Simone & Mezzalira, 1997
Superfamily Mullerioidea Deshayes, 1832a
Family Mulleriidae Deshayes, 1832a
Subfamily Mulleriinae Deshayes, 1832a
Subfamily Leilinae Morretes, 1949
Subfamily Monocondylaeinae Modell, 1942
Subfamily Mycetopodinae J. Gray, 1840b
Family Etheriidae Deshayes, 1832a
Family Iridinidae Swainson, 1840
Subfamily Iridininae Swainson, 1840
Subfamily Aspathariinae Modell, 1942
•?Superfamily Trigonioidoidea Cox, 1952 (or in Trigoniida, which see)
Suborder Hyriidina Hoeh & others, 2009
Superfamily Hyrioidea Swainson, 1840
Family Hyriidae Swainson, 1840
Subfamily Hyriinae Swainson, 1840
Tribe Hyriini Swainson, 1840
Tribe Castaliini Morretes, 1949
?Tribe Cucumerunionini Iredale, 1934
Tribe Diplodontini Ihering, 1901
Tribe Hyridellini McMichael & Hiscock, 1958 (Iredale, 1934)
Subfamily Velesunioninae Iredale, 1934
•Suborder Silesunionidina! Skawina & Dzik, 2011
•Superfamily Silesunionoidea! Skawina & Dzik, 2011
•Family Silesunionidae! Skawina & Dzik, 2011
•Family Unionellidae Skawina & Dzik, 2011
Cohort Cardiomorphi Férussac, 1822 in 1821–1822 (=***Heterodonta*** of authors)
(plesion) •Family Lipanellidae Sánchez, 2005
Subcohort Carditioni Dall, 1889
•Order Actinodontida! Deschaseaux, 1952
•Superfamily Anodontopsoidea! S. A. Miller, 1889
•Family Anodontopsidae S. A. Miller, 1889
•Family Actinodontidae! Davies, 1933
•Family Baidiostracidae Fang & Cope, 2008
•Family Cycloconchidae! Ulrich in Ulrich & Scofield, 1894
•Subfamily Cycloconchinae! Ulrich in Ulrich & Scofield, 1894
•Subfamily Taselasmodinae Fang & Cope, 2008
•Family Intihuarellidae! Sánchez in Sánchez & Vaccari, 2003
•Family Redoniidae! Babin, 1966
•Superfamily Nyassoidea! S. A. Miller, 1877
•Family Nyassidae! S. A. Miller, 1877
•Superfamily Palaeomuteloidea Lahusen, 1897
•Family Palaeomutelidae Lahusen, 1897
•?Superfamily Amnigenioidea Khalfin, 1948
•Family Amnigeniidae Khalfin, 1948
•Family Montanariidae! Scarlato & Starobogatov, 1979a
•Family Zadimerodiidae! Guo, 1988
•Superfamily Oriocrassatelloidea Boyd & Newell, 1968
•Family Oriocrassatellidae Boyd & Newell, 1968
•Family Crassatellopsidae! Carter, *nov.*
Order Carditida Dall, 1889
(plesion) •?Family Archaeocardiidae Khalfin, 1940
(paraplesion) •Family Eodonidae! Carter, Campbell, & Campbell, 2000
Superfamily Crassatelloidea Férussac, 1822 in 1821–1822
Family Crassatellidae Férussac, 1822 in 1821–1822
Subfamily Crassatellinae! Férussac, 1822 in 1821–1822
•Subfamily Ptychomyinae Keen, 1969b
Subfamily Scambulinae Chavan, 1952a
•?Family Aenigmoconchidae Betekhtina in Betekhtina & Soukhov, 1968
Family Astartidae! d'Orbigny, 1844 in 1844–1848 (J. Gray, 1840b)
Subfamily Astartinae! d'Orbigny, 1844 in 1844–1848 (J. Gray, 1840b)
•Subfamily Astartellinae! Boyd & Newell, 1968
•Subfamily Eriphylinae Chavan, 1952b
•Subfamily Opinae! Chavan, 1952b
•Subfamily Pinzonellinae Beurlen, 1954
•Subfamily Terraiinae Scarlato & Starobogatov, 1979a

•Subfamily Trigonopinae R. N. Gardner & Campbell, 2002
•Family Cardiniidae Zittel, 1881
Family Carditidae! Férussac, 1822 in 1821–1822
Subfamily Carditinae Férussac, 1822 in 1821–1822
Subfamily Carditamerinae! Chavan, 1969b
Subfamily Carditesinae! Chavan, 1969b
Subfamily Miodomeridinae Chavan, 1969b
Subfamily Thecaliinae Dall, 1903
Subfamily Venericardiinae Chavan, 1969b
Family Condylocardiidae Félix Bernard, 1896
Subfamily Condylocardiinae Félix Bernard, 1896
Subfamily Cuninae Chavan, 1969b
•Family Myophoricardiidae Chavan in Cox & Chavan, 1969
Subcohort Cardioni Férussac, 1822 in 1821–1822 (=**Euheterodonta** Giribet & Distel, 2003)
Infrasubcohort Lucinidia J. Gray, 1854a
(paraplesion) •Superfamily Babinkoidea! Horný, 1960
•Family Babinkidae! Horný, 1960
•Family Coxiconchiidae Babin, 1977
Order Lucinida J. Gray, 1854a
Superfamily Lucinoidea! J. Fleming, 1828
Family Lucinidae J. Fleming, 1828
Subfamily Lucininae J. Fleming, 1828
Subfamily Fimbriinae Nicol, 1950 (Stoliczka, 1870 in 1870–1871)
•Subfamily Ilioniinae! Scarlato & Starobogatov, 1979a
Subfamily Milthinae! Chavan, 1969a
Subfamily Myrteinae Chavan, 1969a
•Family Mactromyidae Cox, 1929 (P. Fischer, 1887)
•Family Paracyclidae! P. A. Johnston, 1993
Superfamily Thyasiroidea Dall, 1900 (Dall, 1895a)
Family Thyasiridae Dall, 1900 (Dall, 1895a)
Subfamily Thyasirinae! Dall, 1900 (Dall, 1895a)
Subfamily Axinopsidinae Frank Bernard, 1983
Infrasubcohort Cardiidia Férussac, 1822 in 1821–1822
(paraplesion) •Superfamily Grammysioidea! S. A. Miller, 1877
•Family Grammysiidae! S. A. Miller, 1877
•Subfamily Grammysiinae S. A. Miller, 1877
•Subfamily Cuneamyinae! N. Morris, Dickins, & Astafieva-Urbajtis, 1991
•Family Sanguinolitidae S. A. Miller, 1877
•Subfamily Sanguinolitinae! S. A. Miller, 1877
•Subfamily Alulinae N. Morris, Dickins, & Astafieva-Urbajtis, 1991
•Subfamily Paleodorinae Carter, *nov.*
•Subfamily Pholadellinae S. A. Miller, 1877
•Subfamily Undulomyinae Astafieva-Urbajtis, 1983
Megaorder Cardiata Férussac, 1822 in 1821–1822 (=**Neoheterodontei** Taylor & others, 2007)
Superorder Cardiiformii Férussac, 1822 in 1821–1822
•Order Modiomorphida! Newell, 1969c
•Superfamily Modiomorphoidea! S. A. Miller, 1877
•Family Modiomorphidae! S. A. Miller, 1877
•Subfamily Modiomorphinae! S. A. Miller, 1877
•?Subfamily Butovicellinae Kříž, 1965
•Subfamily Healeyinae! Hautmann, 2008
•Subfamily Joanininae Carter, *nov.*
•Family Cypricardiniidae Ulrich in Ulrich & Scofield, 1894
•Family Hippopodiumidae Cox in Cox & LaRocque, 1969
•Family Palaeopharidae Marwick, 1953
•Family Tusayanidae Scarlato & Starobogatov, 1979a
•Order Megalodontida! Starobogatov, 1992
•Superfamily Mecynodontoidea! Haffer, 1959
•Family Mecynodontidae! Haffer, 1959
•Family Beichuaniidae Liu Xie-zhang & Gu in Hou Hong-fei, Wan, & Xian, 1988
•Family Congeriomorphidae Saul, 1976
•?Family Plethocardiidae Scarlato & Starobogatov, 1979a
•Family Prosocoelidae! Karczewski, 1992
•Superfamily Megalodontoidea! J. Morris & Lycett, 1853
•Family Megalodontidae! J. Morris & Lycett, 1853
•Family Ceratomyopsidae Cox, 1964
•Family Dicerocardiidae! Kutassy, 1934

- •Family Pachyrismatidae! Scarlato & Starobogatov, 1979a
- •Family Wallowaconchidae Yancey & Stanley, 1999

•Order Hippuritida Newell, 1965
- •Superfamily Requienioidea Kutassy, 1934
  - •Family Requieniidae Kutassy, 1934
    - •Subfamily Requieniinae Kutassy, 1934
    - •Subfamily Matheroniinae! R. Scott & others, 2010
  - •Family Epidiceratidae! Rengarten, 1950
- •Superfamily Radiolitoidea d'Orbigny, 1847b
  - •Family Radiolitidae d'Orbigny, 1847b
  - •?Family Antillocaprinidae Mac Gillavry, 1937
  - •Family Caprinidae d'Orbigny, 1847b
    - •Subfamily Caprininae d'Orbigny, 1847b
    - •Subfamily Caprinuloideinae Damestoy, 1971
  - •Family Caprinulidae Yanin, 1990
  - •Family Caprotinidae J. Gray, 1848
  - •Family Diceratidae! Dall, 1895a
  - •Family Hippuritidae J. Gray, 1848
  - •Family Ichthyosarcolitidae Douvillé, 1887 (T. Gill, 1871)
  - •Family Monopleuridae! Munier-Chalmas, 1873
  - •Family Plagioptychidae Douvillé, 1888
  - •Family Polyconitidae! Mac Gillavry, 1937
  - •?Family Trechmannellidae Cox, 1934

Order Cardiida Férussac, 1822 in 1821–1822
- (paraplesion) •Superfamily Kalenteroidea! Marwick, 1953
  - •Family Kalenteridae! Marwick, 1953
    - •Subfamily Kalenterinae! Marwick, 1953
    - •Subfamily Myoconchinae! Newell, 1957
  - Suborder Cardiidina Férussac, 1822 in 1821–1822
    - (paraplesion) •Family Palaeocarditidae! Chavan, 1969b
    - Hyporder Cardioidei Férussac, 1822 in 1821–1822
      - Superfamily Cardioidea Lamarck, 1809
        - •Family Pterocardiidae Scarlato & Starobogatov, 1979a
          - •Subfamily Pterocardiinae Scarlato & Starobogatov, 1979a
          - •Subfamily Tulongocardiinae! J. Schneider, 1995
        - Family Cardiidae! Lamarck, 1809
          - •Subfamily Lahilliinae Finlay & Marwick, 1937
          - Subfamily Protocardiinae Reuss, 1846 in 1845–1846
          - Clade Neocardiids J. Carter, Hylleberg, & Popov, *nov.*
            - Subfamily Laevicardiinae Keen, 1951
            - •Subfamily Pleuriocardiinae J. Schneider, 1995
            - Clade Eucardiids J. Schneider, 1995
              - Subfamily Cardiinae! Lamarck, 1809
                - Tribe Cardiini! Lamarck, 1809
                - Tribe Vepricardiini Kafanov & Starobogatov in Kafanov & Popov, 1977
              - Subfamily Cerastodermatinae! Nordsieck, 1969
                - Tribe Cerastodermatini! Nordsieck, 1969
                - •Tribe Chokrakiini S. V. Popov in Nevesskaja, Paramonova, & Popov, 2001
                - Tribe Parvicardiini! Kafanov & Starobogatov in Kafanov & S. V. Popov, 1977
              - Subfamily Clinocardiinae Kafanov, 1975
              - Subfamily Fraginae R. Stewart, 1930
                - Tribe Fragini R. Stewart, 1930
                - Tribe Goniocardiini Scarlato & Starobogatov, 1979a
              - Subfamily Lymnocardiinae! Stoliczka, 1870 in 1870–1871
                - •Tribe Lymnocardiini! Stoliczka, 1870 in 1870–1871
                - •Tribe Acobaecardiini Paramonova in Nevesskaja & others, 1986
                - Tribe Adacnini! T. Gill, 1871
                - •Tribe Arcicardiini Nevesskaja in Nevesskaja & others, 1986
                - •Tribe Avicardiini S. V. Popov in Kafanov & S. V. Popov, 1977
                - •Tribe Aviculocardiini Paramonova in Nevesskaja, Paramonova, & Popov, 2001
                - •Tribe Limnopappiini Schlickum, 1962
                - •Tribe Merklinicardiini S. V. Popov in Nevesskaja, Paramonova, & Popov, 2001
                - •Tribe Obsoletiformini! Paramonova in Nevesskaja, Paramonova, & Popov, 2001
                - •Tribe Pachydacnini Andreescu, 1975
                - •Tribe Paradacnini Eberzin, 1967
                - •Tribe Phyllocardiini Nevesskaja in Nevesskaja & others, 1986
                - •Tribe Planacardiini Paramonova in Nevesskaja, Paramonova, & Popov, 2001

•Tribe Plicatiformini! Paramonova in Nevesskaja, Paramonova, & Popov, 2001
•Tribe Pontalmyrini! Taktakishvili, 1987
•Tribe Prosodacnini Keen, 1937
•Tribe Pseudocarditini Keen, 1969b
Subfamily Orthocardiinae J. Schneider, 2002
•Subfamily Profraginae Badve, 1977
•Subfamily Trapezicardiinae Kanjilal & Srinivasan, 2002
Subfamily Tridacninae Lamarck, 1819
Superfamily Tellinoidea Blainville, 1814
Family Tellinidae Blainville, 1814
Family Donacidae J. Fleming, 1828
•Family Icanotiidae R. Casey, 1961
Family Psammobiidae J. Fleming, 1828
•Family Quenstedtiidae Cox, 1929
Family Semelidae Stoliczka, 1870 in 1870–1871 (Latreille, 1825)
Subfamily Semelinae! Stoliczka, 1870 in 1870–1871 (Latreille, 1825)
Subfamily Erviliinae Dall, 1895b
Subfamily Scrobiculariinae H. Adams & A. Adams, 1856
Family Solecurtidae d'Orbigny, 1846
•Family Sowerbyidae Cox, 1929
•Family Tancrediidae F. Meek, 1864a
•Family Unicardiopsidae Chavan, 1969c
Hyporder Veneroidei J. Gray, 1854a
Minorder Veneroitei J. Gray, 1854a
Superfamily Arcticoidea! R. Newton, 1891 (d'Orbigny, 1844 in 1844–1848)
Family Arcticidae! R. Newton, 1891 (d'Orbigny, 1844 in 1844–1848)
Family Euloxidae J. A. Gardner, 1944
•Family Pollicidae L. Stephenson, 1953
Family Trapezidae Lamy, 1920 (Dall, 1895a)
•Family Veniellidae Dall, 1895a
Superfamily Chamoidea Lamarck, 1809
Family Chamidae Lamarck, 1809
Superfamily Cyrenoidea J. Gray, 1840b
Family Cyrenidae! J. Gray, 1840b
Family Cyrenoididae H. Adams & A. Adams, 1857 (J. Gray, 1853)
Family Glauconomidae J. Gray, 1853
Superfamily Gaimardioidea Hedley, 1916
Family Gaimardiidae Hedley, 1916
Superfamily Glossoidea J. Gray, 1847b (J. Gray, 1840b)
Family Glossidae J. Gray, 1847b (J. Gray, 1840b)
Family Kelliellidae P. Fischer, 1887
Family Vesicomyidae Dall & Simpson, 1901
Superfamily Hemidonacoidea Scarlato & Starobogatov in Nevesskaja & others, 1971
Family Hemidonacidae Scarlato & Starobogatov in Nevesskaja & others, 1971
Superfamily Mactroidea Lamarck, 1809
Family Mactridae! Lamarck, 1809
Subfamily Mactrinae! Lamarck, 1809
Subfamily Darininae Signorelli, *nov.*
Subfamily Kymatoxinae Stenzel & Krause in Stenzel, Krause, & Twining, 1957
Subfamily Lutrariinae J. Gray, 1853
Subfamily Tanysiphoninae Scarlato & Starobogatov in Nevesskaja & others, 1971
Family Anatinellidae Deshayes in J. Gray, 1853
Family Cardiliidae P. Fischer, 1887
Family Mesodesmatidae J. Gray, 1840b
Subfamily Mesodesmatinae! J. Gray, 1840b
Subfamily Davilinae Dall, 1895b
Superfamily Ungulinoidea J. Gray, 1854b
Family Ungulinidae J. Gray, 1854b
Superfamily Veneroidea Rafinesque, 1815
•Family Isocyprinidae! R. N. Gardner, 2005
Family Veneridae! Rafinesque, 1815
Subfamily Venerinae Rafinesque, 1815
Tribe Venerini Rafinesque, 1815
Subtribe Venerina Rafinesque, 1815
Subtribe Chionina Frizzell, 1936
Tribe Dosiniini Deshayes, 1853
Tribe Tapetini! J. Gray, 1851
Subfamily Meretricinae J. Gray, 1847b (J. Gray, 1838)

Tribe Meretricini J. Gray, 1847b (J. Gray, 1838)
Subtribe Meretricina! J. Gray, 1847b (J. Gray, 1838)
Subtribe Callocardiina! Dall, 1895a
Subtribe Clementiina Frizzell, 1936
Subtribe Cyclinina Frizzell, 1936
Subtribe Gemmina Dall, 1895a
Subtribe Petricolina d'Orbigny, 1840
Subtribe Samarangiina Keen, 1969c
Subtribe Sunettina Stoliczka, 1870 in 1870–1871
Subtribe Turtoniina W. Clark, 1855
?Tribe Gouldiini R. Stewart, 1930
Subtribe Gouldiina! R. Stewart, 1930
Subtribe Lioconchina Habe, 1977
Minorder Dreissenoitei R. Moore in Moore, Lalicker, & Fischer, 1952
Superfamily Dreissenoidea J. Gray, 1840a
Family Dreissenidae J. Gray, 1840a
Subfamily Dreisseninae! J. Gray, 1840a
•Subfamily Dreissenomyinae Babak, 1983
Superfamily Sphaerioidea! Deshayes, 1855b (Rafinesque, 1820)
Family Sphaeriidae! Deshayes, 1855b (Rafinesque, 1820)
Subfamily Sphaeriinae! Deshayes, 1855b (Rafinesque, 1820)
Subfamily Euperinae Heard, 1965
Subfamily Pisidiinae J. Gray, 1857
•?Family Neomiodontidae R. Casey, 1955
•Subfamily Neomiodontinae R. Casey, 1955
•Subfamily Eomiodontinae Hayami, 1965
Suborder Gastrochaenidina Morretes, 1949
Superfamily Gastrochaenoidea J. Gray, 1840b
Family Gastrochaenidae J. Gray, 1840b
Subfamily Gastrochaeninae J. Gray, 1840b
Subfamily Eufistulaninae Carter, *nov.*
Subfamily Spengleriinae! Carter, *nov.*
•Suborder Anthracosiidina Silantiev & Carter, 2011
•Superfamily Anthracosioidea Amalitzky, 1892
•Family Anthracosiidae Amalitzky, 1892
•?Family Ferganoconchidae Martinson, 1961
•?Family Shaanxiconchidae Liu Ben-pei in Liu Ben-pei & Li, 1980
•Superfamily Palaeanodontoidea Modell, 1964
•Family Palaeanodontidae Modell, 1964
•Superfamily Prilukielloidea Starobogatov, 1970
•Family Prilukiellidae Starobogatov, 1970
•Family Senderzoniellidae Betekhtina, Starobogatov, & Jatsuk, 1987
Suborder Leptonidina Dall, 1889
Superfamily Cyamioidea! G. O. Sars, 1878
Family Cyamiidae G. O. Sars, 1878
Family Basterotiidae Cossmann in Cossmann & Peyrot, 1909
Family Galatheavalvidae Knudsen, 1970
Family Sportellidae! Dall, 1899
Superfamily Galeommatoidea J. Gray, 1840b
Family Galeommatidae J. Gray, 1840b
Family Lasaeidae J. Gray, 1842
Superorder Pholadiformii J. Gray, 1854a
Order Pholadida J. Gray, 1854a
Superfamily Pholadoidea Lamarck, 1809
Family Pholadidae! Lamarck, 1809
Subfamily Pholadinae Lamarck, 1809
Tribe Pholadini! Lamarck, 1809
•Tribe Euxinibarneini Zhgenti, 1991
Subfamily Jouannetiinae Tryon, 1862b
Subfamily Martesiinae U. Grant & Gale, 1931
Subfamily Xylophaginae! Purchon, 1941
Family Teredinidae Rafinesque, 1815
Subfamily Teredininae Rafinesque, 1815
Tribe Teredinini Rafinesque, 1815
Tribe Bankiini Turner, 1966
Subfamily Kuphinae Tryon, 1862b
•Superfamily Pleuromyoidea! Zittel, 1895
•Family Pleuromyidae! Zittell, 1895

- •Family Ceratomyidae! Arkell, 1934
  - •Subfamily Ceratomyinae! Arkell, 1934
  - •Subfamily Myopholadinae! Cox, 1964
- •Family Vacunellidae! Astafieva-Urbajtis, 1973

Superfamily Myoidea Lamarck, 1809
- Family Myidae Lamarck, 1809
  - Subfamily Myinae Lamarck, 1809
  - Subfamily Cryptomyinae Habe, 1977
  - Subfamily Spheniinae! Frank Bernard, 1983
- Family Corbulidae! Lamarck, 1818
  - Subfamily Corbulinae! Lamarck, 1818
  - •Subfamily Caestocorbulinae H. Vokes, 1945
  - Subfamily Caryocorbulinae H. Vokes, 1945
  - Subfamily Erodoninae Winckworth, 1932
  - •Subfamily Pachydontinae H. Vokes, 1945
- •Family Pleurodesmatidae Cossmann in Cossmann & Peyrot, 1909
- •Family Raetomyidae R. Newton, 1919

Megaorder Poromyata Ridewood, 1903
- Order Poromyida Ridewood, 1903
  - Superfamily Poromyoidea Dall, 1886
    - Family Poromyidae! Dall, 1886
    - Family Cetoconchidae Ridewood, 1903
  - Superfamily Cuspidarioidea Dall, 1886
    - Family Cuspidariidae Dall, 1886
    - Family Halonymphidae Scarlato & Starobogatov, 1983
    - Family Protocuspidariidae! Scarlato & Starobogatov, 1983
    - ?Family Spheniopsidae J. A. Gardner, 1928
  - Superfamily Parilimyoidea! B. Morton, 1981
    - Family Parilimyidae! B. Morton, 1981
  - Superfamily Verticordioidea! Stoliczka, 1870 in 1870–1871
    - Family Verticordiidae Stoliczka, 1870 in 1870–1871
    - Family Euciroidae Dall, 1895a
    - Family Lyonsiellidae! Dall, 1895a
- Order Pholadomyida! Newell, 1965
  - Superfamily Pholadomyoidea! W. King, 1844
    - Family Pholadomyidae! W. King, 1844
      - Subfamily Pholadomyinae! W. King, 1844
      - •Subfamily Chaenomyinae Waterhouse, 1966
    - •Family Arenigomyidae Carter, *nov.*
    - •Family Margaritariidae H. Vokes, 1964
    - •Family Ucumariidae Sánchez in Sánchez & Vaccari, 2003
- Order Pandorida R. Stewart, 1930
  - Superfamily Pandoroidea! Rafinesque, 1815
    - Family Pandoridae Rafinesque, 1815
    - Family Laternulidae! Hedley, 1918 (J. Gray, 1840b)
    - Family Lyonsiidae! P. Fischer, 1887
  - Superfamily Clavagelloidea d'Orbigny, 1844 in 1844–1848
    - Family Clavagellidae! d'Orbigny, 1844 in 1844–1848
    - Family Penicillidae J. Gray, 1858
- Order Thraciida Carter, *nov.*
  - Superfamily Thracioidea! Stoliczka, 1870 in 1870–1871 (Couthouy, 1839)
    - Family Thraciidae! Stoliczka, 1870 in 1870–1871 (Couthouy, 1839)
    - •Family Burmesiidae M. Healey, 1908
    - Family Cleidothaeridae Hedley, 1918 (Stoliczka, 1870 in 1870–1871)
    - Family Myochamidae P. P. Carpenter, 1861
    - Family Periplomatidae Dall, 1895a

Megaorder Solenata Dall, 1889
- Order Solenida Dall, 1889
  - •Superfamily Orthonotoidea! S. A. Miller, 1877
    - •Family Orthonotidae! S. A. Miller, 1877
    - •Family Konduriidae! Sánchez in Sánchez & Benedetto, 2007
    - •Family Prothyridae S. A. Miller, 1889
    - •Family Solenomorphidae Cockerell, 1915
      - •Subfamily Solenomorphinae Cockerell, 1915
      - •Subfamily Promacrinae Scarlato & Starobogatov, 1979a
  - Superfamily Solenoidea Lamarck, 1809
    - Family Solenidae Lamarck, 1809
    - Family Pharidae! H. Adams & A. Adams, 1856

Subfamily Pharinae! H. Adams & A. Adams, 1856
Subfamily Cultellinae A. Davies, 1935
Subfamily Novaculininae Ghosh, 1920
Subfamily Pharellinae Stoliczka, 1870 in 1870–1871
•Subfamily Rzehakiinae Korobkov, 1954
Subfamily Siliquinae! Bronn, 1862
Order Hiatellida Carter, *nov.*
Superfamily Hiatelloidea J. Gray, 1824
Family Hiatellidae J. Gray, 1824
Subfamily Hiatellinae J. Gray, 1824
Subfamily Panopeinae! Bronn, 1862
Family Saxicavellidae! P. H. Scott, 1994
•Superfamily Edmondioidea! W. King, 1850
•Family Edmondiidae! W. King, 1850
•Family Pachydomidae! P. Fischer, 1887
•Subfamily Pachydominae! P. Fischer, 1887
•Tribe Pachydomini P. Fischer, 1887
•Tribe Astartilini Waterhouse, 1969
•Tribe Holdhausiellini Beurlen, 1954
•Tribe Plesiocyprinellini Simões & others, 1997
•Subfamily Myoniinae Scarlato & Starobogatov, 1979a

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APPENDIX 1. NEW SUPRAGENERIC TAXA AND UNRANKED CLADE NAMES

Abbreviations: CL, simple crossed lamellar; CCL, complex crossed lamellar; ISP, irregular simple prismatic; RSP, regular simple prismatic.

Afghanodesmatida Carter, herein, *ord. nov.*, *nom. transl. et correct. ex* Afghanodesmatidae Scarlato & Starobogatov (1979a, p. 19, 25). Taxonomic content indicated above.

Anadontellidae Silantiev, herein, *fam. nov.* Type genus, *Anadontella* Betekhtina in Betekhtina, Starobogatov, & Jatsuk, 1987, p. 41. Family diagnosis: members of the superfamily Prokopievskioidea with relatively thin, elongate, subtriangular (*Anthraconauta*-like) or subrectangular, equivalve or slightly inequivalve shells, with an edentulous hinge, distinctly multilayered shells with fine, commarginal growth lines, and no radial microsculpture. Some forms (e.g., *Synjaella*) are strongly tapered posteroventrally and have a sinus-like concavity on the posterior and ventral margins. Ligament opisthodetic, possibly submerged, with single, narrow ligament groove appearing on internal molds, possibly representing secondarily simplified duplivincular ligament. Outer shell layer calcitic irregular simple prismatic or fibrous prismatic, middle and inner shell layers nacreous, except immediately internal to ISP pallial myostracum, where irregular CCL is developed. Nonmarine. Anadontellidae resembles Naiaditidae but differs from Prokopievskiidae in lacking radial microsculpture. At least *Anadontella* differs from some Prokopievskiidae and Naiaditidae in having a distinct sublayer of irregular CCL between the pallial myostracum and the nacreous inner part of the inner shell layer. Anadontellidae differs from Naiaditidae in having a single, narrow, opisthodetic ligament groove instead of an amphidetic, duplivincular ligament. This family also contains *Soanellina* Betekhtina, 1990, and *Synjaella* Kanev, 1993.

Antijaniridae Hautmann, herein, *fam. nov.* Type genus, *Antijanira* Bittner, 1901, p. 49. Family diagnosis: small shells with well-developed radial ribs occasionally bearing spines; ribs either equal in strength or intercalated in two or more ranks; discs circular to slightly retrocrescent, biconvex or with right disc flatter; dorsal margin straight and relatively short; beaks located close to midpoint of dorsal margin; byssal notch well developed; ctenolium not observed; ligament alivincular-areate, with centrally or slightly posteriorly located resilifer; shell with calcitic outer shell layer, regular simple prismatic in right valve and predominantly homogeneous in left valve, plus aragonitic crossed lamellar middle and inner shell layers. Comparisons: the ligament system indicates affinity with taxa presently classified with Aviculopectinoidea or Heteropectinoidea, contrary to Hertlein's (1969, p. 355) placement of the "*Antijanira* group" in Pectinidae. The style of ornamentation in Antijaniridae is not observed in other Triassic Aviculopectinoidea or Heteropectinoidea, except for *Ornithopecten* (Ornithopectinidae), which differs in having a broad right posterior wing and a delicate right anterior auricle. This family also contains *Amphijanira* Bittner, 1901, and *Oxypteria* Waagen, 1907. The affinity of *Oxypteria* to this group was first recognized by Allasinaz (1972, p. 266).

Arenigomyidae Carter, herein, *fam. nov.* Type genus, *Arenigomya* Cope, 1996, p. 1017. Cope (1996, p. 1017) gave the following diagnosis for *Arenigomya*, which is also the present family diagnosis: "Equivalve, edentulous, trapezoidal bivalve with length one-and-a-half times greater than height. Surface with fine concentric undulose ornament, radial striae and anteriorly prominent commarginal rugae. Surface detail of finely granulose ornament. Strong carina runs from posterior side of umbo to postero-ventral margin of valves. Each valve with subumbonal articulation device." This family is monogeneric.

Aulacomyini Carter, herein, *tribe nov*. Type genus, *Aulacomya* Mörch, 1853 in 1852–1853, p. 53. This new tribe is proposed because Perninae Scarlato & Starobogatov, 1979b, p. 24, is invalid;

its type genus was given without author or date but is inferred from the context to be *Perna* Philipsson in Retzius, 1788. This Perninae is a junior homonym of Pernadae J. Fleming, 1828 (spelling corrected by Zittel, 1895, to Pernidae, the latter based on *Perna* Bruguière, 1789, in Bruguière, Lamarck, & Deshayes, 1789–1832, a junior synonym of *Isognomon* Lightfoot, 1786). Tribe Aulacomyini diagnosis: smooth or radially ribbed, mytiliform members of Mytilinae in which the anterior adductor muscle is present only in the juvenile stage. Other than the type genus, this tribe contains *Ischadium* Jukes-Browne, 1905, *Perna* Philipsson in Retzius, 1788, and *Choromytilus* T. Soot-Ryen, 1952.

Colpomyida Carter, herein, *ord. nov.*, *nom. transl. et correct.* Carter, herein, *ex* Colpomyidae Pojeta & Gilbert-Tomlinson, 1977, p. 37. Taxonomic content indicated above.

Concinellinae Silantiev, herein, *subfam. nov.* Type genus, *Concinella* Betekhtina, 1966, p. 108, 198. Subfamily diagnosis: members of family Prokopievskiidae with thin, subcircular to subtriangular, inequivalve or equivalve, edentulous shells, probably an opisthodetic, possibly submerged ligament with a single, narrow ligament groove appearing on internal molds, possibly representing a secondarily simplified, duplivincular ligament. Ornamentation of regularly imbricated growth lines and fine radial striae. Outer shell layer calcitic irregular simple prismatic; middle and inner shell layers nacreous. Nonmarine. This subfamily is monogeneric.

Crassatellopsidae Carter, herein, *fam. nov.* Type genus, *Crassatellopsis* Beushausen, 1895, p. 146. The following family diagnosis is modified from the description of *Crassatellopsis* by P. A. Johnston (1993): two cardinal teeth in right valve, one anterior and one central, the latter bordered posteriorly by a narrow shelf; two cardinal teeth in left valve, left cardinal tooth immediately posterior to left pivotal cardinal is slender and directed posteroventrally; right cardinal tooth anterior to right pivotal cardinal tooth is slender and directed anteroventrally; no lateral teeth and no shell marginal teeth. Shell shape similar to *Astarte*, trigonally suboval or subcircular; umbos pointed, prosogyrate; shell margin broadly concave immediately anterior to umbos, convex elsewhere; lunule and escutcheon absent; exterior ornament of commarginal ribs, rugae, and growth lines; ribs generally prominent and regularly spaced in early growth stages, in some cases diminishing gradually throughout ontogeny. Hinge plate narrow or broad. Anterior adductor muscle scar reniform or moderately elongate; posterior adductor muscle scar larger. Anterior pedal retractor scar positioned above and separate from anterior adductor scar; above this scar 2 to possibly 4 subumbonal muscle scars are positioned at the junction of hinge plate and the shell interior, with the dorsalmost of these scars most prominent and usually positioned directly below the left or right principal cardinal tooth or its socket in the opposite valve. Posterior internal radial ridge present immediately anterior to posterior adductor muscle scar. Pallial line continuous, nonsinuate, relatively close to shell margin ventrally. Lamellar sublayer of ligament inserting into opisthodetic, narrow, submarginal fossette, but fibrous sublayer of ligament inserting within a strongly oblique, short resilifer; ligament sublayers separated by indistinct ridge on posterior margin of resilifer. This family is monogeneric.

Darininae Signorelli, herein, *subfam. nov.* Type genus, *Darina* J. Gray, 1853, p. 42. Subfamily diagnosis: members of Mactridae with thin, fragile, oval to subcircular, elongate, anteriorly and posteriorly gaping shells, nearly median umbos, a rudimentary, external ligament, a large resilium on a ventrally to posteroventrally strongly projecting chondrophore, a subdued posterior umbonal ridge, and hinge dentition that is concentrated on the central part of the hinge. This subfamily also contains *Darcinia* B. Clark & Durham, 1946. Darininae differs from Mactrinae in having a more elongate shell shape, thinner, more pellucid valves, and more medially concentrated hinge dentition. It differs from Kymatoxinae in having a more elongate, more nearly equilateral shell shape, anterior as well as posterior gapes, less prominent sculpture, and stronger anterior lateral teeth. It differs from Lutrariinae in having a more projecting chondrophore and more median umbos.

Entoliidina Hautmann, herein, *subord. nov.*, *nom. transl. et correct*. M. Hautmann, herein, *ex* Entoliinae Teppner, 1922, p. 89. A suborder proposed for the superfamilies Euchondrioidea and Entolioidea, as indicated above.

Eubivalvia Carter, herein, *unranked clade nov.* A descriptive clade name proposed for the subclasses Protobranchia and Autobranchia.

Eufistulaninae Carter, herein, *subfam. nov*. Type genus, *Eufistulana* Eames, 1951, p. 445. Subfamily diagnosis: obligate tube-dwelling Gastrochaenidae with long, straight-sided tubes; long, largely fused siphons *sensu stricto*; sparse, minute siphonal papillae on incurrent but not excurrent siphonal aperture; anterior pedal retractor muscles passing around visceral mass as they approach the foot; the ventral surface of the foot elongate-ovate in the lateral direction. This subfamily differs from Spengleriinae and Gastrochaeninae in having obligate tube-dwelling life habits in which the tube is very elongate and straight sided, in lacking papillae on the excurrent siphon, and in having a laterally expanded instead of round to anteroposteriorly elongate ventral pedal surface. This family also contains *Kummelia* L. Stephenson, 1937.

Hiatellida Carter, herein, *ord. nov.,* *nom. transl. et correct*. Carter, herein, *ex* Hyatelladae J. Gray, 1824, based on *Hyatella*, an incorrect subsequent spelling of *Hiatella* Bosc *ex* Daudin MS, 1801; =suborder Saxicavoidea Morretes, 1949, p. 47, invalid, based on the junior synonym *Saxicava* Fleuriau de Bellevue, 1802 (=*Hiatella* Bosc *ex* Daudin MS, 1801). Taxonomic content indicated above.

Joannininae Carter, herein, *subfam. nov*. Type genus, *Joannina* Waagen, 1907, p. 94. Subfamily diagnosis: edentulous members of Modiomorphidae differing from sister subfamilies Modiomorphinae and Healeyinae in having more dorsally projecting umbos, better defined anterior auricles, a narrower hinge plate, and, with the exception of *Leidapoconcha*, a shorter, more external ligament nymph and growth lines not continuing from a lunule onto the subumbonal hinge plate. This subfamily also contains *Protopis* Kittl, 1904, *Waijiaoella* Stiller & Chen, 2006, *Qingyaniola* Stiller & Chen, 2006, and *Leidapoconcha* Stiller & Chen, 2006.

Neocardiids Carter, Hylleberg, & Popov, herein, *unranked clade nov.* A descriptive name proposed for the clade of Laevicardiinae + Pleuriocardiinae + "eucardiids" *sensu* J. Schneider (1995, 1998a).

Ornithopectinidae Hautmann, herein, *fam. nov.* Type genus, *Ornithopecten* Cox, 1962, p. 596. Family diagnosis: discs inequilateral, retrocrescent, posteriorly slightly expanded; beaks located well in front of midpoint of dorsal margin; right anterior auricle delicate, with narrow subauricular byssal notch; right posterior wing broad, poorly differentiated but distally pointed; left anterior auricle poorly

differentiated, with indistinct auricular sinus; ornament with radial ribs usually intercalated in different ranks, superimposed by regularly spaced commarginal riblets. Comparisons: Ornithopectinidae differs from the closely related Antijaniridae chiefly in the anteriorly positioned beaks, retrocrescent dics, and broad posterior wing. This family is monogeneric.

Ovatoconchidae Carter, herein, *fam. nov*. Type genus, *Ovatoconcha* Cope, 1996, p. 988. Family diagnosis: members of superfamily Solemyoidea with anteriorly produced shell, as in Ctenodontidae and Solemyidae, but lacking parivincular nymphs and possibly also lacking palaeotaxodont hinge teeth in adult shell. This family is monogeneric.

Paleodorinae Carter, herein, *subfam. nov*. Type genus, *Paleodora* C. Fleming, 1957, p. 943. Subfamily diagnosis: members of family Sanguinolitidae with elongate, subrectangular, slightly sickle-shaped shell with anterior end short and rounded, posterior end longer; posteroventrally rounded and dorsoposteriorly truncate; ornament of low, commarginal ribs, replaced by fine growth lines on the relatively flat, dorsoposterior area; hinge unknown, possibly lacking distinct teeth; sharply elevated, internal shell lamellae radiating from area below beaks anteroventrally and toward the posterior. This subfamily is monogeneric.

Pleuronectitidae Hautmann, herein, *fam. nov*. Type genus, *Pleuronectites* Schlotheim, 1820, p. 217. Family diagnosis: discs procrescent, height of valves greater than length, left valve more convex than right; shell exterior smooth or with radial ribs; right anterior auricle with auricular scroll and deep byssal notch; ctenolium present; right posterior auricle obtuse but well delimited, not projecting above hinge margin; auricles of left valve lacking auricular sinuses and dorsally levelling with hinge margin; ligament alivincular-alate, small bourrelets may be present; hinge lacking resilial teeth; shell interior without buttresses; shell with thin, calcitic outer shell layer, divided into radial sectors with irregular foliated to radially irregular spherulitic prismatic to radially fibrous prismatic structure; aragonitic middle and inner shell layers with evidence of linear to slightly branching crossed lamellar structure. Comparisons and comment: Pleuronectitidae differs from other families of Pectinoidea (as defined by the presence of both an alivincular-alate ligament and a ctenolium, thus excluding the Entolioidea) in having procrescent discs, a flat right valve, a well-developed right anterior auricular scroll, and in lacking teeth and internal buttresses. This family tentatively also contains Lower and Middle Triassic *Periclaraia* Li Jin-hua & Ding, 1981.

Saturnopectininae D. Campbell, herein, *subfam. nov*. *Nom. subst*. D. Campbell, herein, *pro* Saturnellinae Astafieva, 1994, p. 12, 16, invalid, based on *Saturnella* Astafieva, 1994, a preoccupied name. Type genus, *Saturnopecten* Astafieva, 2001a, p. 106, 2001b, p. 557, *nom. nov. pro Saturnella* Astafieva, 1994, *non Saturnella* Hedinger, 1993 [Foraminifera]. Subfamily diagnosis same as for Saturnellinae in Waterhouse (2008, p. 104): "Distinguished by ornament of strong commarginal rugae, radial ornament absent or very faintly developed over body of shell, and stronger over right anterior auricle in some species." This subfamily also contains *Astafievina* Waterhouse, 2008, and *Montorbicula* Waterhouse, 2008.

Similodontidae Carter & Pojeta, herein, *fam. nov*. Type genus, *Similodonta* H. Soot-Ryen, 1964, p. 498. Family diagnosis: members of superfamily Tironuculoidea with low hinge angle (65–100°) and only slightly, if at all, anteroventrally expanded shell. Increased anterior shell gape achieved by orienting ligament axis more nearly perpendicular to the anteroventral shell margins. Anterior hinge teeth convexodont to orthomorphodont and inclined. Posterior hinge teeth convexodont in most genera, to orthomorphodont and inclined. Anterior and posterior tooth rows generally form continuous series below the beaks, but posterior tooth row may overlap anterior tooth row below beaks. Anterior and posterior tooth rows typically nearly equal in length, but the posterior tooth row may be slightly shorter. This family also contains *Australonucula* Sánchez, 1989, *Trigonoconcha* Sánchez, 1999, *Villicumia* Sánchez, 1999, and doubtfully Upper Ordovician *Palaeoconcha* S. A. Miller, 1889.

Spengleriinae Carter, herein, *subfam. nov*. Type genus, *Spengleria* Tryon, 1862a, p. 472, 485. Subfamily diagnosis: obligate endolithic Gastrochaenidae with short to long, entirely separated siphons *sensu stricto*, and with little or no extension of ctenidia and mantle cavity posterior to shell margins. Beaks slightly to moderately anterior, never far anterior or terminal. Numerous, minute siphonal papillae surround each siphonal aperture. Anterior pedal retractor muscles pass around visceral mass as they approach the sole of the foot; ventral surface of foot nearly circular to elongate-ovate in anteroposterior direction. This subfamily differs from Gastrochaeninae in having siphons *sensu stricto* that are entirely separated, and by having little or no extension of the ctenidia and mantle cavity posterior to the shell margins. It differs from Eufistulaninae in having entirely separated siphons *sensu stricto*, and in having obligate endolithic instead of obligate tube dwelling habits. This family also contains *Gastrochaenopsis* Chavan, 1952c, and *Spenglerichaena* Carter, *gen. nov.*

Thraciida Carter, herein, *ord. nov.,* *mom. transl. et correct*. Carter, herein, *ex* subfamily Thraciinae Stoliczka, 1870 in 1870–1871, p. 59, 62. Taxonomic content indicated above.

APPENDIX 2. NEW GENERA AND SPECIES

Superfamily Gastrochaenoidea J. Gray, 1840b
Family Gastrochaenidae J. Gray, 1840b
Subfamily Gastrochaeninae J. Gray, 1840b

Stenochaena* Carter, herein, *gen. nov.
Figure 1

Type species.—*Gastrochaena lacera* Belokrys, 1991, p. 10.

Discussion.—The genus *Stenochaena* is presently proposed for Middle Eocene *Gastrochaena lacera* Belokrys, 1991 (p. 10, pl. 1, *1–3,* fig. 1a, 2), from the Dnepropetrovsk region of Ukraine. The name *Stenochaena* derives from the Greek *stenos* for narrow, and from a variation of *cheniskos* for the upturned prow of a boat, as in *Gastrochaena*. The new genus name is feminine. The name *Stenochaena* reflects the extremely small pedal gape and boatlike shape of the united valves. In addition to *Stenochaena lacera*, this genus includes Upper Jurassic *Gastrochaena zitteli* Boehm, 1883, from Stramberk, Czech Republic, and Jurassic *Gastrochaena valfinensis* de Loriol, 1888, in de Loriol & Bourgeat, 1886–1888, from Valfin, eastern France (possibly a juvenile of *Stenochaena zitteli*).

Generic diagnosis and description.—Members of Gastrochaeninae with a greatly posteriorly elongated, small- to medium-sized shell (9.5–38 mm long), with far anterior but not terminal beaks, a very small, anteriorly restricted pedal gape (comprising less than 12% of shell length), and pedal gape margins oriented at a high angle (over 60°) relative to the hinge axis. The shell's posterior is narrowly ovate

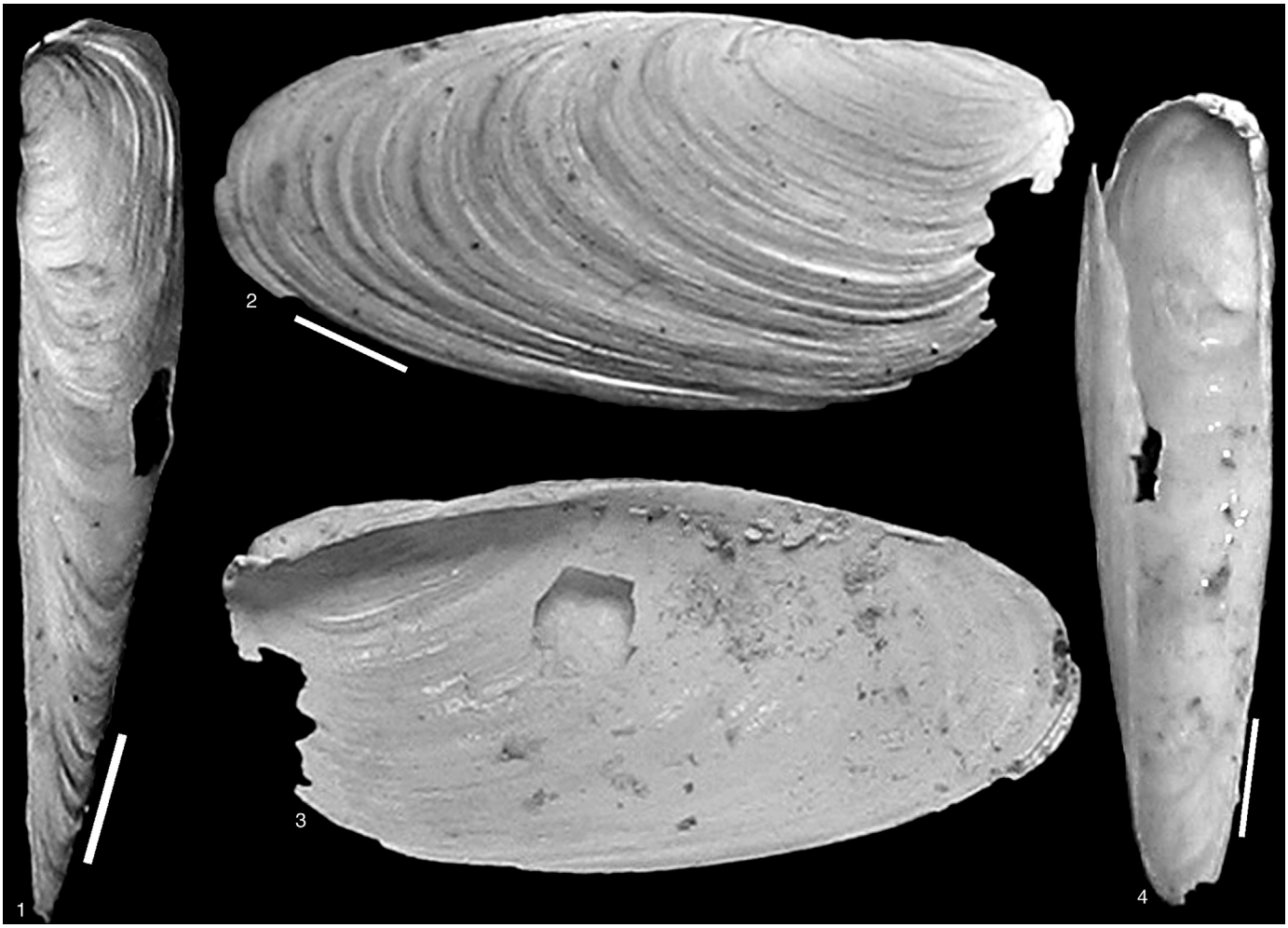

Figure 1. *Stenochaena lacera* (Belokrys, 1991) (new combination), holotype, right valve, Geologic Museum of Krivorozh'ye Mining Institute, Bv=148/74; middle Eocene, Dnepropetrovsk region, Ukraine; *1–4,* dorsal view perpendicular to dorsal hinge, lateral exterior view, lateral interior view, and ventral view perpendicular to subumbonal hinge, respectively; scale bars = 1 mm (new).

and ornamented with regularly spaced, erect, commarginal lamellae (*Stenochaena zitteli*) or irregularly spaced growth lines (*Stenochaena lacera*). There are no mineralized periostracal spikes or spines cemented to the shell. The boring's shell chamber is subcylindrical, tapering far anteriorly and far posteriorly to conform with the shell's shape. The anterior half of the siphonal boring appears like a slightly narrower extension of the shell chamber, without a strong constriction in boring width at the base of the siphons. The posterior half of the siphonal boring is divided into incurrent and excurrent areas that diverge at an angle of 20°–25°. The hinge is thin, edentulous, and lacks myophores. Posterior to the beaks, the hinge is slightly convex and nearly parallel with the ventral shell margin; anterior to the beaks, it is very short, dorsally slightly deflected, and laterally strongly deflected (about 60°) from the subumbonal hinge axis. This lateral deflection frames a distinct, triangular opening between the dorsoanterior shell margins. The ligament is opisthodetic and parivincular, with very thin, not strongly dorsally projecting nymphs. The anterior adductor muscle scar is positioned immediately adjacent to the deflected dorsoanterior shell margin. Other muscle scars are not visible, despite excellent preservation of the aragonitic shells.

Comparisons.—No other member of Gastrochaenidae approaches *Stenochaena* in its combination of a very anteriorly restricted, high-angle pedal gape and greatly posteriorly extended, nearly cylindrical shell shape.

Distribution.—*Stenochaena* is known only from the Upper Jurassic and Middle Eocene of Europe.

Ecology.—Specimens of *Stenochaena lacera* from Belokrys (1991) came from borings in the dome-shaped coral *Astraeopora sphaeroidalis* (Mich.). Belokrys speculated that juveniles of this species bored through living coral tissue. Although this cannot be certain, the borings are sometimes partially overgrown by coral, indicating close proximity to living coral tissue at the time of settlement. Calcareous laminae are sometimes present in the anterior of the boring's shell chamber, indicating that the bivalves sometimes bored in a posterior direction to keep pace with coral growth.

Boehm's (1883) specimen of *Stenochaena zitteli* came from an Upper Jurassic limestone at Stramberk, Czech Republic (Boehm, 1883, p. 495, pl. 53,*6–7*). Boehm indicated that his specimen occupied a calcareous tube that is anteriorly thin walled and posteriorly rather thick walled. This putative tube is probably the calcareous lining of

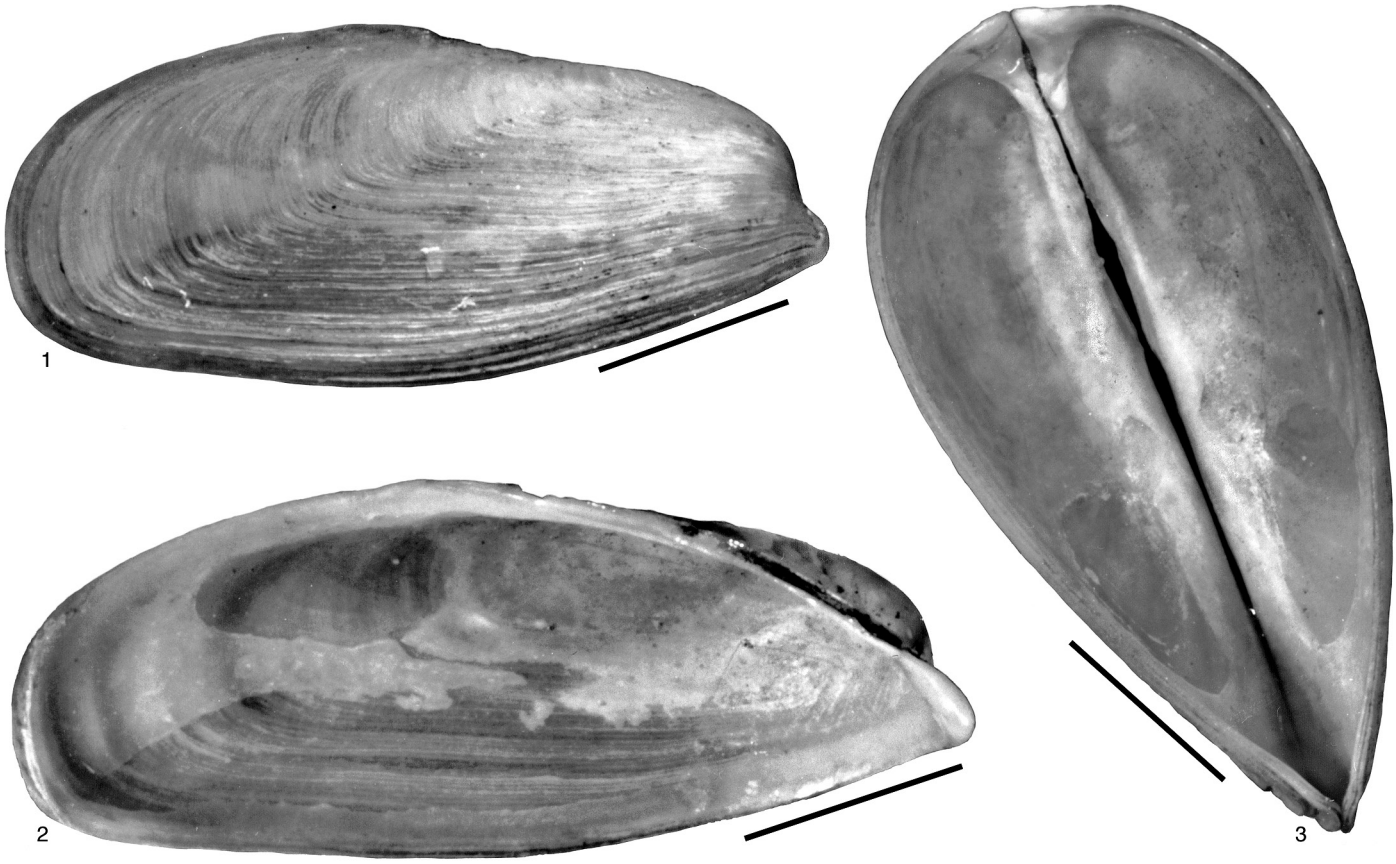

Figure 2. *Spenglerichaena apertissima* (Deshayes, 1855a) (new combination), holotype, paired valves, British Museum (Natural History), 1978086, Hugh Cuming collection; Recent, Isle of Panay, Philippines; *1–3,* right lateral exterior view, left lateral interior view, and ventral view perpendicular to subumbonal hinge, respectively; scale bars = 5 mm (new).

a boring, thickened posteriorly to conform with the shell's shape, as in modern endolithic gastrochaenids. The British Museum has in its collections an upper Tithonian, Upper Jurassic specimen of *S. zitteli*, also from Stramberk (British Museum Geology Department L23855), with impressions of a coral substratum on the exterior of its boring cast.

Superfamily Gastrochaenoidea J. Gray, 1840b
Family Gastrochaenidae J. Gray, 1840b
Subfamily Spengleriinae Carter, herein, *subfam. nov.*

Spenglerichaena Carter, herein, *gen. nov.*

Figure 2

Type species.—*Gastrochaena apertissima* Deshayes, 1855a, p. 326.

Discussion.—The genus *Spenglerichaena* is presently proposed for Recent, Indo-Pacific *Gastrochaena apertissima* Deshayes, 1855a, the type species. The name derives from *Spengleria* and *Gastrochaena*, in recognition of anatomical similarities with *Spengleria* and shell similarities, especially the lack of a raised posterior triangular area, with *Gastrochaena*. The new genus name is feminine.

Generic diagnosis and description.—Members of Spengleriinae with anteriorly strongly laterally inflated shells, moderately anterior umbos, completely divided, relatively long siphons *sensu stricto*, little or no extension of the ctenidia and posterior mantle cavity posterior to the shell margins, no raised, posterior triangular area, and no distinct umbonal-posteroventral sulcus. The shell posterior has irregular, commarginal growth lamellae and a thin, nonmineralized periostracum. The ctenidia are nonplicate, the pedal probing organ is spatulate, and the calcareous boring linings lack an annular septum and spiny baffles at the base of the siphonal boring.

Comparisons.—*Spenglerichaena* resembles *Spengleria* in its completely separated siphons *sensu stricto* and anterior pedal retractor muscles that pass around the visceral mass as they approach the foot. However, *Spenglerichaena* lacks the raised posterior triangular area, aragonitic periostracal spikes, distinct umbonal-posteroventral sulcus, pointed calcareous baffles in the boring lining at the base of the siphons, plicate ctenidia, and more medially positioned umbos of *Spengleria*. Its nonplicate ctenidia, spatulate pedal probing organ, lack of a raised, posterior triangular area, and lack of mineralized periostracal spines are more typical of *Gastrochaena* and *Rocellaria*, but in those genera, the siphons *sensu stricto* and *sensu lato* are largely fused, and the ctenidia and mantle cavity are extended at least slightly into the siphonal part of the boring, posterior to the shell margins. *Spenglerichaena* differs from *Gastrochaenopsis* in having a wider, longer pedal gape, no raised posterior triangular area, and greater lateral inflation of the shell.

Distribution.—Borings similar to those made by *Spenglerichaena* are known from the Lutetian, Middle Eocene near Verona, Italy, but the associated shells are unknown (Savazzi, 1980). *Spenglerichaena* is therefore definitely known only from the Recent tropical Indo-West Pacific Region.

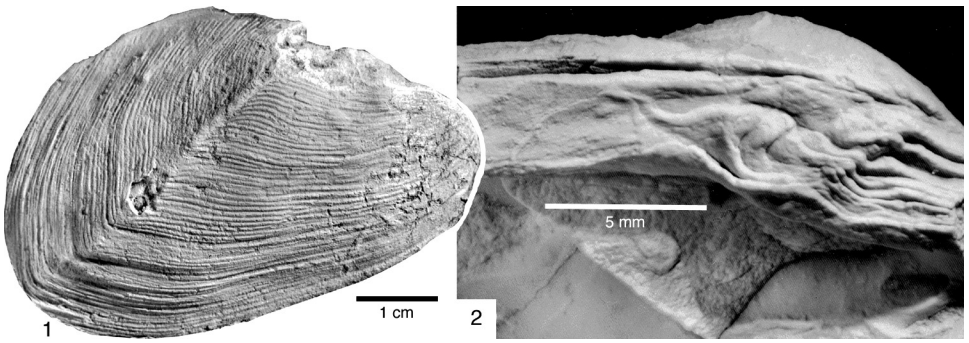

Figure 3. *Goniomorpha hamiltonensis* (J. Hall & Whitfield, 1869) (new combination), Middle Devonian, Marcellus (?) Formation, Hamilton Group, central New York State; *1,* exterior of broken, calcite-replaced right valve (Yale Peabody Museum 10276); *2,* subumbonal hinge of calcite-replaced left valve (Yale Peabody Museum 10060), from north of Morrisville, New York, showing parivincular ligament insertion area (upper left) and crude subumbonal dentition crossed by prominent growth lines (new).

Ecology.—*Spenglerichaena* bores primarily into thicker coral substrata that are less subject to breakage.

Superfamily Modiomorphoidea S. A. Miller, 1877
Family Modiomorphidae S. A. Miller, 1877
Subfamily Modiomorphinae S. A. Miller, 1877

Goniomorpha* Carter, herein, *gen. nov.

Figure 3

Type species.—*Goniophora hamiltonensis* J. Hall & Whitfield, 1869, p. 36.

Discussion.—The genus *Goniomorpha* is presently proposed for sharply carinate, posteriorly obliquely truncate, subumbonally irregularly dentate modiomorphids formerly classified as *Megalodon* J. de C. Sowerby, 1827, in James Sowerby, 1812–1845, or *Goniophora* J. Phillips, 1848. The type species is presently designated as Middle Devonian *Goniophora hamiltonensis* J. Hall & Whitfield, 1869. The name *Goniomorpha* derives from *Gonio-* (from *Goniophora* Phillips, 1848) and *morpha* (from *Modiomorpha* J. Hall & Whitfield, 1869). Johnston (1993, p. 76) was aware that "*Goniophora*" *hamiltonensis* is "almost certainly not congeneric" with *Goniophora* J. Phillips, 1848, and he pointed out that it differs from true *Goniophora* in having a depressed, striated lunule, the growth lines of which continue onto the subumbonal hinge plate, as in *Modiomorpha concentrica* (Conrad, 1838) (see J. Hall, 1884 in 1883–1884, pl. 43,*18–19;* Bailey, 1983, fig. 47; Carter, 1990a, fig. 50A). Carter (1990a, p. 266) indicated that "*Goniophora" hamiltonensis* belongs in Modiomorphidae, noting that it is microstructurally similar to *M. concentrica*, and Johnston (1993) also assigned "*Goniophora" hamiltonensis* to Modiomorphidae.

True *Goniophora* is a mecynodontid based on upper Silurian *Goniophora cymbaeformis* Sowerby in Murchison, 1839. This mecynodontid resembles *Goniomorpha* in having an equivalve, strongly inequilateral, posteriorly elongate shell with simple, commarginal ornament, and a sharp, angular carina extending from the beak to the posteroventral shell margin. However, it differs from *Goniomorpha* in having prominent anterior and posterior internal ridges (Johnston, 1993, p. 74–76; Liljedahl, 1994, p. 74, fig. 52I). The hinge and ligament of *Goniophora cymbaeformis* are unknown, but other species of this genus differ from *Goniomorpha* in having a narrower hinge plate, largely restricted to the subumbonal area, with finer, more regularly shaped cardinal teeth, an opisthodetic, parivincular ligament with shorter, more external nymphs, no strong growth lines on the subumbonal hinge plate, and no deeply impressed lunule (Liljedahl, 1994, p. 74).

Goniomorpha hamiltonensis was described and illustrated by J. Hall (1885, p. 296, pl. 43,*8–15, 17–21*), Carter and Tevesz (1978), Carter (1990a, p. 266–268, fig. 50), Carter, Lutz, and Tevesz (1990, p. 391), and Johnston (1993, p. 76). Other species presently included in *Goniomorpha* lack posterior lateral teeth, and they all have at least one, weakly to strongly developed, irregular but more or less triangular cardinal tooth in the left valve. A second, weaker cardinal tooth may be present posterior to the principal cardinal tooth in the left valve, e.g., in Lower Devonian *Goniomorpha stuertzi* (Beushausen, 1895) (see Maillieux, 1937, p. 136), or a large, rounded cardinal tooth may be present in the right valve, anterior to the right, principal cardinal socket, as in Lower Devonian *Goniomorpha cognata* (Drevermann, 1902) (see Drevermann, 1902, p. 88, pl. 10,*15–16*).

Carter (1990a, p. 266) incorrectly indicated that "*Goniophora*" *hamiltonensis* has a very weak left posterior lateral tooth overlapping a weak right posterior lateral tooth. This was based on a misinterpretation of a shallow flexure near the base of the posterior hinge plate in an isolated left valve. Subsequent sections through united valves from the Hamilton Group near Morrisville, New York, along with the observations by C. F. Römer (1844) and Maillieux (1937), indicate a lack of lateral hinge teeth in this genus.

Generic diagnosis and description.—*Goniomorpha* encompasses members of subfamily Modiomorphinae with a sharply defined, umbonal-posteroventral carina, an angular, rostrate posterior, and no posterior lateral hinge teeth. Like other Modiomorphinae, the shell is equivalved, posteriorly elongate, and strongly inequilateral, with low umbos, a deeply impressed, growth-lined lunule with growth lines extending from the lunule onto a wide, subumbonal hinge plate, a weakly or more strongly developed, irregular, more or less triangular, left cardinal tooth, a flat, wide, posterior hinge plate, and slightly submerged, elongate, parivincular ligament nymphs. In some species, a second, smaller, more posterior, left cardinal tooth is also present, or a rounded cardinal tooth is present in front of the principal cardinal socket in the right valve. The adductors are heteromyarian, the anterior one deeply impressed and positioned just below the hinge, and bounded posteriorly by a low, umbonal ridge or buttress. The posterior adductor muscle scar is more shallowly impressed. The anterior pedal retractor scar is separated from

the anterior adductor scar, but the posterior pedal retractor scar is partially confluent with the posterior adductor scar. The pallial line is unknown for the type species, but it was probably integripalliate, judging from other members of Modiomorphinae. The shell mineralogy and microstructure resemble *Modiomorpha concentrica,* except that mineralized periostracal spikes are fused to the shell's exterior anteriorly (see Carter, 1990a, p. 268).

Comparisons.—*Goniomorpha* resembles *Modiomorpha* in having a crudely shaped cardinal tooth in the left valve, but *Goniomorpha* has a more sharply defined posterior carina, a more sharply truncate posterior, a more variable subumbonal dentition, and no posterior lateral teeth. A posterior lateral tooth is variably developed in *Modiomorpha* (see Carter, 1990a, p. 266).

Distribution.—*Goniomorpha* includes most of the Lower Devonian species assigned by Maillieux (1937) to *Goniophora*, e.g., *Goniophora bipartita* (F. Römer, 1844), *G. dorlodoti* Asselberghs, 1913, *G. trapezoidalis* Kayser, 1885, *G. schwerdi* Beushausen, 1895, *G. stuertzi* Beushausen, 1895, *G. praecedens* Drevermann, 1902, *G. cognata* Drevermann, 1902, *G. rhenana* Beushausen, 1895, *G. stainieri* Maillieux, 1937, *G. kaisini* Maillieux, 1937, and *G. atrebatensis* Leriche, 1912. It also contains most, if not all, of the New York Middle and Upper Devonian species placed by Hall (1885, p. 293–306) in *Goniophora*, e.g., *Goniophora acuta* (Hall & Whitfield, 1869), *G. rugosa* (Conrad, 1841), *G. truncata* Hall, 1883 in 1883–1884, *G. glaucus* (Hall & Whitfield, 1869), *G. ida* (Hall & Whitfield, 1869), *G. carinata* (Conrad, 1841), *G. trigona* Hall, 1885, and *G. chemungensis* (Vanuxem, 1842).

Paleoecology.—*Goniomorpha hamiltonensis* occurs in the Middle Devonian Hamilton Group of central New York State in clay-rich sandstones also containing a high diversity of other marine invertebrates, especially the bivalves *Ptychopteria* (Pterineidae), rare pectinoids, and the gastropods *Palaeozyglopleura* and *Bembexia*. *Goniomorpha hamiltonensis* is not usually found in large concentrations. The strongly and sharply truncate, elongate posterior and lack of a distinct byssal notch suggest a shallow infaunal life habit, with the shell's posterior end at or just above the sediment-water interface. The species is never associated with abundant nuculoids and muddy, fine grained sediments, suggesting suspension feeding habits and low tolerance of resuspended, muddy substrata.

Superfamily Ostreoidea Rafinesque, 1815
Family Arctostreidae Vialov, 1983
Subfamily Palaeolophinae Malchus, 1990

Nacrolopha Carter & Malchus, herein, *gen. nov.*

Figure 4

Type species.—*Nacrolopha carolae* Carter & Malchus, herein, *gen. et sp. nov.*

The new genus *Nacrolopha* is presently proposed for the new species, Carnian, Upper Triassic *Nacrolopha carolae* Carter & Malchus (Fig. 4), with the holotype of the latter being a well-preserved left valve from Alpe di Specie, Cassiano Formation (alt. 1900–2000 m), Italy (UNC 13497b). The holotype was described and illustrated as an unknown genus and species by Carter (1990a, p. 217–220, fig. 32). The genus name derives from the nacreous microstructure and *Lopha*-like shape of the type species. The species is dedicated to Carol Elizabeth Via Carter. The holotype, which has been sectioned for microstructural analysis, is deposited in the paleontological collection of the Yale University Peabody Museum of Natural History, New Haven, Connecticut.

Generic and species diagnosis.—*Nacrolopha* is characterized by a posteriorly instead of posterodorsally positioned posterior adductor scar, a posterior pedal retractor scar that is partially confluent with the posterior adductor scar, a minute, anterior adductor scar, and a nacroprismatic left valve that lacks foliated structure, structural chambering, and chalky deposits. This diagnosis applies to the genus and to its type species.

Generic and species description.—The following description of *N. carolae* is based on left valve UNC 13497b. The beak is prosogyrate in the juvenile stage and orthogyrate in the adult stage. The hinge is slightly arched and smooth except for 9 shallow pits (possible preparation artifacts) posterior and ventral to the cardinal area. There are no chomata. The ventral and lateral internal shell margins vary from nearly smooth to slightly radially costate. The exterior has about 25 coarse, radial costae immediately adjacent to the attachment area; these increase to about 30 at the shell margins through intercalation and branching, but mostly through intercalation. A pallial line is not visible, but this could be covered by an attached brachiopod and adherent sediment. The posterior adductor muscle scar (5.1 × 3.5 mm) is ovate, higher than wide, and much larger than the anterior adductor muscle scar (1.4 × 0.8 mm); both scars are positioned near their respective shell margins, and both are elevated by a shelly buttress, that supporting the anterior adductor being more prominent by virtue of its position on a more steeply inclined shell surface. The posterior pedal retractor scar measures 1.2 × 1.0 mm, and its center is 40% from the ventral shell margin toward the dorsal end of the shell. The ligament insertion area is acutely triangular and alivincular-arcuate, with the fibrous attachment area distinctly impressed below narrow, distinct, anterior and posterior bourrelets. The "incipient" crura that Carter (1990a, p. 219) described for this specimen are actually the flanks of the alivincular-arcuate ligament (Hautmann, 2004, 2006). The ligament insertion area is covered by a very thin aragonitic ligostracum of nearly vertical irregular simple prisms (ISP) and steeply dipping fibrous prisms. The underlying hinge is nacreous. The outer shell layer is very thin and varies from ISP to regular simple prismatic to homogeneous mosaic, with prisms 6–10 µm wide. The middle shell layer is nacreous and closely approaches the shell margins. Where marginal radial folds are present, the nacreous laminae are strongly reflected outward. The adductor myostracum is finely ISP. The inner shell layer is aragonitic and mostly coarsely textured ISP, with minor nacreous lensatic sublayers.

Comparisons.—*Nacrolopha carolae* differs from all other presently known members of Palaeolophinae in having nacre, an anterior adductor muscle scar, and a posterior pedal retractor scar. Because these features are internal, the composition of the genus is poorly known. *Palaeolopha montiscaprilis* (Klipstein, 1843) (Klipstein, 1843, p. 247, pl. 16,*5*) appears externally similar to *N. carolae* (see also Wöhrmann, 1889, p. 200, pl. 6,*1–3*), but illustrations of that species do not show an anterior adductor or posterior pedal retractor muscle scar. Possible congeners of *Nacrolopha* include certain other species assigned by Malchus (1990) to *Palaeolopha*, such as Carnian, Upper Triassic *Palaeolopha mediocostata* (Wöhrmann, 1889), and *Palaeolopha calceoformis* (Broili, 1904). However, these species are unknown both microstructurally and in the details of their muscle scars.

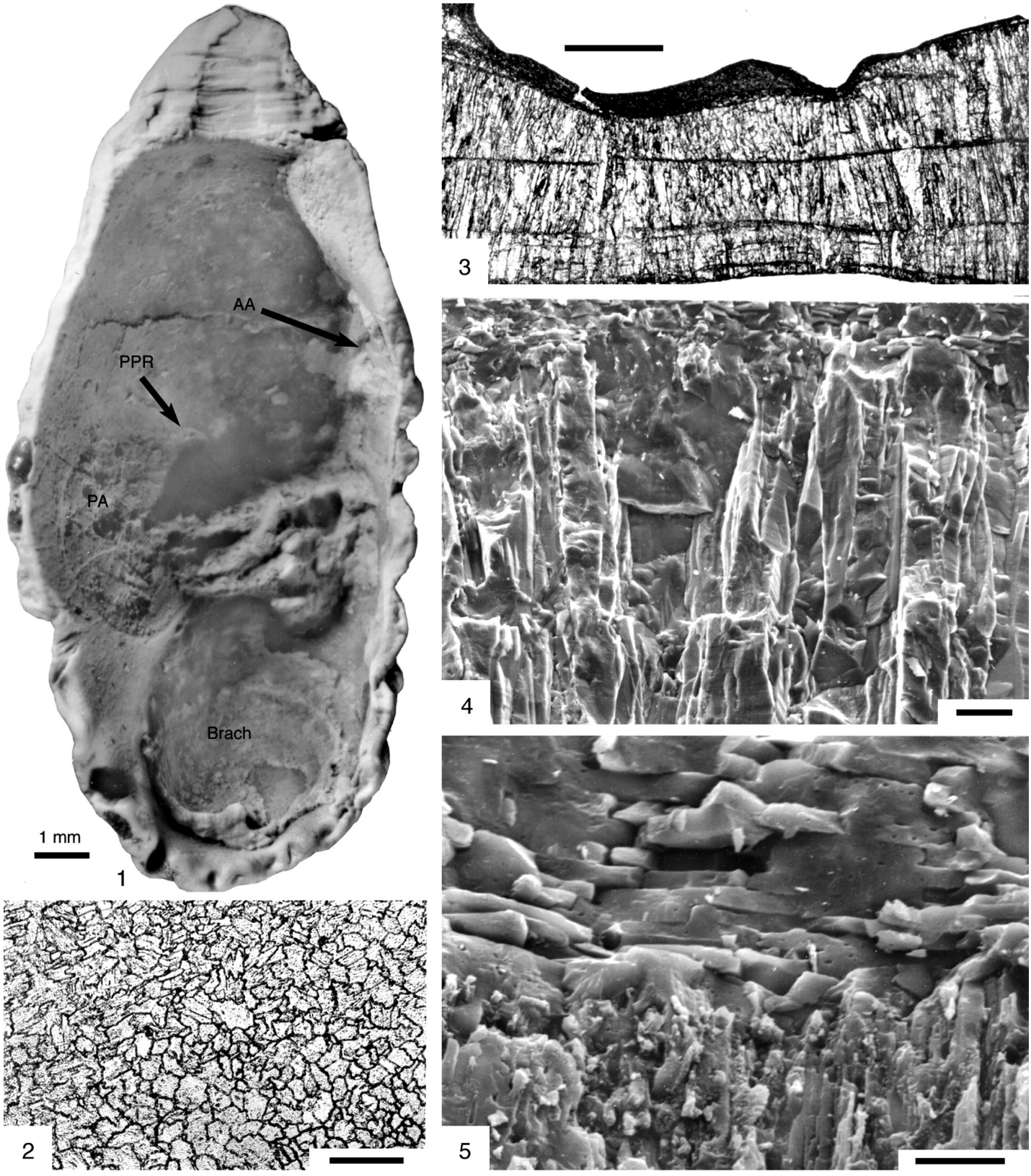

Figure 4. *Nacrolopha carolae* Carter & Malchus, *gen. et sp. nov.,* holotype, left valve, University of North Carolina 13497b; Carnian, Upper Triassic, Cassiano Formation, Alpe di Specie, altitude 1900–2000 m, Dolomitic Alps, northeast of Cortina d'Ampezzo, Italy; *1,* interior of left valve, showing alivincular-arcuate ligament insertion area, muscle scars for posterior adductor (*PA*), anterior adductor (*AA,* supported by a slight buttress), and posterior

(Continued on facing page.)

The presence of ISP and homogeneous mosaic structure in the outer shell layer of the left valve of *N. carolae* resembles some Triassic bakevelliids and gryphaeids, e.g., the Middle Triassic bakevelliid *Hoernesia socialis* (Schlotheim, 1823 in 1822–1823) (Carter, 1990b, p. 337) and the Upper Triassic gryphaeid *Gryphaea nevadensis* McRoberts, 1992 (McRoberts & Carter, 1994). Some Jurassic gryphaeids retained homogeneous mosaic structure in their outer shell layer, typically between an RSP outermost sublayer and the foliated middle shell layer, e.g., in Jurassic *Gryphaea arcuata* (Lamarck, 1801) and in *Praeexogyra hebridica* (Forbes, 1851) (Carter, 1990c, p. 356–359).

The dorsally rounded posterior adductor muscle scar in *N. carolae* resembles Gryphaeidae and differs from the dorsally flattened or concave posterior adductor scar in Ostreidae (Harry, 1985).

Nacrolopha carolae resembles Norian–Rhaetian, Upper Triassic *Umbrostrea emamii* Hautmann, 2001b, from the Nayband Formation of Iran, in having some calcitic RSP in its outer shell layer and nacre in its inner shell layers. However, *U. emamii* differs in having a regularly to irregularly foliated instead of nacreous middle shell layer. In *U. emamii,* the outer layer of the right valve is RSP to slightly ISP, whereas that of the left valve is coarsely ISP (Hautmann, 2001b, pl. 7; 2006). Structural chambers are lacking in the foliated layer. *Umbrostrea* lacks an adult anterior adductor muscle scar and adult posterior pedal retractor muscle scars (Hautmann, 2001b).

Distribution.—Nacrolopha carolae is presently known only from the Carnian, Upper Triassic, Cassiano Formation at Alpe di Specie, Italy.

APPENDIX 3. CLASSIFICATION ABOVE FAMILY RANK

The following abstract includes all taxa at or above the rank of superfamily (superfamilies are listed in alphabetical order), plus all plesions and paraplesions. Taxa above the rank of order are highlighted with bold face type. Symbols: • = extinct; ! = paraphyletic.

Class Bivalvia Linnaeus, 1758 in 1758–1759
•Grade Euprotobranchia! Nevesskaja, 2009
•Order Fordillida! Pojeta, 1975: •Superfamily Fordilloidea! Pojeta, 1975
•Order Tuarangiida MacKinnon, 1982
Clade Eubivalvia Carter, *nov.*
Subclass Protobranchia Pelseneer, 1889 (=Palaeotaxodonta Korobkov, 1954)
Superorder Nuculiformii! Dall, 1889 (=Foliobranchia Ménégaux, 1889)
Order Nuculida! Dall, 1889: Superfamily Nuculoidea! J. Gray, 1824; Superfamily Pristiglomoidea Sanders & Allen, 1973
Order Solemyida Dall, 1889: Superfamily Manzanelloidea Chronic, 1952; Superfamily Solemyoidea! J. Gray, 1840b
Superorder Nuculaniformii Carter, Campbell, & Campbell, 2000
•Order Afghanodesmatida! Carter, *nov.*: •Superfamily Afghanodesmatoidea! Scarlato & Starobogatov, 1979a; •Superfamily Tironuculoidea Babin in Babin & others, 1982
Order Nuculanida Carter, Campbell, & Campbell, 2000: Superfamily Malletioidea! H. Adams & A. Adams, 1858 (d'Orbigny, 1846); Superfamily Nuculanoidea H. Adams & A. Adams, 1858 (J. Gray, 1854a)
Subclass Autobranchia Grobben, 1894
Infraclass Pteriomorphia Beurlen, 1944
Cohort Mytilomorphi! Férussac, 1822 in 1821–1822
Order Mytilida! Férussac, 1822 in 1821–1822: •Superfamily Modiolopsoidea! P. Fischer, 1886; Superfamily Mytiloidea Rafinesque, 1815
•Order Colpomyida Carter, *nov.*: •Superfamily Colpomyoidea Pojeta & Gilbert-Tomlinson, 1977
Cohort Ostreomorphi Férussac, 1822 in 1821–1822
(plesion) •Family Matheriidae Scarlato & Starobogatov, 1979a
(plesion) •Family Ischyrodontidae Scarlato & Starobogatov, 1979a
Subcohort Arcioni! J. Gray, 1854a
•Order Cyrtodontida! Scarlato & Starobogatov in Nevesskaja & others, 1971
•Suborder Cyrtodontidina! Scarlato & Starobogatov in Nevesskaja & others, 1971: •Superfamily Cyrtodontoidea! Ulrich in Ulrich & Scofield, 1894; •Superfamily Falcatodontoidea Cope, 1996; •Superfamily Pichlerioidea Scarlato & Starobogatov, 1979a
•Suborder Praecardiidina Newell, 1965 (=Nepiomorphia Kříž, 2007)
•Hyporder Praecardioidei Newell, 1965: •Superfamily Cardioloidea R. Hoernes, 1884; •Superfamily Praecardioidea R. Hoernes, 1884

Figure 4 *(continued from facing page).*
pedal retractor (*PPR*); a brachiopod (*Brach*) is cemented to shell's interior; *2,* horizontal acetate peel through aragonitic ISP inner shell layer also visible in view *3,* scale bar = 100 µm; *3,* anterior-posterior, vertical acetate peel showing nacreous middle shell layer (above, darker layer) and the underlying aragonitic ISP inner shell layer, scale bar = 0.5 mm; *4,* SEM, vertical fracture through nacreous middle shell layer (barely visible at extreme top of figure) and the aragonitic ISP inner shell layer, scale bar = 25 µm; *5,* vertical fracture through the nacreous middle shell layer and aragonitic ISP adductor myostracum, scale bar = 5 µm; calcitic outer shell layer does not appear in any of these figures (new).

•Hyporder Antipleuroidei Kříž, 2007: •Superfamily Dualinoidea Conrath, 1887
Order Arcida J. Gray, 1854a: Superfamily Arcoidea Lamarck, 1809; •Superfamily Glyptarcoidea Cope, 1996; Superfamily Limopsoidea Dall, 1895a; Superfamily Philobryoidea Félix Bernard, 1897
Subcohort Ostreioni Férussac, 1822 in 1821–1822
•Megaorder Myalinata H. Paul, 1939
•Order Myalinida H. Paul, 1939: •Superfamily Alatoconchoidea H. Termier, Termier, & Lapparent, 1974; •Superfamily Ambonychioidea! S. A. Miller, 1877; •Superfamily Inoceramoidea C. Giebel, 1852; •Superfamily Prokopievskioidea H. Vokes, 1967
Megaorder Ostreata Férussac, 1822 in 1821–1822
(plesion) •Family Myodakryotidae Tunnicliff, 1987
Superorder Ostreiformii Férussac, 1822 in 1821–1822 (=Eupteriomorphia Boss, 1982)
Order Ostreida Férussac, 1822 in 1821–1822
Suborder Ostreidina Férussac, 1822 in 1821–1822: Superfamily Ostreoidea Rafinesque, 1815
Suborder Malleidina! J. Gray, 1854a
(paraplesion) •Family Pterineidae! F. Meek, 1864b
Superfamily Pinnoidea Leach, 1819; •Superfamily Posidonioidea Neumayr, 1891; Superfamily Pterioidea! J. Gray, 1847b (Goldfuss, 1820); •Superfamily Rhombopterioidea! Korobkov in Eberzin, 1960
Order Pectinida J. Gray, 1854a
(paraplesion) •Superfamily Leiopectinoidea! Krasilova, 1959
Suborder Pectinidina J. Gray, 1854a: Superfamily Pectinoidea Rafinesque, 1815
Suborder Anomiidina J. Gray, 1854a
Hyporder Anomioidei J. Gray, 1854a
•(plesion) ?Family Saharopteriidae G. Termier & H. Termier in Pareyn, Termier, & Termier, 1972
•(paraplesion) Superfamily Pseudomonotoidea! Newell, 1938
Minorder Anomioitei J. Gray, 1854a: Superfamily Anomioidea Rafinesque, 1815
Minorder Dimyoitei Ridewood, 1903: Superfamily Dimyoidea P. Fischer, 1886; Superfamily Plicatuloidea J. Gray, 1854b; •Superfamily Prospondyloidea! Pchelintseva, 1960
•Hyporder Aviculopectinoidei! Starobogatov, 1992: •Superfamily Aviculopectinoidea! F. Meek & Hayden, 1865; •Superfamily Chaenocardioidea S. A. Miller, 1889; •Superfamily Heteropectinoidea! Beurlen, 1954; •Superfamily Pterinopectinoidea! Newell, 1938
Hyporder Limoidei R. Moore in Moore, Lalicker, & Fischer, 1952: Superfamily Limoidea Rafinesque, 1815
•Hyporder Monotoidei Waterhouse, 2001: •Superfamily Buchioidea! Cox, 1953 (P. Fischer, 1886); •Superfamily Eurydesmatoidea! Reed, 1932; •Superfamily Oxytomoidea Ichikawa, 1958
Suborder Entoliidina! Hautmann, *nov*.: Superfamily Entolioidea! Teppner, 1922; •Superfamily Euchondrioidea! Newell, 1938
Infraclass Heteroconchia Hertwig, 1895
Cohort Uniomorphi J. Gray, 1854a (=*Palaeoheterodonta* of authors)
(plesion) •Family Thoraliidae N. Morris, 1980
Subcohort Unioni J. Gray, 1854a
(paraplesion) •Superfamily Lyrodesmatoidea! P. Fischer, 1886
Megaorder Unionata J. Gray, 1854a
Order Trigoniida! Dall, 1889: •Superfamily Myophorelloidea T. Kobayashi, 1954; •Superfamily Pseudocardinioidea Martinson, 1961; Superfamily Trigonioidea! Lamarck, 1819; •?Superfamily Trigonioidoidea Cox, 1952 (or in Unionida?); •Superfamily Trigonodoidea! Modell, 1942
Order Unionida J. Gray, 1854a
Suborder Unionidina J. Gray, 1854a: Superfamily Mullerioidea Deshayes, 1832a; •?Superfamily Trigonioidoidea Cox, 1952 (or in Trigoniida?); Superfamily Unionoidea Rafinesque, 1820
Suborder Hyriidina Hoeh & others, 2009: Superfamily Hyrioidea Swainson, 1840
•Suborder Silesunionidina! Skawina & Dzik, 2011: •Superfamily Silesunionoidea! Skawina & Dzik, 2011
Cohort Cardiomorphi Férussac, 1822 in 1821–1822 (=*Heterodonta* of authors)
(plesion) •Family Lipanellidae Sánchez, 2005
Subcohort Carditioni Dall, 1889
•Order Actinodontida! Deschaseaux, 1952: •?Superfamily Amnigenioidea Khalfin, 1948; •Superfamily Anodontopsoidea! S. A. Miller, 1889; •Superfamily Nyassoidea! S. A. Miller, 1877; •Superfamily Oriocrassatelloidea Boyd & Newell, 1968; •Superfamily Palaeomuteloidea Lahusen, 1897
Order Carditida Dall, 1889
(plesion) •?Family Archaeocardiidae Khalfin, 1940
(paraplesion) •Family Eodonidae! Carter, Campbell, & Campbell, 2000

Superfamily Crassatelloidea Férussac, 1822 in 1821–1822

Subcohort Cardioni Férussac, 1822 in 1821–1822 (=Euheterodonta Giribet & Distel, 2003)

Infrasubcohort Lucinidia J. Gray, 1854a

(paraplesion) •Superfamily Babinkoidea! Horný, 1960

Order Lucinida J. Gray, 1854a: Superfamily Lucinoidea! J. Fleming, 1828; Superfamily Thyasiroidea Dall, 1900 (Dall, 1895a)

Infrasubcohort Cardiidia Férussac, 1822 in 1821–1822

(paraplesion) •Superfamily Grammysioidea! S. A. Miller, 1877

Megaorder Cardiata Férussac, 1822 in 1821–1822 (=Neoheterodontei Taylor & others, 2007)

Superorder Cardiiformii Férussac, 1822 in 1821–1822

•Order Modiomorphida! Newell, 1969c: •Superfamily Modiomorphoidea! S. A. Miller, 1877

•Order Megalodontida! Starobogatov, 1992: •Superfamily Mecynodontoidea! Haffer, 1959; •Superfamily Megalodontoidea! J. Morris & Lycett, 1853

•Order Hippuritida Newell, 1965: •Superfamily Radiolitoidea d'Orbigny, 1847b; •Superfamily Requienioidea Kutassy, 1934

Order Cardiida Férussac, 1822 in 1821–1822

(paraplesion) •Superfamily Kalenteroidea! Marwick, 1953

Suborder Cardiidina Férussac, 1822 in 1821–1822

(paraplesion) •Family Palaeocarditidae! Chavan, 1969b

Hyporder Cardioidei Férussac, 1822 in 1821–1822: Superfamily Cardioidea Lamarck, 1809; Superfamily Tellinoidea Blainville, 1814

Hyporder Veneroidei J. Gray, 1854a

Minorder Veneroitei J. Gray, 1854a: Superfamily Arcticoidea! R. Newton, 1891 (d'Orbigny, 1844 in 1844–1848); Superfamily Chamoidea Lamarck, 1809; Superfamily Cyrenoidea J. Gray, 1840b; Superfamily Gaimardioidea Hedley, 1916; Superfamily Glossoidea J. Gray, 1847b (J. Gray, 1840b); Superfamily Hemidonacoidea Scarlato & Starobogatov in Nevesskaja & others, 1971; Superfamily Mactroidea Lamarck, 1809; Superfamily Ungulinoidea J. Gray, 1854b; Superfamily Veneroidea Rafinesque, 1815

Minorder Dreissenoitei R. Moore in Moore, Lalicker, & Fischer, 1952: Superfamily Dreissenoidea J. Gray, 1840a; Superfamily Sphaerioidea! Deshayes, 1855b (Rafinesque, 1820)

Suborder Gastrochaenidina Morretes, 1949: Superfamily Gastrochaenoidea J. Gray, 1840b

•Suborder Anthracosiidina Silantiev & Carter, 2011: •Superfamily Anthracosioidea Amalitzky, 1892; •Superfamily Palaeanodontoidea Modell, 1964; •Superfamily Prilukielloidea Starobogatov, 1970

Suborder Leptonidina Dall, 1889: Superfamily Cyamioidea! G. O. Sars, 1878; Superfamily Galeommatoidea J. Gray, 1840b

Superorder Pholadiformii J. Gray, 1854a

Order Pholadida J. Gray, 1854a: Superfamily Myoidea Lamarck, 1809; Superfamily Pholadoidea Lamarck, 1809; •Superfamily Pleuromyoidea! Zittel, 1895

Megaorder Poromyata Ridewood, 1903

Order Poromyida Ridewood, 1903: Superfamily Cuspidarioidea Dall, 1886; Superfamily Parilimyoidea! B. Morton, 1981; Superfamily Poromyoidea Dall, 1886; Superfamily Verticordioidea! Stoliczka, 1870 in 1870–1871

Order Pholadomyida! Newell, 1965: Superfamily Pholadomyoidea! W. King, 1844

Order Pandorida R. Stewart, 1930: Superfamily Clavagelloidea d'Orbigny, 1844 in 1844–1847; Superfamily Pandoroidea! Rafinesque, 1815

Order Thraciida Carter, *nov.*: Superfamily Thracioidea! Stoliczka, 1870 in 1870–1871 (Couthouy, 1839)

Megaorder Solenata Dall, 1889.

Order Solenida Dall, 1889: •Superfamily Orthonotoidea! S. A. Miller, 1877; Superfamily Solenoidea Lamarck, 1809

Order Hiatellida Carter, *nov.*: •Superfamily Edmondioidea! W. King, 1850; Superfamily Hiatelloidea J. Gray, 1824

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