

A revised, annotated, family-level classification of the Diplopoda

Ревизованная аннотированная классификация диплопод на уровне семейства

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КЛЮЧЕВЫЕ СЛОВА: классификация, уровень семейства, Diplopoda.

ABSTRACT: The arthropod class Diplopoda comprises two subclasses, 16 orders, and 144 families, which are arranged in an annotated modern classification including alterations and higher taxa proposed since publication of the last such work in 1980 (updated in 1982), which covered most taxa published through 1978. The total number of families has grown by 24%, from 115 in 1980, and the largest and most diverse orders remain the Chordeumatida and Polydesmida, with 47 and 30 families, respectively, as opposed to 35 and 28 families in 1980. The suborder Siphonocryptidea Cook, 1895 (Polyzoniida), is elevated herein to full ordinal status, and the following ordinal-group taxa have been newly proposed: the infraorder Oniscodesmoids Simonsen, 1990 (Polydesmida), and the suborders Pseudonannolenidea Mauriès, 1983 (Spirostreptida) [now considered a synonym of Epinannolenidea Chamberlin, 1922], Sinocallipodidea Shear, 2000 (Callipodida), and Heterochordeumatidea Shear, 2000 (Chordeumatida). One family published in 1976, Sakhalineumatidae Golovatch (Chordeumatida), and two from 1978, Lankasomatidae Mauriès and Megalotyulidae Golovatch (both Chordeumatida), were not included in the previous classification, and the following 15 families have been newly proposed: Trichonemasomatidae, Cheloljulidae, Pseudonemasomatidae, and Telsonemasomatidae, all by Enghoff, 1991 (Julida); Hoffmanobolidae Shelley, 2001 (Spirobolida); Bilingulidae Zhang & Li, 1981 (Spirostreptida: Cambalidea) [now considered a synonym of Pericambalidae Silvestri, 1909]; Paracortinidae Wang & Zhang, 1993, and Sinocallipodidae Zhang, 1993 (both Callipodida); and Kashmirreumatidae Mauriès, 1982, Vieteumatidae Golovatch, 1984, Neocambriosomatidae Mauriès, 1987, Reginaterreumatidae Mauriès, 1988, Golovatchiidae Shear, 1992, Biokoviellidae Mršić, 1992, and Altajellidae Mikhaljova & Golovatch, 2001 (all Chordeumatida). A number of publication dates are corrected, particularly Striariidea (Chordeumatida), from Cook 1898/99 to 1896; Dalodesmidea (Polydesmida), from Hoffman 1977 to 1980; and Campodesmidae (Polydesmida: Leptodesmidea), from Cook 1895 to 1896. Authorships are based on the Principle of Coordination and are assigned to the first person(s)

proposing a category at each hierarchical level. The following new ordinal-group authorship assignments are made: Polyxenida Verhoeff, 1934; Glomeridesmida, Platydesmida, Polyzoniida, Siphonocryptida, Spirobolida, Stemmiulida, Siphoniulida, Cambalidea (Spirostreptida), and Craspedosomatidea (Chordeumatida), all Cook, 1895; Siphonophorida Hoffman, 1980; Callipodida and Chordeumatida, both Pocock, 1894 (different publications); Polydesmida Pocock, 1887; Trigonulidea (Spirobolida) Brölemann, 1913; and Leptodesmidea and Strongylosomatidea (Polydesmida), both Brölemann, 1916, and their junior synonyms, Chelodesmidea and Paradoxosomatidea, both Hoffman, 1967. The following two new family-group assignments are made: Sphaerotheriidae Koch, 1847, and Spirostreptidae Pocock, 1894. As his “phyla” are the first proposed supra-familial taxa, Brölemann is credited with the suborders Trigonulidea (Spirobolida) and Leptodesmidea and Strongylosomatidea (Polydesmida), the first established in 1913 and the last two in 1916. The following new synonymies are proposed: Nematozoniidae Verhoeff, 1939, under Siphonorhinidae Cook, 1895 (Siphonophorida); Chelodesmidea Hoffman, 1967, and Sphaeriodesmidea Jeekel, 1971, under Leptodesmidea Brölemann, 1916 (Polydesmida); and Paradoxosomatidea Hoffman, 1967, under Strongylosomatidea Brölemann, 1916 (Polydesmida).

РЕЗЮМЕ: Класс членистоногих Diplopoda включает два подкласса, 16 отрядов и 144 семейства, которые представлены в виде аннотированной современной классификации, включающей изменения и высшие таксоны, предложенные со времени публикации последней работы такого типа в 1980 г. (обновлённой в 1982 г.), которая покрывала большинство таксонов, опубликованных по 1978 г. Общее число семейств выросло на 24%, с 115 в 1980 г., и наиболее крупными и разнообразными остаются отряды Chordeumatida и Polydesmida, с 47 и 30 семействами, соответственно, в отличие от 35 и 28 семейств в 1980 г. Ранг подотряда Siphonocryptidea Cook, 1895 (Polyzoniida) здесь поднят до отряда. Также предложены следующие изменения на уров-

не отряда: инфраотряд *Oniscodesmoides* Simonsen, 1990 (Polydesmida) и подотряды *Pseudonannolenidea* Mauriès, 1983 (Spirostreptida) [рассматриваемый сейчас как синоним *Epinannolenidea* Chamberlin, 1922], *Sinocallipodidea* Shear, 2000 (Callipodida) и *Heterochordeumatidea* Shear, 2000 (Chordeumatida). Одно семейство, описанное в 1976 г., *Sakhalineumatidae* Golovatch (Chordeumatida), и два — в 1978 г., *Lankasomatidae* Mauriès и *Megalotylidae* Golovatch (оба в Chordeumatida), не были включены в предыдущие классификации. Предложены следующие 15 семейств: *Trichonemasomatidae*, *Chelojulidae*, *Pseudonemasomatidae*, and *Telsonemasomatidae*, все Enghoff, 1991 (Julida); *Hoffmanobolidae* Shelley, 2001 (Spirobolida); *Bilingulidae* Zhang & Li, 1981 (Spirostreptida: Cambalidea) [сейчас рассматривается как синоним *Pericambalidae* Silvestri, 1909]; *Paracortinidae* Wang & Zhang, 1993 и *Sinocallipodidae* Zhang, 1993 (оба в Callipodida); а также *Kashmireumatidae* Mauriès, 1982, *Vieteuematidae* Golovatch, 1984, *Neocambrisomatidae* Mauriès, 1987, *Reginaterreumatidae* Mauriès, 1988, *Golovatchiidae* Shear, 1992, *Biokoviellidae* Mršić, 1992 и *Altajellidae* Mikhaljova & Golovatch, 2000 (все в Chordeumatida). Исправлен ряд дат опубликования, в частности *Striariidea* (Chordeumatida) с Cook 1898/99 на 1896, *Dalodesmidea* (Polydesmida) с Hoffman 1977 на 1980 и *Campodesmidae* (Polydesmida: Leptodesmidea) с Cook 1895 на 1896. Авторство основано на принципе координации и приписано первым персонам, предложившим категорию на данном уровне иерархии. Произведены следующие изменения авторства на уровне отряда: *Polyxenida* Verhoeff, 1934; *Glomeridesmida*, *Platydesmida*, *Polyzoniida*, *Siphonocryptida*, *Spirobolida*, *Stemmiulida*, *Siphoniulida*, *Cambalidea* (Spirostreptida) и *Craspedosomatidea* (Chordeumatida), все Cook, 1895; *Siphonophorida* Hoffman, 1980; *Callipodida* и *Chordeumatida*, оба Pocock, 1894 (разные публикации); *Polydesmida* Pocock, 1887; *Trigoniulidea* (Spirobolida) Brölemann, 1913; а также *Leptodesmidea* и *Strongylosomatidea* (Polydesmida), оба Brölemann, 1916, и их младшие синонимы, *Chelodesmidea* и *Paradoxosomatidea*, оба Hoffman, 1967. Произведены следующие изменения авторства на уровне семейства: *Sphaerotheriidae* Koch, 1847 и *Spirostreptidae* Pocock, 1894. Поскольку “фили” Брёлеманна (Brölemann) были первыми предложенными таксонами надсемейственного уровня, его авторство приписано подотрядам *Trigoniulidea* (Spirobolida), *Leptodesmidea* и *Strongylosomatidea* (Polydesmida), первый — в 1913 г. и два последующих — в 1916 г. Предложены следующие новые синонимы: *Nematozoniidae* Verhoeff, 1939 — к *Siphonorhinidae* Cook, 1895 (Siphonophorida); *Chelodesmidea* Hoffman, 1967 и *Sphaeroidesmidea* Jeekel, 1971 — к *Leptodesmidea* Brölemann, 1916 (Polydesmida); *Paradoxosomatidea* Hoffman, 1967 — к *Strongylosomatidea* Brölemann, 1916 (Polydesmida).

Introduction

Twenty-three years have elapsed since Hoffman [1980] published his epic *Classification of the Diplopo-*

da, as nearly as possible, a complete accounting of all supra-specific taxa established in the class through 1978, although some names proposed in that year are not included. Though dated as being published in 1979, it did not actually appear until June 1980 [Hoffman, 1995], which is the official publication date for the purposes of the Code and the 28 new taxa proposed therein. A number of alterations to Hoffman's system have been proposed in the past quarter century along with 18 new families and four ordinal-group taxa, enough changes and additions in my view to justify a revised taxonomy to the family hierarchical level. Additionally, I elevate herein the suborder *Siphonocryptidea* Cook, 1895 (Polyzoniida) to full ordinal status, and I submerge the family *Nematozoniidae* Verhoeff, 1939, under *Siphonorhinidae* Cook, 1895 (Siphonophorida). Hoffman's [1980] arrangement was not based on a cladistic analysis, which Enghoff [1984] provided down to the ordinal level, so this contribution is an amalgam of the two systems except for three orders that have been studied in detail: *Julida* [Enghoff, 1981, 1991], *Chordeumatida* [Shear, 2000a] and *Polydesmida* [Simonsen, 1990]. I adopt the published arrangements of the *Julida* and *Chordeumatida*, but for the reasons provided, I cannot accept all of the changes Simonsen [1990] proposed for the *Polydesmida*. Hoffman recognized three subclasses — *Penicillata*, *Pentazonia*, and *Helminthomorpha* — nine superorders (two in the *Pentazonia* and seven in the *Helminthomorpha*), 15 orders, and 115 families. I adopt Enghoff's cladistic arrangement [1984] of two subclasses, *Penicillata* and *Chilognatha*, with *Pentazonia* and *Helminthomorpha* becoming infraclasses in the latter. I see no reason not to recognize two pentazonian superorders, *Limacomorpha* and *Oniscomorpha*, and I accept Enghoff's internal arrangement of the *Helminthomorpha* with two subterclasses, *Colobognatha* and *Eugnatha*, the latter comprising three superorders — *Juliformia*, *Nematophora*, and *Merocheta*. The *Diplopoda* has grown considerably since 1978, from 115 to 144 families, a gain of 29 families (24%); 18 are newly proposed; 12 result from tribal and subfamilial elevations, some of which may be superfluous; and *Nematozoniidae* is eliminated. The most diverse orders remain the *Chordeumatida* and *Polydesmida*, with 47 and 30 families, respectively, as opposed to 35 and 28 families in Hoffman's work; conversely, the *Glomeridesmida*, *Siphonocryptida*, *Stemmiulida*, and *Siphoniulida* are monotypic.

In this classification, I adhere to the Law of Priority at the ordinal-group level even though this is not mandated by the Code, which does not address this category, and to the Principle of Coordination (Article 36.1 of the Code) at both the ordinal and familial levels. Hoffman [1980] assigned ordinal-group authorships to those who proposed the nominate families and discussed the problems in determining authorships of higher categories. He cited two options — (a) crediting a taxon to the author first proposing it in the sense of its current usage, or (b) crediting all supra-generic taxa to the author first proposing such. The Code provides no guidance on this

matter, and either alternative is equally valid. Hoffman chose the latter, but I prefer the first alternative and see no reason why early authors who clearly established families should automatically be credited with ordinal-level taxa that they did not realize were needed. Consequently, I credit family- and ordinal-group taxa to the authors who first proposed categories at these levels, or, in the latter case, authors who first proposed supra-familial taxa regardless of label. O. F. Cook is credited with more ordinal-group taxa than any other author — the superorder Merocheta, seven orders (Glomeridesmida, Platydesmida, Polyzoniida, Siphonocryptida, Spirobolida, Stemmiulida, and Siphoniulida), and two suborders (Cambalidea (Spirostreptida) and Craspedosomatidea (Chordeumatida)), all proposed in 1895, and Striariidea in 1896 (a) — but he consistently employed the “...oidea” suffix, which is now reserved for the superfamilial level. However, he labeled these categories as suborders and clearly intended for them to be such, so it is appropriate that he be so credited. Thus, I attribute the orders Stemmiulida and Siphoniulida to Cook [1895] instead of Pocock [1894a], recognized by Hoffman [1980], who proposed the families Stemmiulidae and Siphoniulidae; the order Spirobolida is likewise attributed to Cook [1895] instead of Bollman [1893], who only proposed the subfamily Spirobolinae. Similarly, Brandt [1833] is credited with authoring the Julida, not Leach [1814], who proposed the family Julidae.

The ensuing section summarizes the changes, if any, in all 16 diplopod orders since 1978. In reviewing the literature, I found numerous discrepancies in publication dates for various ordinal- and family-group taxa, to the point that, for accuracy, I personally checked as many as possible against the original works; authors and dates that were confirmed by colleagues are indicated by asterisks. Encapsulated summaries of status changes and synonymies are noted beneath appropriate taxa. Categories are presented in alphabetical order below the infraclass level, but I conform to tradition and place the superorder Merocheta at the end, followed by the helminthomorph *incertae sedis* order, Siphoniulida. Most references in the bibliography are augmented with statements of relevant actions or changes. I thank my colleagues S. I. Golovatch, J.-J. Geoffroy, M. Nguyen Duy-Jacquemin, R. L. Hoffman, and W. A. Shear, for checking and providing access to references, and advising on aspects of the document. I am indebted to Dr. Shear, for allowing me to publish the new status, Siphonocryptida, based on his analysis of ordinal relationships, and to Dr. Golovatch, for checking a number of references and activating his network of contacts to acquire copies of the rare references by Leach [1814] and Jones [1843], thereby ensuring that every relevant citation could be examined and every author and date, confirmed.

Summary of changes

Orders Polyxenida, Glomeridesmida, Platydesmida, Stemmiulida, and Siphoniulida. No family-level or higher changes have been proposed in these orders

since 1978, so their taxonomies are as presented by Hoffman [1980]. Hoffman [1982] suggested that the Platydesmidae and Andrognathidae (Platydesmida) “might better be combined” but did not actually do so. Hoffman *et al.* [1996, 2002] stated that the subfamily Termitodesminae (Glomeridesmida: Glomeridesmidae) “surely merits family status” but did not formally elevate the taxon; never having seen a termitodesmine, I cannot do so here.

Order Glomerida. The only change in this order is replacement of the family name Trachysphaeridae Strasser, 1971/Mauriès, 1971, with the much older name, Doderiidae Silvestri, 1904, as is being done in the Fauna Europaea project (Enghoff, in prep.).

Order Sphaerotheriida. The only change in this order is replacement of the family name Sphaeropoeidae Brölemann, 1913, with Zephroniidae Gray in Jones, 1843, which has priority by 70 years [Jeekel, 2001]. This action was necessitated by the recognition that *Zephronia* Gray, placed in this family by Hoffman [1980] but cited as a genus of “uncertain subfamily position or taxonomic status”, truly does belong there. Published essentially simultaneously with Jeekel’s treatment was one by Mauriès [2001] that regarded Sphaeropoeidae as the correct name and excluded *Zephronia* from the family without addressing its placement. The merits of these two arrangements are subject to debate, but there are now two published systems that include *Zephronia* in the family versus one without it; I opt for the former and am further persuaded by Jeekel’s extensive involvement with this order, particularly his classification of 1974. With *Zephronia* now in the family, there can be little argument with the name change, as Jeekel [2001] confirmed his previous judgement [1974] that with “formal recognition of the genus *Zephronia* as a member of the family the oldest family-group name should take priority”.

Order Polyzoniida. No family-level or higher changes have been published in the Polyzoniida since 1978, but I elevate herein the suborder Siphonocryptidea to a full order and accordingly drop the category, Polyzoniidea, which is no longer necessary. Siphonocryptida thus constitutes the sixteenth order in the class and the first since Hoffman’s proposal [1980] of Siphonophorida, also in the subterclass Colobognatha¹. Siphono-

¹ Research on the Colobognatha lags behind that on the Eugnatha in part because of the generally small size of the organisms and the minute, unmodified gonopods, which have to be mounted on slides and examined under compound microscopes. It therefore is not surprising that the two most recently established diplopod orders, Siphonophorida and Siphonocryptida, the latter elevated from subordinal status, are components of this taxon. The only other order erected in the twentieth century is Polyxenida by Verhoeff [1934], and it and Siphonophorida are the only ones that were originally proposed as such. All the other orders were established in the nineteenth century, specifically prior to 1896, and were either proposed as suborders or unranked (the four attributed to Brandt [1833]). It is interesting to note that 14 of the 16 diplopod orders had been detected by 108 years ago, and 10 of these were originally perceived as worthy of ordinal-level status. This is a testament to the perceptive acuity of Cook and Pocock, who authored 10 orders combined, the seven by Cook previously delineated and three by Pocock (Callipodida, Chordeumatida, and Polydesmida).

cryptidans differ from Polyzoniidans in a number of features (see Hoffman, 1982 and Enghoff and Golovatch, 1995), and my colleague W. A. Shear recommended this action based on his unpublished cladistic analysis of ordinal relationships, which shows the Siphonocryptida to be worthy of such status and sister-group to the Platydesmida. While I have not personally conducted such an analysis, I concur with the taxon's elevation based on my readings of its recent literature (as a suborder under Polyzoniida) [Hoffman, 1982, Enghoff and Golovatch, 1995]. Hoffman [1980] employed the category Ommatophora Brandt, 1840, as a superorder covering Polyzoniida, and Typhlogena Brandt, 1840, as one encompassing both Platydesmida and Siphonophorida, but Enghoff [1984] noted that Hoffman's usage of Typhlogena "remains to be supported by apomorphies". I therefore accept Enghoff's arrangement with only one superorder (unstated) in this subclass. More study is necessary in the Colobognatha, but the names Ommatophora and Typhlogena are available for superordinal categories when monophyly can be demonstrated.

Order Siphonophorida. No family-level or higher changes have been published in the Siphonophorida since 1978, but I formalize the suggestion of Hoffman [1982] and herein place Nematozoniidae Verhoeff, 1939 (monotypic for the South Africa genus *Nematozonium* Verhoeff), in synonymy under Siphonorhinidae Cook, 1895. Having published two papers on New World siphonophoridans [Shelley, 1996a, b], I have long wondered about *Nematozonium*, so I borrowed the types of *N. filum* Verhoeff, the species for which the family was erected, and found them to be typical but slender siphonorhinids with subpyriform heads and elbowed antennae that lack pits on the 5th and 6th articles. A detailed study of the genus is in progress, but *Nematozonium* clearly does not warrant a separate family. I thank S. Friedrich, Zoologische Staatssammlung, München, for loan of the specimens.

Order Julida. A number of changes have been made to the taxonomy of the Julida that are mostly addressed in two summary publications [Enghoff, 1981, 1991]; four new families have been proposed, all by Enghoff [1991]: Trichonemasomatidae, Chelolulidae, Pseudonemasomatidae, and Telsonemasomatidae. Hoffman [1980] recognized five families: Blaniulidae with four subfamilies (Blaniulinae, Aprosphylosomatinae, Nemasomatinae, and Zosteractininae), Paeromopodidae, Mongoliulidae, Parajulidae, and Julidae. Enghoff [1981] elevated the Nemasomatinae to family status and reelevated the Zosteractininae, originally proposed as a family by Loomis [1943]; he also elevated the blaniuline tribe Galliobatini and the nemasomatine tribes Trichoblaniulini and Rhopaloiulini to the family level. Thus, Enghoff [1981] recognized 10 families: Parajulidae, Mongoliulidae, Paeromopodidae, Zosteractinidae, Galliobatidae, Blaniulidae, Nemasomatidae, Rhopaloiulidae, Trichoblaniulidae, and Julidae. He [Enghoff, 1985] excluded *Okeanobates* Verhoeff and *Yosidaiulus* Takakuwa from the redefined family Nem-

asomatidae and upgraded the available subfamily name Okeanobatinae Verhoeff to full family status. Enghoff [1991] further reorganized the order by proposing the four aforementioned families, all monotypic, bringing the ordinal composition to 15 families, which he grouped among five superfamilies based on a cladistic analysis. The final action in the Julida was by Shelley [1994a], who elevated the Aprosphylosomatinae Hoffman to full family status in the superfamily Paeromopodoidea. This taxon was proposed in the Nemasomatidae [Hoffman, 1961], transferred to the Blaniulinae [Hoffman, 1980], submerged under the Paeromopodidae by Enghoff [1981], who did not clearly indicate whether he considered it a synonym or subfamily, and retained in this status by Enghoff [1991].

Order Spirobolida: The Spirobolida has experienced little activity in the past 25 years. Only one new family has been erected, Hoffmannobolidae Shelley, 2001, in the suborder Spirobolidea. Hoffman *et al.* [1996] reelevated the subfamily Trigoniulinae to family status in the Trigoniulidea, action that Hoffman [1999] and Hoffman *et al.* [2002] confirmed. The Spirobolidea currently comprises 10 families whose relationships are unknown; elucidating affinities among these taxa and proposing sound superfamilial categories are productive areas for future research.

Order Spirostreptida: The suborder Spirostreptida has been stable since 1978; the five families Hoffman [1980] recognized — Adiaphorostreptidae, Harpagophoridae, and Spirostreptidae (all in the superfamily Spirostreptoidea), and Atopogestidae and Odontopygidae (Odontopygoidea) — still stand and no new families have been proposed. Hoffman [1982] transferred the Adiaphorostreptidae, with a question mark, from the Spirostreptoidea to the Odontopygoidea but did not mention this family in his classification [1991] of the latter, so I retain it in the Spirostreptoidea. Mauriès [1997] questioned the validity of the Atopogestidae, suggesting that the unique characters of its lone species, *Atopogestus graueri* (Attems), may be abnormalities related to ontogeny and sexuality, but this matter has not been resolved.

The situation in the suborders Cambalidea and Epinannolenidea, however, is quite different. One new suborder, Pseudonannolenidea Mauriès, 1983, and one new family, Bilingulidae Zhang & Li, 1981, have been proposed; the former is considered a synonym of Epinannolenidea Chamberlin, 1922, and the latter was formally placed in synonymy under the Pericambalidae by Mauriès and Nguyen Duy-Jacquemin [1997]. Hoffman [1980: 47] believed that cambalidans and spirostreptidans are closely related because of female characteristics and modifications of the prefemora of the first male legs in cambalids, pseudonannolenids, and spirostreptidans; he also believed that a partly transitional condition between cambalidan and spirostreptidan gonopods exists in certain Australian cambalidans, for example species of *Dinocambala* Attems (Iulomorphidae). For these reasons, he [Hoffman, 1980, 1982, 1999] recognized three suborders — Cambalidea, Epinannolenidea, and Spiros-

treptidea; I concur with this arrangement, but other opinions exist. Mauriès [1977] considered the Cambalidea as a suborder of the Julida with four component families — Cambalidae, Dimerogonidae, Pseudonannolenidae, and Trachyjulidae, which Hoffman [1980, 1982] regarded as a synonym of Cambalopsidae. Mauriès [1980a] regarded the Cambalida as an order, and though not providing an internal classification, placed the Pseudonannolenidae in it. He [Mauriès, 1983] also treated the Cambalida as an order and this time recognized two suborders: Cambalidea, with the families Cambalidae and Cambalopsidae, and Pseudonannolenidea, a new ordinal-group taxon comprising four families — Choctellidae, Iulomorphidae, Physiostreptidae, and Pseudonannolenidae. Jeekel [1985] also regarded the Cambalida as an order with four component families — Cambalidae, Cambalopsidae, Iulomorphidae, and Pseudonannolenidae. Mauriès [1987a] again considered the Cambalidea to be a suborder of the Julida but now with two component families, Cambalidae and Cambalopsidae; he also elevated the Pseudonannolenidea to full ordinal status to encompass the families, Iulomorphidae and Pseudonannolenidae. Ten years later, Mauriès and Nguyen Duy-Jacquemin [1997] also treated the Cambalidea as a julidan suborder and established the superfamily Cambalopsioidea, n. stat., to cover the Pericambalidae, Glyphiulidae (resurrected from synonymy under Cambalopsidae), and, by implication, Cambalopsidae. Most recently, Hoffman [1999] reiterated his prior conclusions and subordinal divisions. Enghoff [1984] did not address the “cambalidan problem” and [1981, 1991] did not include cambalidans or pseudonannolenidans in the Julida. Having had very little experience with cambalidans, I am not in a position to resolve this chaos, so I adopt Hoffman’s system [1980, 1982, 1999] in which the Cambalidea, Epinannolenidea, and Spirostreptidea are suborders of the Spirostreptida, as the arguments espoused in his 1980 work seem the most cogent and convincing to me. I am also persuaded by the absence of cambalidans from Enghoff’s treatments [1981, 1984, 1991], which implies that the cladistic evidence does not support separate ordinal status for either the “Cambalida” or “Pseudonannolenida”, or placement of these groups as suborders in the Julida. There being no evidence to support division of the Cambalidea into superfamilies, I do not recognize the taxon, Cambalopsioidea, which was proposed without the simultaneous erection of coordinate categories.

Just as confusion exists at the subordinal level, families and subfamilies have also been switched around in the Cambalidea and elevated and reduced in a haphazard manner. For example, the subfamily Glyphiulinae, proposed by Chamberlin [1922] and elevated to family status by Verhoeff [1924], is considered a subfamily of the Cambalidae [Mauriès, 1977], a synonym of the Cambalopsidae [Hoffman, 1980, 1982; Jeekel 1985], a subfamily of the Cambalopsidae [Mauriès, 1983, 1987a], and a family in the “Cambalopsioidea” [Mauriès and Nguyen Duy-Jacquemin, 1997]. As this is the latest status, I accept the Glyphiulidae as a family and

place it in the Cambalidea. Likewise, the Physiostreptidae and Pericambalidae, authored by Silvestri [1903, 1909a], have confusing histories. They are treated as subfamilies in the Cambalidae and Dimerogonidae, respectively, by Mauriès [1977], and families in the Epinannolenidea by Hoffman [1980, 1982]. Mauriès [1983] regarded the Pericambalinae as a subfamily of the Cambalopsidae and the Physiostreptidae as a family in the suborder Pseudonannolenidea, order Cambalida; Mauriès [1987a] also treated the Pericambalinae as a cambalopsid subfamily but reduced the Physiostreptidae to a subfamily under the Pseudonannolenidae, a status that was retained by Hoffman and Florez [1995]. Finally, Mauriès and Nguyen Duy-Jacquemin [1997] elevated the Pericambalinae to family status in the “Cambalopsioidea”, order Julida. Again, I accept the latest statuses of these taxa and consider the Physiostreptinae as a subfamily of the Pseudonannolenidae and Pericambalidae as a family in the Cambalidea. While Hoffman [1980] considered the Epinannolenidae to be a synonym of the Pseudonannolenidae (Epinannolenidea), he [Hoffman, 1982] recognized Epinannolenidae as a full family but countered this action with the statement that it is “similar to the Pseudonannolenidae with which it is probably better combined as a subfamily”. To my knowledge, subfamily status has never been proposed, and as this reevaluation was done with little conviction, I do not recognize the Epinannolenidae; a decision on its actual status (synonym, subfamily, or family) is left to future workers. Mauriès [1977] reduced the Choctellidae to subfamily status in the Pseudonannolenidae, but Hoffman [1980] returned it to family status, and having personally collected and examined both choctellid species, I too consider it a family. Mauriès [1977] also erected the new subfamily Cambalomminae for *Cambalomma* Loomis but did not mention it again in subsequent works; he [Mauriès, 1983] placed *Cambalomma* in the Pseudonannolenidae, when he did not recognize subfamilies, and [Mauriès, 1987a] assigned it to the subfamily Pseudonannoleninae. Consequently, the Cambalomminae stands today as a valid subfamily and should be addressed by future workers delving below the familial level.

Order Callipodida. One new suborder, Sinocallipodidea Shear, 2000b, and two new families — Paracortinidae Wang & Zhang, 1993, and Sinocallipodidae Zhang, 1993, have been proposed in the Callipodida since 1978. Prior to 1993, the order, represented by the families Schizopetalidae, Dorypetalidae, and Caspiopetalidae, was known in Asia from Turkey to Pakistan and the southern part of the Former Soviet Union, although Golovatch [1981] published a record of *Bollmania* Silvestri (Caspiopetalidae) from China, based on females, that has been generally overlooked. In that year, Wang and Zhang [1993] and Zhang [1993] reported the order from southern China, the first definite records from east Asia, proposing eight new species, four genera, and two families, Paracortinidae and Sinocallipodidae. Shear [2000b] added a genus and species from Vietnam, which he placed in the Schizopetalidae, and speculated that the Paracortinidae was either a

synonym or subfamily of this taxon, but he stopped short of formally proposing either. The Paracortinidae therefore stands until the types of its seven species and representatives of schizopetalid subfamilies are studied to determine its validity. In southwestern North America, I suspect that the schizopetalid subfamily Tynommatinae warrants full family status, as it shares the setal migration formula with the Abacionidae in the eastern United States and adjacent Mexico [Shear, 2000b]. Thus, the Tynommatinae appears to be more closely related to the Abacionidae than to European and Asian representatives of the Schizopetalidae, where it is currently placed. I include the small, disjunct tribe Texophonini (one genus and two species), on the Gulf Coast and Rio Grande in southeastern Texas, in the Tynommatinae where I [Shelley, 1996c] placed it. Hoffman [1999] treated the Texophonini as "Callipodida of uncertain family position", but having examined all the North American species, genera, and tribes of the family, I am convinced that the Texophonini truly belongs in the Tynommatinae. It appears to be a relict of an early, more widespread tynommatine distribution that survives in moist habitats of southeastern Texas and is now detached from the rest of the subfamily by some 765 mi (1,224 km).

Zhang [1993] proposed the family Sinocallipodidae for one genus and species, *Sinocallipus simplicipodius* Zhang (occasionally misspelled as "*simplicipodus*"), a species with extraordinary gonopods that are totally different from those of any other callipodidan. Shear [2000b] suggested that the Sinocallipodidae is the plesiomorphic sister-group of all other callipodidan families collectively and erected the suborder, Sinocallipodea, to accommodate it.

Order Chordeumatida. The Chordeumatida has experienced a high level of activity since Hoffman's publication, and as with the Julida, there is an excellent summary work [Shear 2000a]. One new suborder, Heterochordeumatidea Shear, 2000a, and ten new families have been proposed, one dating to 1976 and two to 1978 that were not included by Hoffman [1980, 1982]: Sakhalineumatidae Golovatch, 1976; Lankasomatidae Mauriès, 1978; Megalotylidae Golovatch, 1978 (in Golovatch and Mikhaljova, 1978); Kashmireumatidae Mauriès, 1982; Vièteumatidae Golovatch, 1984; Neocambrisomatidae Mauriès, 1987b; Reginaterreumatidae Mauriès, 1988; Biokoviellidae Mršić, 1992; Golovatchiidae Shear, 1992; and Altajellidae Mikhaljova & Golovatch, 2001. Shear [2000a] presented a complete classification of the order that he characterized as a "very preliminary hypothesis", which is based on comprehensive study, extensive argumentation, and a career's worth of personal experience with the order. It is difficult to imagine how a classification could be more authoritative, shortcomings notwithstanding, given our imperfect knowledge of the global diplopod fauna. I fully accept Shear's arrangement and refer readers to his work for further details; alternative arrangements of parts of the order are presented by Mauriès [1978, 1988], Shear [1979], and Golovatch [1986]. Shear

[1987] discussed the classification of Asian chordeumatids.

Order Polydesmida. The most speciose order has been surprisingly stable at the family-level the past 25 years, particularly in comparison to the Julida, Spirostreptida, and Chordeumatida. One new "infraorder" has been proposed, Oniscodesmoidea Simonsen, 1990, but there are no entirely new families², and there have been few rearrangements. While admitting that the arrangement was not entirely satisfactory, Hoffman [1999] continued his earlier system [1980, 1982] of four suborders — Chelodesmidea, Paradoxosomatidea, Polydesmidea, and Dalodesmidea — which therefore stands today, although I think that Brölemann's [1916] "phyla", Leptodesmida and Strongylosomida (*recte*: Strongylosomatida), the oldest available suprafamilial names, should replace the first two, with the proper spelling and suffix. Simonsen [1990] conducted a cladistic analysis of the Polydesmidea and proposed a number of changes, most notably submerging Dalodesmidea under Polydesmidea; however, his work has been strongly critiqued [Golovatch, 1991, 1996, 2002; Hoffman, 1999], and some alterations have been reversed. Simonsen also synonymized the Vaalgonopodidae under the Dalodesmidae, but Hamer [1998] recognized both families. Composition of the Strongylosomatidea, with only the family Paradoxosomatidae, has not changed, although Hoffman [1999] stated that he no longer thinks the taxon is monophyletic and that one or more of the three subfamilies and 20 tribes³ should be elevated to family status. The majority of changes have been in the Polydesmidea, but a few involve the Leptodesmidea.

Suborder Leptodesmidea. The first change in this suborder was the transferral of the Campodesmidae from the superfamily Xystodesmoidea to the Sphaeriodesmoidea [Hoffman, 1982, as noted by Golovatch, 2003]. Hoffman [1998] split the Platyrrhacidae (sensu Hoffman, 1975, 1980, 1982) into three coordinate fam-

² While new families continue to be proposed at a fairly high rate in the Chordeumatida, such activity has diminished dramatically in the Polydesmida, perhaps signifying that all or most have now been discovered. To the best of my knowledge, only six new families have been proposed in the Polydesmida since 1950: Nearctodesmidae Chamberlin and Hoffman, 1950; Eurymerodesmidae Causey, 1951; Sigocheiridae Causey, 1955, reduced to tribal status under the Xystodesminae (Xystodesmidae) by Hoffman [1980]; Dorsoporidae Loomis, 1958; Tridontomidae Loomis and Hoffman, 1962; and Opisetretidae Hoffman, 1980. By my count, 19 families have been proposed in the Chordeumatida during this same period, 18 coming after 1960, seven after 1980, and three after 1990, the most recent being Altajellidae Mikhaljova and Golovatch, 2001. However, six of the 18 families established since 1960 have been synonymized, three that were proposed in the 1970's and three from the 1980's, so there seems to be a tendency to too readily erect families in the Chordeumatida.

³ Hoffman [1980] recognized 21 tribes, three in the Australiosomatinae, two in the Alogolykinae, and 16 in the Paradoxosomatinae. He [Hoffman, 1982] reported only 20 tribes and this is the present number as there are 15 in the Paradoxosomatinae with the action of Golovatch and Enghoff [1994], who suppressed Hylomini under Orthomorphiini. To the best of my knowledge, no new tribes have been proposed in the Paradoxosomatidae since 1978.

ilies: Platyrrhacidae; Euryuridae, reelevating the Euryurinae to the family status that it held prior to 1975 [Hoffman, 1975]; and Aphelidesmidae, elevating the former subfamily. He [Hoffman, 1998] also allied the Euryuridae to the Xystodesmidae (Xystodesmoidea), action that was accepted by Hoffman *et al.* [2002] and Golovatch [2003]. Hoffman [1999] also questioned, but did not refute, the validity of the five superfamilies he [Hoffman, 1980, 1982] recognized. Hoffman *et al.* [2002] stated that the spiniform paranota of the Tridontomidae was insufficient justification for full family status and that the taxon should be reduced to subfamilial or tribal status under the Rhachodesmidae, but they did not formally take this action, and the Tridontomidae therefore stands today.

Suborder Polydesmoidea. The basic criticism of Simonsen's work [1990] is that too few specimens and too little diversity of this great melange were examined to draw such extensive conclusions and make major changes; furthermore, the literature review was hardly exhaustive, as only 31 of the 62 references on diplopods (113 total citations) were published after 1960. Golovatch [1996] noted that Simonsen's brief anatomical description of the Pyrgodesmidae is fundamentally flawed and that only two species of this large family were examined, one unidentified even to genus. The Pyrgodesmidae occurs on all the inhabited continents, though possibly introduced to some, so this is an extremely poor representation of what is now a global taxon. Similarly, Hoffman [1999] stated that the work is "flawed by too much assumption of the reality of existing taxa and too little familiarity with the global fauna", a case in point being the primarily west-Nearctic family Nearctodesmidae, which comprises six genera — *Nearctodesmus* Silvestri, *Kepolydesmus* Chamberlin, *Ergodesmus* Chamberlin, *Sakophallus* Chamberlin, *Harpogonopus* Loomis⁴, and *Bistolodesmus* Shelley — and nine species. Hoffman [1982] included this family under the Macrosterodesmidae, and Simonsen recognized it as a subfamily based solely on the examination of "genus et species indet.". However, we

do not know which species he viewed nor how many specimens; could there have been only one? Nearctodesmids are abundant in northwestern North America and well represented in American institutions, so copious material was available for loan. When I [Shelley, 1994b] revised the Nearctodesmidae, I overlooked Hoffman's [1982] action and was not aware of Simonsen's work, but now that I know about these I cannot agree with placement under Macrosterodesmidae. Furthermore, Hoffman [1999] reversed his previous action and recognized the family, citing the need to study the numerous "micro-nearctodesmids" in southwestern North America before making major changes. Simonsen's decision came before the family was revised and was based solely on the presumed timing of origin of the Macrosterodesmidae versus the Nearctodesmidae and Hennig's recommendation that family status should only be accorded to taxa arising in the early Cretaceous to early Triassic. As very little material was examined and gonopodal features were not considered, this is far too weak a basis to reduce such a distinctive taxon. Consequently, the Nearctodesmidae stands today as a valid component of the superfamily Trichopolydesmoidea.

Simonsen placed the Dorsoporidae under the Oniscodesmidae on the basis of the original description, but Hoffman *et al.* [1996] and Hoffman [1999] recognized the family. Changes of Simonsen that I accept include the introductions of two infraorders, Oniscodesmoidea and Polydesmoidea; correction of the superfamily name Stylodesmoidea to Pyrgodesmoidea (also noted by Golovatch, 2001); transferral of the Ammodesmidae from the Oniscodesmoidea to Pyrgodesmoidea; and recognition of two new superfamilies, Opistrotretoidea and Haplodesmoidea. Mauriès [1980b] revived without comment the Mastigonodesmidae from synonymy under the Polydesmidae, but this action has not been accepted elsewhere and is not addressed by Simonsen, who presumably followed Hoffman [1980] in recognizing the aforementioned synonymy. This seems the best placement for the Mastigonodesmidae.

⁴ Golovatch [1994] and Hoffman [1999] placed *Harpogonopus* (misspelled as "*Harpagonopus*" by Hoffman [1980, 1999] and Shelley [1993, 1994b]) in the Fuhrmannodesmidae, but as I [Shelley, 1994b] noted, its one species possesses the gonopodal features of the Nearctodesmidae, though in a different arrangement. Thus, *Harpogonopus* clearly belongs in this family, extending its distribution southward along the Pacific Coast into northern Baja California Norte.

Family-level classification⁵**CLASS DIPLOPODA** de Blainville in Gervais, 1844**Subclass PENICILLATA** Latreille, 1831

— Two 1829 [a, b] references by Latreille, which present identical accounts on myriapods, do not employ the category, Penicillata. It is present in the 1831 work, which is the correct date instead of 1829, as cited previously.

Order Polyxenida Verhoeff, 1934

— Lucas [1840] established “Pollyxénites”, a new category that he considered a family and is thus properly credited with the family-group name. Cook [1895] apparently was the first to employ an ordinal category as he coined the name, “Ancyrotricha”, in what was then considered the subclass “Pselaphognatha”, and the name was subsequently used by Silvestri [1897], but it was not based on either of the included genera, *Polyxenus* Latreille and *Lophoproctus* Pocock. Chamberlin and Hoffman [1958] apparently were the first to employ the spelling “Polyxenida” for an ordinal category, but 24 years earlier, Verhoeff [1934] established the order “Polyxenoidea”. To the best of my knowledge this is the first ordinal-level proposal based on an included genus, so Verhoeff is properly credited with authoring the order.

Superfamily Polyxenoidea Lucas, 1840

Family Hypogexenidae Schubart, 1947*

Family Lophoproctidae Silvestri, 1897

Family Polyxenidae Lucas, 1840

Superfamily Synxenoidea Silvestri, 1923*

— Date given as 1948 by Hoffman [1980], but according to the Principle of Coordination, it must be the same date as the family itself.

Family Synxenidae Silvestri, 1923*

Subclass CHILOGNATHA Latreille, 1802/1803**Infraclass Pentazonia** Brandt, 1833Superorder **Limacomorpha** Pocock, 1894aOrder **Glomeridesmida** Cook, 1895

Family Glomeridesmidae Latzel, 1884

Superorder **Oniscomorpha** Pocock, 1887Order **Glomerida** Brandt, 1833

— Brandt [1833] used the term, “Glomeridia”, without assigning rank, which was the second category based on the genus *Glomeris* Latreille, 1802/1803. As Leach [1815] clearly labeled his taxon a family, it is appropriate to credit Brandt, author of the second supra-generic name, with the order.

Family Doderiidae Silvestri, 1904*

— Syn. Trachysphaeridae Strasser, 1971/Mauriès, 1971. The name, Doderiidae, has substantial priority over Trachysphaeridae, employed by Hoffman [1980], and is being used in the Fauna Europaea Project (Enghoff, in prep.). Hoffman credited Strasser with the Trachysphaeridae, but he only used the name without comment at the head of a list; Mauriès [1971] proposed the tribe Trachysphaerini in the same year and labeled it as new. I cannot determine which publication was first.

Family Glomeridae Leach, 1815

— Leach [1815] proposed the category “Glomerides”, which he labeled a family, and is therefore properly credited with authorship of the Glomeridae.

Family Glomeridellidae Cook, 1896b

Order **Sphaerotheriida** Brandt, 1833

— Brandt [1833] erected the genus *Sphaerotherium* in the category, “Sphaerotheria”, without assigned rank. Unlike the simultaneous proposal of “Glomeridia”, there was no established family category for *Sphaerotherium* at that time, but as Brandt is properly credited with the order Glomerida, for consistency, I also credit him with the Sphaerotheriida.

Family Sphaerotheriidae C. L. Koch, 1847

— As Brandt is credited with the order, authorship of the family falls to the next person employing a supra-generic category, who was Koch [1847].

Family Zephroniidae Gray in Jones, 1843

— Syn. Sphaeropoeidae Brölemann, 1913 [Jeekel, 2001]; the date of this work has been misprinted as 1842.

Infraclass Helminthomorpha Pocock, 1887Subterclass **Colobognatha** Brandt, 1834*Order **Platydesmida** Cook, 1895

— According to Chamberlin and Hoffman [1958], Latzel was the next author to employ a supra-generic category based on *Platydesmus* Lucas after DeSaussure, but Latzel labeled his as the subfamily “Platydesmia” and attributed it to DeSaussure. Cook is the first to unequivocally propose an ordinal category.

Family Andrognathidae Cope, 1869

Family Platydesmidae DeSaussure, 1860

— DeSaussure [1860] proposed the tribe “Platydesmii”, the first supra-generic category based on *Platydesmus*; as tribes are family-group taxa, it is appropriate to credit him with the family Platydesmidae.

Order **Polyzoniida** Cook, 1895

Family Hirudisomatidae Silvestri, 1896

⁵ Authorships and dates that were confirmed by colleagues are marked by *.

- Family **Polyzoniidae** Newport, 1844
 — Newport [1844] erected the family Polyzoniidae and is properly credited with this taxon but not the order. As noted by Jeekel in Opinion 1065 [1977] of the International Commission on Zoological Nomenclature and reiterated by Shelley [1998], Gervais' usage of this name in ?August 1844 is superseded by that of Newport in May 1844, so authorship is properly attributed to Newport instead of Gervais, as reported by Jeekel [1971a] and most of the older literature.
- Family **Siphonotidae** Cook, 1895
- Order **Siphonocryptida** Cook, 1895 **stat. nov.**
 — Hoffman [1980] recorded the suborder, Siphonocryptidea (Polyzoniida), as a new status from Pocock's proposal of the family, but Cook [1895] proposed the suborder "Siphonocryptoidea" 85 years earlier.
- Family **Siphonocryptidae** Pocock, 1894a
- Order **Siphonophorida** Hoffman, 1980
 — Hoffman [1980] was the first to propose an ordinal category based on the genus *Siphonophora* Brandt. Cook [1895] employed the term, "Siphonophoridae", which he labeled a superfamily.
- Family **Siphonophoridae** Newport, 1844
- Family **Siphonorhinidae** Cook, 1895 (= **Nematozoniidae** Verhoeff, 1939 **syn. nov.**)
- Subterclass **Eugnatha** Attems, 1898
- Superorder **Juliformia** Attems, 1926
- Order **Julida** Brandt, 1833
 — Brandt [1833] erected the category "Julidea", without rank, which is the second supra-generic category based on *Julus* L. As Leach [1814] specifically established the family, Brandt is properly credited with the order.
- Superfamily **Blaniuloidea** C. L. Koch, 1847
 — Superfamily status originally proposed by Mauriès [1970] and accepted by Causey [1974]; not recognized by Hoffman [1980]; reinstated by Enghoff [1981].
- Family **Blaniulidae** C. L. Koch, 1847
- Family **Galliobatidae** Brolemann, 1921
 — Proposed as a "subtribe" and considered a tribe by Hoffman [1980]; elevated to family status by Enghoff [1981].
- Family **Okeanobatidae** Verhoeff, 1942
 — Proposed as a subfamily and considered a tribe by Hoffman [1980]; elevated to family status by Enghoff [1985].
- Family **Zosteractinidae** Loomis, 1943
 — Proposed as a family and reduced to a subfamily by Hoffman [1980]; reelevated to family status by Enghoff [1981].
- Superfamily **Juloidea** Leach, 1814
 — New superfamily status proposed by Enghoff [1981]. Pocock [1887, 1894a] proposed "Juloidea" but labeled it a suborder as did Cook [1895] and other authors. For consistency, Enghoff [1981] is credited with proposing this status.
- Family **Julidae** Leach, 1814
 — Leach proposed the category "Julides", which he labeled a family, and hence is credited with all family-group names.
- Family **Rhopaloiulidae** Attems, 1926
 — Proposed as a tribe and considered such by Hoffman [1980]; elevated to family status by Enghoff [1981].
- Family **Trichoblaniulidae** Verhoeff, 1911a
 — Proposed as a subfamily and reduced to a tribe by Hoffman [1980]; elevated to family status by Enghoff [1981].
- Family **Trichonemasomatidae** Enghoff, 1991
- Superfamily **Nemasomatoidea** Bollman, 1893
 — New superfamily status proposed by Enghoff [1981].
- Family **Chelojulidae** Enghoff, 1991
- Family **Nemasomatidae** Bollman, 1893
- Family **Pseudonemasomatidae** Enghoff, 1991
- Family **Telsonemasomatidae** Enghoff, 1991
- Superfamily **Paeromopodoidea** Cook, 1895
 — Superfamily status originally proposed by Mauriès [1970a] and accepted by Causey [1974]; not recognized by Hoffman [1980]; reinstated by Enghoff [1981].
- Family **Aprophylosomatidae** Hoffman, 1961
 — Proposed as a subfamily and considered such by Hoffman [1980]; elevated to family status by Shelley [1994a].
- Family **Paeromopodidae** Cook, 1895
- Superfamily **Parajuloidea** Bollman, 1893
 — Superfamily status originally proposed by Mauriès [1970a] and accepted by Causey [1974]; not recognized by Hoffman [1980]; reinstated by Enghoff [1981].
- Family **Mongoliulidae** Pocock, 1903
- Family **Parajulidae** Bollman, 1893
- Order **Spirobolida** Cook, 1895
- Suborder **Spirobolidea** Cook, 1895
- Family **Allopocockiidae** Keeton, 1960
- Family **Atopetholidae** Chamberlin, 1918a
- Family **Floridobolidae** Keeton, 1959
- Family **Hoffmanobolidae** Shelley, 2001

- Family Messicobolidae Loomis, 1968
- Family Pseudospirobolellidae Brölemann, 1913
- Family Rhinocricidae Brölemann, 1913
- Family Spirobolellidae Brölemann, 1913
- Family Spirobolidae Bollman, 1893
- Family Typhlobolellidae Hoffman, 1969

Suborder **Trigoniulidea** Brölemann, 1913

- As Attems [1909] specifically erected the family “Trigoniulidae”, authorship of the suborder is credited to Brölemann (1913), who proposed the first supra-familial category, the “phylum Trigoniulidi”. This was the first proposal of a supra-familial name based on *Trigoniulus* Pocock, and it is appropriate to credit Brölemann with this taxon ahead of Attems [1914], who proposed subordinal usage of his family Trigoniulidae.

Family Pachybolidae Cook, 1897

- Jeekel [1971a] credited Brölemann [1913] with authorship, but Cook [1897] was actually the first to propose the taxon.

Family Trigoniulidae Attems, 1909a

- Proposed as a family but considered a subfamily of the Pachybolidae by Hoffman [1980, 1982]; reelevated to family status by Hoffman *et al.* [1996].

Order **Spirostreptida** Brandt, 1833

- Brandt [1833] erected the genus *Spirostreptus* in the category, “Spirostreptidea”, without assigned rank. There was no established family category for *Spirostreptus* at that time, but as Brandt is properly credited with the order Sphaerotheriida, proposed under the same circumstances, for consistency, I also credit him with the order Spirostreptida.

Suborder **Cambalidea** Cook, 1895

- Hoffman [1980] credited Bollman [1893] with this taxon, but he only proposed “Cambalinae” and, hence, is credited with all family-group names based on *Cambala* Gray. The first person to propose an ordinal-group name was Cook [1895], who published “Cambaloidea”. Mauriès and Nguyen Duy-Jacquemin [1997] proposed the new family-group name, Cambalopsioidea (as a new status from Cambalopsidae Cook, 1895), for Pericambalidae Silvestri, 1909a, Glyphiulidae Chamberlin, 1922, and, by implication, Cambalopsidae Cook, 1895; coordinate superfamily categories were not designated. and such have not otherwise been recognized in the Cambalidea.

Family Cambalidae Bollman, 1893

- Syn. Dimerogonidae Verhoeff, 1924; new status of Mauriès [1977].

Family Cambalopsidae Cook, 1895

Family Glyphiulidae Chamberlin, 1922

- Considered a subfamily of Cambalidae by Mauriès [1977], a synonym of Cambalopsidae by Hoffman [1980] and Jeekel [1985], a subfamily of Cambalopsidae by Mauriès [1983, 1987a], reelevated to family status by Mauriès and Nguyen Duy-Jacquemin [1997].

Family Pericambalidae Silvestri, 1909a

- Considered a subfamily of the Dimerogonidae by Mauriès [1977] and a subfamily of the Cambalopsidae by Mauriès [1983, 1987a; Jeekel, 1985; and Mauriès and Enghoff, 1990], reelevated to family status by Mauriès and Nguyen Duy-Jacquemin 1997. Syn. Bilingulidae Zhang and Li, 1981 (implied by Mauriès [1987a] and Mauriès and Enghoff [1990], formalized by Mauriès and Nguyen Duy-Jacquemin [1997]).

Suborder **Epinannolenidea** Chamberlin, 1922

- Syn. Pseudonannolenidea Mauriès, 1983. Implicitly synonymized with Epinnannolenidea (misspelled as Epinnannolenidea) by Hoffman, 1999, and Pseudonannolenidea Mauriès, 1983 (new status introduced by Mauriès, 1987a). Silvestri [1895] established the family Pseudonannolenidae but did not propose an ordinal-group name; the first usage at this level is by Mauriès [1983], so Epinnannolenidea has priority.

Family Choctellidae Chamberlin and Hoffman, 1950

- Combined under Pseudonannolenidae by Jeekel [1985] but considered a separate family by Mauriès [1983, 1987a] and Hoffman [1999].

Family Iulomorphidae Verhoeff, 1924

- Placed under Cambalidea by Hoffman [1980], transferred to Epinnannolenidea by Mauriès [1983, 1987a].

Family Pseudonannolenidae Silvestri, 1895

- Syn. Phallorhidae Chamberlin, 1952 (transferred from synonymy under Spirostreptidae by Hoffman and Florez [1995]). Pseudonannolenidae considered a family in order Cambalida by Mauriès [1980a]. Currently divided into three subfamilies: Pseudonannoleninae Silvestri, 1895; Physiostreptinae Silvestri, 1903, considered a subfamily of Pseudonannolenidae by Mauriès [1977], elevated to family status by Hoffman [1980] and considered such by Mauriès [1983], and reduced to subfamily status by Mauriès [1987a] and considered such by Hoffman and Florez [1995]; and Cambalomminae Mauriès, 1977.

Suborder **Spirostreptidea** Brandt, 1833

Superfamily Odontopygoidea Attems, 1909b

Family Atopogestidae Hoffman, 1980

Family Odontopygidae Attems, 1909b

Superfamily Spirostreptoidea Pocock, 1894a

Family Adiaphorostreptidae Hoffman, 1977

Family Harpagophoridae Attems, 1909c

Family Spirostreptidae Pocock, 1894a

- As Brandt [1833] is credited with the order Spirostreptida, the first person to clearly erect a family-group name based on *Spirostreptus* Brandt was Pocock [1894a], one year ahead of Cook [1895].

Superorder **Nematothorax** Verhoeff, 1913aOrder **Callipodida** Pocock, 1894b

— Hoffman [1980] credited Bollman [1893] with authorship of this order, but he only erected the family-group taxon “Callipodoidea”, which he labeled a superfamily, and, later in this work, Callipodidae. The first person to designate an ordinal-group taxon based on *Callipus* Risso and label it as such was Pocock, 1894b, who proposed “Callipodoidea” as a suborder in the “order Helminthomorpha”, containing the families Callipodidae and Stemmiulidae.

Suborder **Callipodidea** Pocock, 1894b

— New status proposed by Hoffman [1973].

Family Callipodidae Bollman, 1893

Suborder **Schizopetalidea** Hoffman, 1973

Family Abacionidae Shelley, 1979

— Proposed as a tribe, elevated to a subfamily by Hoffman [1980], and elevated to family status by Hoffman [1999].

Family Caspiopetalidae Lohmander, 1931

— This date has been reported as 1933.

Family Dorypetalidae Verhoeff, 1900*

— Verhoeff [1900] erected the new tribe, Dorypetalini, and [1909a] established Dorypetalidae as a new family. The latter was actually a new status, and the family-group taxa date from the original proposal in 1900.

Family Paracortinidae Wang and Zhang, 1993

— Shear [2000b] suggested either synonymy or subfamily status for this taxon under Schizopetalidae, but did not formalize either.

Family Schizopetalidae Verhoeff, 1909a

Suborder **Sinocallipodidea** Shear, 2000b

Family Sinocallipodidae Zhang, 1993

Order **Chordeumatida** Pocock, 1894a

— Pocock [1894a] is credited with the order Chordeumatida while Koch [1847] is credited with the family. Pocock [1894a] reported that he talked with Cook and Collins during their visit to the British Museum, who “informed me that they propose to elevate the Millipedes of the Chordeumid group to the rank of a sub-order...”, a proposition that he agreed with. Pocock then “scooped” Cook and Collins by formally erecting the suborder, “Chordeumoidea”. Cook [1895] subsequently established the “suborder Craspedosomatoidea”, but priority for the ordinal taxon goes to Pocock’s name, Chordeumatida. Later, Cook [1899] ascribed authorship to “Cook and Collins, with Pocock”; my interpretation of Article 50 of the 4th edition of the Code is that Pocock alone is properly credited with authorship, even though Cook and Collins originally perceived that ordinal status was justified. Hoffman [1980] named the order Chordeumatida, but under his system of crediting all supra-generic taxa to the author first proposing such, it should technically be named “Craspedosomatida”, as Craspedosomatidae Gray in Jones, 1843, holds priority by four years over Chordeumatidae C. L. Koch, 1847. However, under the alternative followed herein, the correct name is clearly “Chordeumatida”, which holds priority by one year.

Suborder **Chordeumatidea** Pocock, 1894a

Superfamily Chordeumatoidae C. L. Koch, 1847

Family Chordeumatidae C. L. Koch, 1847

?Family Speophilosomatidae Takakuwa, 1949

— Shear [2000a] tentatively placed this family in the Chordeumatoidae but noted in commentary that it may require a superfamily of its own in the suborder Craspedosomatidea.

Suborder **Craspedosomatidea** Cook, 1895

— Cook’s usage of the suborder “Craspedosomatoidea” has 40 years of priority over that by Brolemann [1935], who proposed “Craspedosomoidea” and was credited with the suborder by Hoffman [1980] and Shear [2000a].

Superfamily Anthroleucosomatoidea Verhoeff, 1899*

— Elevated to superfamily status by Shear [2000a].

Family Anthroleucosomatidae Verhoeff, 1899*

Family Haasiidae Hoffman, 1980

— Proposed as a subfamily; elevated to family status by Shear [2000a].

Family Origmatogonidae Verhoeff, 1914

— Proposed as a tribe but considered a subfamily by Hoffman [1980]; elevated to family status by Shear [2000a].

Family Vandeumatidae Mauriès, 1970b

— Proposed as a family but considered a subfamily by Hoffman [1980]; reelevated to family status by Shear [2000a].

Superfamily Brannerioidea Cook, 1896a

Family Brachychaeteumatidae Verhoeff, 1911b

— Proposed as a family but considered a subfamily by Hoffman [1980]; reelevated to family status by Shear [2000a].

Family Branneriidae Cook, 1896a

Family Chamaesomatidae Verhoeff, 1913b

— Proposed as a family but considered a subfamily by Hoffman [1980]; reelevated to family status by Shear [2000a].

Family Golovatchiidae Shear, 1992

Family Heterolatzeliidae Verhoeff, 1899*

— The date has been reported as 1897.

Family Kashmireumatidae Mauriès, 1982

— Syn. Vieteumatidae Golovatch, 1984 [Shear, 1987].

Family Macrochaeteumatidae Verhoeff, 1914

— Proposed as a subfamily and considered such by Hoffman [1980]; elevated to family status by Shear [2000a].

- Family Niponiosomatidae Verhoeff, 1941
- Family Tingupidae Loomis, 1966
- Family Trachygonidae Cook, 1896c
- Superfamily Cleidogonoidea Cook, 1896c
 - Family Biokoviellidae Mršić, 1992
 - Family Cleidogonidae Cook, 1896c
 - Family Entomobielziidae Verhoeff, 1899*
 - Family Lusitaniosomatidae Schubart, 1953
 - Family Opisthocheiridae Ribaut, 1913
 - Family Trichopetalidae Verhoeff, 1914
- Superfamily Craspedosomatoidea Gray in Jones, 1843
 - Family Attemsiidae Verhoeff, 1899*
 - Family Craspedosomatidae Gray in Jones, 1843
 - Family Haplobainosomatidae Verhoeff, 1909b
 - This family was inadvertently assigned to both the Craspedosomatoidea and the Anthroleucosomatoidea by Shear [2000a], who advised me (*in litt.*) that the former is the proper assignment.
- Superfamily Haaseoidea Attems, 1899
 - Family Haaseidae Attems, 1899
- Superfamily Neoatractosomatoidea Verhoeff, 1901*
 - Family Altajellidae Mikhaljova and Golovatch, 2001
 - Family Faginidae Attems, 1926
 - Family Hoffmaneumatidae Golovatch, 1978
 - The date has been reported as 1974.
 - Family Mastigophorophyllidae Verhoeff, 1899*
 - Family Neoatractosomatidae Verhoeff, 1901*
- Superfamily Verhoeffioidea Verhoeff, 1899*
 - New status proposed by Hoffman [1980].
 - Family Verhoeffiidae Verhoeff, 1899*
- Suborder **Heterochordeumatidea** Shear, 2000a
 - Superfamily Conotyloidea Cook, 1896a
 - Family Adritylidae Shear, 1971
 - Family Conotyliidae Cook, 1896a
 - Superfamily Diplomaragnoidea Attems, 1907
 - Family Diplomaragnidae Attems, 1907
 - Syns. Sakhalineumatidae Golovatch, 1976 [Shear, 1990], Syntelopodeumatidae Golovatch, 1977 [Golovatch, 1979].
 - Superfamily Heterochordeumatidea Pocock, 1894a
 - Family Eudigonidae Verhoeff, 1914
 - Family Heterochordeumatidae Pocock, 1894a
 - Family Megalotyliidae Golovatch, 1978
 - in Golovatch and Mikhaljova, 1978
 - Family Metopidiotrichidae Attems, 1907
 - Syns. Schedotrigonidae Mauriès, 1978; Neocambrisomatidae Mauriès, 1987b; Reginaterreumatidae Mauriès, 1988 [Shear and Tanabe, 1994; Shear, 2002].
 - ?Family Peterjohnsiidae Mauriès, 1987b
 - Shear [2000a] noted that this family is enigmatic but bears some similarity to the Metopidiotrichidae, hence placement in the same superfamily. An earlier placement in the Cleidogonoidea (Craspedosomatidea) [Mauriès, 1987b] was based on a misinterpretation of the gonopods.
 - Superfamily Pygmaeosomatoidea Carl, 1941
 - Elevated to superfamily status by Shear [2000a].
 - Family Lankasomatidae Mauriès, 1978
 - Family Pygmaeosomatidae Carl, 1941
- Suborder **Striarioidea** Cook, 1896a
 - The correct date for this taxon, erected in the text of the work, is 1896, not 1898 or 1899, as have been reported.
 - Superfamily Caseyioidea Verhoeff, 1909b
 - Elevated to superfamily status by Shear [2000a].
 - Family Caseyidae Verhoeff, 1909b
 - Family Urochordeumatidae Silvestri, 1909b
 - Superfamily Striarioidea Bollman, 1893
 - Shear [2000a] credited Cook [1896a], given as 1898, with authorship of the superfamily as he was the first to use this exact term, which he labeled as a suborder of the “Coelocheta”. However, according to the Principle of Coordination, superfamily authorship must be credited to Bollman [1893], as his subfamily Striariinae holds priority at the family-group level.
 - Family Apterouridae Loomis, 1966

- Family Rhiscosomididae Silvestri, 1909b
 Family Striariidae Bollman, 1893
 Order **Stemmiulida** Cook, 1895
 Family Stemmiulidae Pocock, 1894a
 Superorder **Merocheta** Cook, 1895
 Order **Polydesmida** Pocock, 1887
 — Leach [1815] proposed “Polydesmides”, which he labeled a family, and thus is properly credited with all family-group taxa. Pocock [1887] was the first to use an ordinal-level term based on the genus *Polydesmus* Latreille and thus is credited with all ordinal-group taxa. He erected “Polydesmoidea” as a suborder in the order Helminthomorpha.
 Suborder **Leptodesmidea** Brölemann, 1916
 = Chelodesmidea Hoffman, 1967; = Sphaeriodesmidea Jeekel, 1971a, **syns.nov.** Brölemann established the “phylum Leptodesmidei,” the first suprafamilial name based on a component of this subordinal grouping, and it is appropriate to credit him with the taxon.
 Superfamily Chelodesmoidea Cook, 1895
 Family Chelodesmidae Cook, 1895
 Superfamily Platyrrhacoidea Pocock, 1895
 Family Aphelidesmidae Brölemann, 1916
 — Proposed as a subfamily, reduced to tribal status by Hoffman [1980], elevated to family status by Hoffman [1998].
 Family Platyrrhacidae Pocock, 1895
 Superfamily Rhachodesmoidea Carl, 1903
 — The change in authorship of the family, noted below, necessitates change in authorship of the superfamily.
 Family Rhachodesmidae Carl, 1903
 — Authorship corrected from Pocock [1909] by Hoffman [1999].
 Family Tridontomidae Loomis and Hoffman, 1962
 Superfamily Sphaeriodesmoidea Humbert and DeSaussure, 1869
 Family Campodesmidae Cook, 1896d
 — The date is sometimes cited as 1895, but Jeekel [1971a] noted that this usage, and that of the genus *Campodesmus* in the same work, constituted *nomina nuda*.
 Family Holistophallidae Silvestri, 1909c*
 Family Sphaeriodesmidae Humbert and DeSaussure, 1869
 Superfamily Xystodesmoidea Cook, 1895
 Family Eurymerodesmidae Causey, 1951
 Family Euryuridae Pocock, 1909
 — Proposed as a subfamily and elevated to family status by Chamberlin [1918b], returned to subfamilial status by Hoffman [1975] and retained there by Hoffman [1980], reelevated by Hoffman [1998] and transferred from the Platyrrhacoidea.
 Family Gomphodesmidae Cook, 1896d
 — As noted by Jeekel [1971a], the usages of this family and the genus *Gomphodesmus* by Cook [1895] constituted *nomina nuda*.
 Family Oxydesmidae Cook, 1895
 Family Xystodesmidae Cook, 1895
 Suborder **Dalodesmidea** Hoffman, 1980
 — Subordinal status proposed by Hoffman [1980], synonymized under Polydesmidea by Simonsen [1990] and placed in the superfamily Polydesmoidea, reelevated to subordinal status by Hoffman [1999]. Both Hoffman [1980] and Simonsen [1990] credit the taxon to Hoffman, 1977, but this paper was never published, so 1980 is the correct date of publication of the subordinal name (Hoffman *in litt.*).
 Family Dalodesmidae Cook, 1896e
 Family Vaalognopodidae Verhoeff, 1940
 — Synonymized under Dalodesmidae by Simonsen [1990], recognized at the family level by Hamer [1998].
 Suborder **Strongylosomatidea** Brölemann, 1916
 = Paradoxosomatidea Hoffman, 1967, **syn. nov.** Again, Brölemann was the first to propose a supra-familial name based on a component of this subordinal grouping, and it is appropriate to credit him with the taxon.
 Family Paradoxosomatidae Daday, 1889*
 Suborder **Polydesmidea** Pocock, 1887
 Infraorder Oniscodesmoides Simonsen, 1990
 Superfamily Oniscodesmoidea DeSaussure, 1860
 — Proposed as a family, elevated to superfamily status by Hoffman [1980].
 Family Dorsoporidae Loomis, 1958
 — Synonymized with Oniscodesmidae by Simonsen [1990]; revived and returned to family status by Hoffman [1999].
 Family Oniscodesmidae DeSaussure, 1860
 Superfamily Pyrgodesmoidea Silvestri, 1896
 — Elevated to superfamily status by Simonsen [1990] to replace Stylodesmoidea Cook, 1896, a junior synonym, used by Hoffman [1980].
 Family Ammodesmidae Cook, 1896d

Family Cyrtodesmidae Cook, 1896a

Family Pyrgodesmidae Silvestri, 1896

Infraorder Polydesmoides Pocock, 1887

— New status proposed by Simonsen [1990].

Superfamily Haplodesmoidea Cook, 1895

— New status proposed by Simonsen [1990].

Family Doratodesmidae Cook, 1896a

Family Haplodesmidae Cook, 1895

Superfamily Opisotretoidea Hoffman, 1980

— New status proposed by Simonsen [1990].

Family Opisotretidae Hoffman, 1980

Superfamily Polydesmoidea Leach, 1815

Family Cryptodesmidae Karsch, 1880

— The publication date is sometimes cited as 1879.

Family Polydesmidae Leach, 1815

Superfamily Trichopolydesmoidea Verhoeff, 1910

Family Fuhrmannodesmidae Brölemann, 1916

— Proposed as a tribe, elevated to family status by Hoffman [1980].

Family Macrosternodesmidae Brölemann, 1916

— Proposed as a tribe, elevated to family status by Hoffman [1980].

Family Nearctodesmidae Chamberlin and Hoffman, 1950

— Placed under Macrosternodesmidae by Hoffman [1982] and recognized as a subfamily by Simonsen [1990]; reelevated to family status by Shelley [1994b] and retained at this level by Hoffman [1999].

Family Trichopolydesmidae Verhoeff, 1910

Helminthomorpha *incertae sedis*

Order **Siphoniulida** Cook, 1895

Family Siphoniulidae Pocock, 1894a

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— Proposes the family Odontopygidae (Spirostreptida).
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⁶ Citations preceded by an asterisk (*) were not available to me and were confirmed by colleagues.

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