

American earthworms (Oligochaeta) from north of the Rio Grande - a species checklist

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Abstract This current review totals approximately 183 earthworm taxa in 12 families reported from America north of Mexico, i.e., USA & Canada, of which approximately 60 (ca. 33%) are exotic/introduced. All records are presented in an annotated checklist, but not all occurrences are verified and there may be some residual errors and/or omissions in this draft that, nevertheless, seems to be the most current and complete version available, at least online. Compare to Reynolds & Wetzel (2004) who claim 161 terrestrial species in 10 megadrile families from the same region, including just 45 exotics and many of these with superceded or obsolete names or family affiliations.

Introduction

The first (dubious) species described from America was *Hypogaeum hirtum* Savigny, 1820. A recent estimate for the whole of North America (USA + Canada) – from the Arctic Ocean south to the Rio Grande but excluding offshore islands – had 161 valid species from 10 families of terrestrial oligochaetes [as reported by Reynolds & Wetzel (2004) and cited by Wetzel (2005) here: inhs.uiuc.edu/~mjwetz/AOGSMNP.PkChklst.html]. Of these, 116 were considered native, and 45 introductions from other countries for which several of the names quoted had been superceded at least 20 years previously (eg. invalid *Aporrectodea turgida*, "*Eisenia foetida* Savigny, 1826", *Amyntas hawayanus*, *A. diffringens* – see: inhs.uiuc.edu/~mjwetz/TerrWoi.mjw.list.html May, 2005). Previously, Wetzel (2003) recognized 159 nominal species in 40 genera from 12 families and an earlier paper, by Reynolds (1995: 1) cited a study by "Reynolds & Wetzel, 1994" that check-listed 147 species from North America with about 30% exotic. In the same volume, now fifteen years old, Fender (1995: 59) estimated the number of native North American taxa could be doubled, but it would take 5 years full time-work to describe the 100+ species and the results would be too big for conventional publication (cf. Gates, 1942). Schwert (1900) and Reynolds (1995: 10) together listed 36-38 lumbricids; James (1995: 34) some 69 other taxa, and Fender (1995: 53) mentioned 28 species (listed by Fender & McKey-Fender, 1900: 377), with perhaps another 80 awaiting description. These figures to 1995 gave totals of about 133-135 described species and a potential count of 215 taxa. The current list is for species from continental North America (Canada and USA) north of the Rio Grande (i.e., north of Mexico) where the earthworm fauna is thought impoverished by extensive Wisconsin(i)an glaciations. However, in what is now northeastern USA, native Indians traditionally named Spring "Full Worm Moon" as its onset was heralded by earthworm activity (noted by surface casting and song birds) preparing the earth for new growth.

Enigmatic *Argilophilus hyalinus* Eisen, 1900 from Guatemala should be removed from the North American list, whereas recently restored *Eiseniella neapolitana* should be added. *Pheretima americana bidentata* Cernovitov, 1942, cited by BIOSIS, is a *species et subspecies inquirendae*. A

single species, *Diplocardia* (?) *indica* Stephenson, 1924: 353, reported from Buldana, Berar, Maharashtra, India is also dubious and unlikely to have been introduced from USA nor Mexico.

Authors of another recent online checklist, apparently published after Blakemore (2005, 2006, [2007](#)) but without citations and quoted as Bruce A. Snyder (Odum School of Ecology, University of Georgia) with assistance from Paul F. Hendrix, Mac A. Callahan, and Sam W. James [Website http://pick4.pick.uga.edu/mp/20q?act=x_checklist&guide=Earthworms (2008-10-02)], list only 165 species but have numerous omissions (e.g. *Criodrilus lacuum*, *Dichogaster modiglianii*, *Hormogaster redii*, *Eiseniella neapolitana*, *Amyntas tokioensis*, *Polypheretima elongata* etc.) and also many errors at specific (e.g. *A. turgida*, *S. eiseni*), synonymic or generic (e.g. *Eisenia hortensis*, *E. pearsei*, *E. zebra*, *Amyntas hilgendorfi*), or family levels (e.g. Komarekionidae) plus authority miscitations (e.g. *Eisenoides carolinensis* “Michaelson, 1903” sic, Stephenson, 1932, etc.) errors and, moreover, their *Argilophilus spp.* and *Pontodrilus litoralis* are quoted under Megasoldcidae (presumably *sensu* Blakemore, 2000) rather than under Acanthodrilidae *sensu* Gates, 1969; they also omit Octochaetidae without justification. The compilers of that checklist optimistically state “*All earthworms recorded from North America, north of Mexico, are included. Subspecies and references will be included at a later date. This guide is currently in the process of being built and will be completed pending additional funding*” ... or they could just cite my current website freely.

Methods and Materials

This species list is updated from sources cited below and, with permission, from the **Polistes Foundation** website: usmo4.discoverlife.org/mp/20q?act=x_checklist&guide=Earthworms that lists 118 taxa (24 exotic : 94 native). Species from US territories, protectorates and zones of influence, e.g. Puerto Rico, Western Samoa, Hawaii, and Philippines are not included here, neither are those from Mexico or the Caribbean (see separate checklists in this series by Blakemore, [2007](#)).

Regarding the *Aporrectodea caliginosa* species-group complex *sensu* Blakemore (2002; 2006) [non *Allolobophora caliginosa* species-group, Gerard, 1964: 27; Sims & Gerard, 1985; 1999: 41, 56; nec *Allolobophora caliginosa* species-complex, Gates, 1972: 84, nec *Allolobophora trapezoides* species-group, Gates, 1972b: 1 nec *Aporrectodea trapezoides* species-complex, Easton, 1981: 41]; according to Sims & Gerard (1985; 1999: 44) some North American authors continue to incorrectly cite *Aporrectodea turgida* (Eisen, 1873) and/or *A. tuberculata* (Eisen, 1874) in preference to the prior *A. caliginosa* (Savigny, 1826) on the grounds that Savigny did not clearly define his species whereas Eisen’s material permits adequate characterization (e.g. Gates, 1972; Reynolds, 1977; James, 1990: 381). Yet other authors, such as Schwert (1990: 355), acknowledge *trapezoides* and note that *turgida* is a junior synonym of *caliginosa* but also retain *tuberculata*. This latter strategy was supported by Blakemore (2002; 2006) and is also followed herein.

Some North American authors favour retention of family Komarekionidae without justification, whereas synonymy in Ailoscolecidae follows Sims (1980) (see Appendix).

Results

Table 1. Estimated totals of native earthworm families, genera, and species in North America, north of Mexico (revised from Hendrix & Bohlen, 2002: tab. 2; Fender & McKey-Fender, 1990).

Family	Genus	Approx. No. Species
Ailoscolecidae	<i>Komarekiona</i> Gates, 1974	1
Lumbricidae	<i>Bimastos</i> Moore, 1893	10
	<i>Eisenoides</i> Gates, 1969	2
Lutodrilidae	<i>Lutodrilus</i> McMahan, 1976	1
Sparganophilidae	<i>Sparganophilus</i> Benham, 1892	12-13
Ocnerodrilidae	? <i>Ocnerodrilus</i>	1+
Acanthodrilidae	<i>Diplocardia</i> Garman, 1888	52-57
	? <i>Microscolex</i> Rosa, 1887	3?
Megascolecidae (all in tribe)	<i>Arctiostrotus</i> McKey-Fender & Fender, 1982	7 (+2 undescribed?)
	<i>Argilophilus</i> Eisen, 1893	11 (+30 undescribed)
Argilophilini	<i>Chetcodrilus</i> Fender & McKey-Fender, 1990: 374	3 (+2 undescribed)
Fender &	<i>Drilocheira</i> Fender & McKey-Fender, 1990: 376	1 (+3 undescribed)
McKey-Fender, 1990)	<i>Driloleirus</i> Fender & McKey-Fender, 1990: 372	6 (+3 undescribed)
	<i>Kincaidodrilus</i> McKey-Fender, 1982	1
	<i>Macnabodrilus</i> Fender & McKey-Fender, 1990: 373	2
	<i>Nephralaxis</i> Fender & McKey-Fender, 1990: 375	2 (+7 undescribed)
	<i>Toutellus</i> Fender & McKey-Fender, 1990: 374	4 (+4 undescribed)
TOTALS	15-17	123-170

Species checklist

FAMILIES after Blakemore (2000); remarks and synonyms (syn.) in brackets, marked with "?" where there is some taxonomic uncertainty. Codes: * = exotic/introduced, - = native/endemic, # = uncertain affinities. For common exotics and cosmopolitan species, complete synonymies are found elsewhere (e.g. Sims & Gerard, 1985, 1999; Blakemore, 2000, 2002).

Family CRIODRILIDAE Vejdovsky, 1884 (Palearctic) now including *Biwadrilus* (Japan)

- *1. *Criodrilus lacuum* Hoffmeister, 1845 [syn. *Hydrilus ghaniae* Qiu & Bouché, 1998: 18, 198 synonymy of this monotypic genus was by Omodeo, Rota & Baha (2003: 6). Notes (from Blakemore, 2002): natural range from Iberian Peninsular to Pacific-coast of Siberia, and introduced into North America - plant pots, Baltimore; although Gates (1943) thought it likely to be extinct in USA].

Family SPARGANOPHILIDAE Michaelsen, 1918 (Nearctic)

- 2. *Sparganophilus gatesi* Reynolds, 1980.
- 3. *Sparganophilus helenae* Reynolds, 1980.
- 4. *Sparganophilus komareki* Reynolds, 1980.
- 5. *Sparganophilus kristinae* Reynolds, 1980.
- 6. *Sparganophilus meansi* Reynolds, 1980.
- 7. *Sparganophilus pearsei libertiensis* Reynolds, 1980 [omitted by James (1995: 34)].
- 8. *Sparganophilus pearsei pearsei* Reynolds, 1975 [misspelt "pearsi" by James (1995: 34)].
- 9. *Sparganophilus pearsei sarasotae* Reynolds, 1980 [omitted by James (1995: 34)].
- 10. *Sparganophilus smithi* Eisen, 1896 (sometimes "smithii").
- 11. *Sparganophilus sonomae* Eisen, 1896.
- 12. *Sparanophilus tamesis* Benham, 1892 [syns. *S. eiseni* Smith, 1895 - misdated "Smith, 1980" by James (1995: 34) who attempts to maintain *S. eiseni* while at the same time overlooking *tamesis*, despite Sims & Gerard's (1985; 1999: 122) explanation of its synonymy; *Sparganophilus benhami* Eisen, 1896; *Sparganophilus benhami* var. *guatemalensis* Eisen, 1896; *Sparganophilus benhami* var. *carnea* Eisen, 1896; *Helodrilus elongatus* Friend, 1911; ?*Pelodrilus cuenoti* Tétrý, 1934 [synonymy of *cuenoti* by Cernosvitov reported in Gates (1972: 314), others from Sims & Gerard (1985, 1999: 120)]. Misspelt "tamesi" in Qiu & Bouché (1998: 178). Distribution is eastern North America through to Guatemala, introduced into Britain and France (Lorraine) - from Sims & Gerard (1999: 122)].
- 13. *Sparganophilus tennesseensis* Reynolds, 1977 [sometimes misspelt "tennessensis"].
- 14. *Sparganophilus wilmae* Reynolds, 1980.

Family AILOSCOLECIDAE (Pyrenees and southeast USA).

Note: Sims, (1980: 108) put American Komarekionidae Gates, 1974 in synonymy, cf. Reynolds & Cook, (1993) – see Appendix.

- 15. *Komarekiona eatoni* Gates, 1974

Family HORMOGASTRIDAE (Mediterranean)

- *16. *Hormogaster redii* Rosa, 1887 [single record of transport to North America Gates (1943; 1954; 1972: 61), Gates ([1943](#)) doubted it had become established in USA].

Family LUTODRILIDAE McMahan, 1976 (native)

- 17. *Lutodrilus multivesiculatus* McMahan, 1976.

Family LUMBRICIDAE (Holarctic – Vancouver Island to Japan)

[**Note:** the only wholly endemic North American genus is *Eisenoides* (cf. James, 1990: 379 who says “*There is only one native terrestrial genus of Lumbricidae, Bimastos*”), while *Bimastos* apparently shares similar species with the Mediterranean (e.g. see Csuzdi & Pavlicek, 1999), as did (does?) the Palaearctic *Dendrodrilus*, at least prior to glaciation (Schwert, 1990: 344)].

- *18. *Allolobophora chlorotica* (Savigny, 1826)
- *19. *Allolobophoridella eiseni* (Levisen, 1884)
- *20. *Aporrectodea caliginosa* (Savigny, 1826) [includes *Aporrectodea turgida* (Eisen, 1873) and many, many other synonyms such as *arnoldi* Gates, 1952; *molita* Gates, 1952 – see Blakemore (2005; 2007)].
- *21. *Aporrectodea icterica* (Savigny, 1826) [sometimes misspelt "icteria"].
- *22. *Aporrectodea limicola* (Michaelsen, 1890)
- *23. *Aporrectodea longa* (Ude, 1885)
- *24. *Aporrectodea rosea rosea* (Savigny, 1826) [many synonyms including *Ap. bowcrowensis* Reynolds & Clapperton, 1996: 77 (this latter synonymy by Csuzdi & Zicsi (2003: 93)].
- *25. *Aporrectodea trapezoides* (Duges, 1828)
- *26. *Aporrectodea tuberculata* (Eisen, 1874)
- 27. *Bimastos gieseleri gieseleri* (Ude, 1895) Savannah, Georgia (sometimes put in synonymy of *B. tumidus*).
- 28. *Bimastos gieseleri hempeli* (Smith, 1915) (sometimes put in synonymy of *B. tumidus*).
- 29. *Bimastos heimbürgeri* Smith, 1928
- 30. *Bimastos lawrenceae* Fender, 1994 in Fender, McKey-Fender & Marshall, 1994 [an endemic lumbricid, known only from Vancouver Island, BC, Canada].
- 31. *Bimastos longicinctus* (Smith & Gittins, 1915) [cf. *B. parvus*].
- 32. *Bimastos palustris* H.F. Moore, 1895 (*Bimastos sp.* H.F. Moore, 1893) [sometimes attributed to *Allolobophora*, also mislisted as "J.P. Moore" by James (1995: 43)].
- *-33. *Bimastos parvus* Eisen, 1974 [syns. *beddardi* Michaelsen, 1894 (non Ribaucourt, 1896 = *Ap. caliginosa/trapezoides* complex); *parva udei* Ribaucourt, 1896 (non Sapkarev, 1972 = *Serbiona juncesapcarevi* Blakemore, 2004: 78); *consticta geminata* Friend, 1897; ?*longicinctus* Smith & Gittins, 1915: 548 - some authors maintain this parthenogenetic taxon on the grounds that it has >60-64 partitions in the calciferous glands vs. 40-45 in *B. parvus* (S. James, pers. com. 7th Dec, 2004)]. [Note: recently transferred from *Allolobophoridella parva* to *Bimastos parvus* by Csuzdi & Zicsi (2003: 69, 71), although sometimes still reported as *Allolobophora parva* or even *Eisenia parva*, some authors revoke the probable *beddardi* and possible *longicinctus* synonyms. Regarded as a North American endemic genus, but this taxon commonly transported globally thus subject to relocation in USA and noted as an introduction, at least to

Yukon Territory, Canada].

- 34. *Bimastos tumidus* (Eisen, 1874) [syn. *Bimastos ducis* Stephenson, 1933, although James (1995: 34) apparently attempts to maintain it]. Also reported from Mexico (Fragoso pers. comm. Sept. 2006).
- 35. *Bimastos welchi* (F. Smith, 1917) [miscited without braced by James ([1995: 34](#)).
- 36. *Bimastos zeteki* (Smith & Gittins, 1915) (sometimes misspelt "zeteski" or "zetzki").
- *37. *Dendrobaena attemsi* Michaelsen, 1902
- *38. *Dendrobaena hortensis* (Michaelsen, 1890) [several synonyms].
- *39. *Dendrobaena octaedra octaedra* (Savigny, 1826) [several synonyms].
- *40. *Dendrobaena pygmaea* (Savigny, 1826) [syns. *Allolobophora minima* Rosa, 1884 non Muldal, 1953 (= *Murchieona minuscula*); *cognettii* Michaelsen, 1903 nom. nov. pro *ribaucourti* Cognetti, 1901 non Bretscher, 1901 (= *L. rubellus*); *pygmaea cognettii*: Bouché, 1972].
- *41. *Dendrobaena veneta veneta* (Rosa, 1886: 674) [syns *veneta veneta* (Rosa, 1886: 674); *caucasica* Kulagin, 1889; *bogdanowii* Kulagin, 1889; *veneta zebra* Michaelsen, 1902; *veneta succinta* Rosa, 1905; *venetus concolor* Michaelsen, 1909; *veneta picta* Michaelsen, 1910; *veneta tumida* Friend, 1927 (non Eisen, 1874); *austriaca* Michaelsen, 1936; *veneta crassa* Malevics, 1947 [non Michaelsen, 1900]; *veneta minuta* Malevics, 1947; *svetlovia* Grieb, 1948)].
- ?*42. *Dendrodrilus rubidus norvegicus* (Eisen, 1874) [possibly a morph rather than subspecies; a tentative report from Michigan and Indiana by Smith (1917: 177)].
- #43. *Dendrodrilus rubidus rubidus* (Savigny, 1826) [many synonyms].
- ?*44. *Dendrodrilus rubidus subrubicundus* (Eisen, 1874) [possibly a morph rather than subspecies].
- ?*45. *Dendrodrilus rubidus tenuis* (Savigny, 1826) [possibly a morph rather than subspecies].
- ?*46. *Eisenia andrei* Bouché, 1972 [syns. *E. fetida andrei* Bouché, 1972 replacement name for *E. fetida* var. *unicolor* André, 1963 as varietal names were invalid after 1961. Note: *E. fetida andrei*, placed in synonymy of *E. fetida* by Easton (1983) and Csuzdi & Zicsi (2003: 143), is sometimes given separate specific status, but this is almost arbitrary between authors - see discussion in Blakemore (2002)].
- *47. *Eisenia fetida* (Savigny, 1826) [many synonyms, often confused with *E. andrei*].
- *48. *Eiseniella neapolitana* (Örley, 1885) [syns. *ninii* Rosa: 1886: 680; *sewelli* Stephenson, 1924: 363; *andaluciana* Qiu & Bouche, 1998: 103). Recently restored (e.g. Csuzdi & Pavlicek, 2005) to species level, and (*neapolitana* + *ninii*) reported from California (Redding), not least by Michaelsen, 1900].
- ?*49. *Eiseniella tetraedra pupa* (Eisen, 1874) [syn. *hercynius* Michaelsen, 1890; *tetraedra quadripora* Cernosvitov, 1942. Recorded from Niagra; Germany; Portugal; USA (California and Illinois) and UK. Possibly meriting only varietal status as synonym of *Ei. t. tetraedra*, or

maintained as a subspecies by some authors].

- *50. *Eiseniella tetraedra tetraedra* (Savigny, 1826) [many synonyms possibly including ?*Ei. tetraedra pupa* (Eisen, 1874) with syns. *hercynius* Michaelsen, 1890; *tetraedra quadripora* Cernosvitov, 1942 - according to Csuzdi & Zicsi (2003: 153) as the only differences of several *tetraedra* morphs are the locations of the male pores they could be either varieties rather than subspecies].
- 51. *Eisenoides carolinensis* Michaelsen, 1910 (syn. *pearsei* Stephenson, 1933).
- 52. *Eisenoides lonnbergi* (Michaelsen, 1894: 179) [originally *lönnerbergi*, sometimes spelt "loennerbergi" but, as the name is of Scandinavian rather than German origin (named for collector Dr Einar Lönnberg), under ICZN (1999: Art: 32.5.2.1) it is corrected with only the diacritic removed rather than changed to "oe"].
- *53. *Lumbricus castaneus* (Savigny, 1826)
- *54. *Lumbricus festivus* (Savigny, 1826)
- *55. *Lumbricus friendi* Cognetti, 1904 [in Washington-Baltimore Metropolitan Area (Csuzdi & Szlávecz, 2003)].
- *56. *Lumbricus rubellus* Hoffmeister, 1843
- *57. *Lumbricus terrestris* Linnaeus, 1758
- *58. *Murchieona muldali* (Omodeo, 1956) [nom. nov. pro *Allolobophora minima* Muldal, 1952 non *A. minima* Rosa, 1884 (= *Dendrobaena pygmaea*); the fate of *Allolobophora muldali* var. *pickfordi* Bouché, 1972 illegitimate varietal name is unknown. Note: *Mu. muldali* was resurrected from synonymy in *Mu. minuscula* Rosa, 1906 by Zicsi & Csuzdi (1999: 990)].
- *59. *Octolasion cyaneum* (Savigny, 1826) [some N. American studies confused it for *B. welchi*].
- *60. *Octolasion lacteum* (Örley, 1881) [described from Ohio by Olsen (1933)].
- *61. *Octolasion tyrtaeum* (Savigny, 1826)
- *62. *Satchellius mammalis* (Savigny, 1826)

Family OCNERODRILIDAE

- *63. *Eukerria saltensis* (Beddard, 1892)
- #64. *Ocnerodrilus occidentalis occidentalis* Eisen, 1878 [from Fresno; syns: *O. o.* var. *sinensis* Eisen, 1900; *O. tenellulus* Gates, 1945].
- ?#65. *Ocnerodrilus occidentalis arizonae* Eisen, 1900:116 [from Phoenix: possibly synonymous with *O. occidentalis*, or with one of its pathenogenetic morphs].
- ?#66. *Ocnerodrilus mexicanus hawaiiensis* Eisen, 1900:124 [from San Francisco, brought in from Honolulu, Hawaii: possibly synonymous with *O. occidentalis*, or with one of its pathenogenetic morphs].

Family ACANTHODRILIDAE

[Records of *Diplocardia* may overlap Mexican borders but no species classed as a Mexican native by Fragoso *et al.* (1995: 111, Appendix) are listed here; the genus is defined by two gizzards in 5 and 6, seldom 6 and 7 (e.g. Michaelsen, 1900: 324; Stephenson, 1930: 850; 1933); cf. James (1995: 33) who misleadingly states that in *Diplocardia*, as in *Diplorema*, there is but a single gizzard (albeit extending through two segments). The genus may belong in a revived and redefined (sub)family Diplocardi-inae/-idea – see Blakemore (2008a)].

Acanthodrilidae taxa, that seem to have been overlooked in all the above references (except for Michaelsen, 1900), are from the genus *Deltania* Eisen, 1893: 250 (non *Deltacanthus* Diaz-Ungria & Rodrigo 1958: 42. n.n. pro *Deltania* Diaz-Ungria & Rodrigo 1957: 12) that is listed as a homonym [on nomenclator <http://uio.mbl.edu/NZ/detail.php?uid=55691&d=1>], but was placed in synonymy of *Microscolex* Rosa, 1887 in Michaelsen (1900), viz.

Deltania benhami Eisen, 1893: 253 (= *Microscolex benhami*).

Deltania dubia Eisen, 1894: 22 (= a junior homonym and junior synonym of *M. dubius* (Fletcher, 1887) according to Michaelsen (1900) - from California).

Deltania elegans Eisen, 1893: 251 [= *Microscolex elegans* - from California; sometimes misdated "Eisen, 1892" e.g. Reynolds & Cook (1976)].

Deltania troyeri Eisen, 1893: 251 (?= *Microscolex troyeri troyeri*).

Deltania troyeri crassa Eisen, 1896: 169 (= *Microscolex troyeri*)

Deltania troyeri lagunae Eisen, 1896: 170 (= *Microscolex troyeri*)

-67. *Diplocardia alabamana* Gates, 1977

-68. *Diplocardia alba alba* Gates, 1943: 108 [from Fort Myers, Florida; other subspecies *D. alba mexicana* Gates, 1955: 229 and *D. alba gravida* Gates, 1977, overlooked or synonyms from Mexico (omitted from Fragoso *et al.*, 1995: 111, Appendix). Cf. *Eodrilus albidus* Gates, 1973: 22 (= ?*Microscolex*) - nom. nov. pro *Eodrilus albus* Gates, 1970: 267 (non *Diplocardia alba* Gates, 1943: 108) from a cave in Mexico cited as "*Diplorema albidus* .. Gates, 1970b, 1973" by Fragoso *et al.*, (1995: 111); non *Trigaster albida* Gates, 1973: 22 (= *Zapatadrilus albidus*) also from Mexico described in the same paper - this species was cited as "*albida*" in Reynolds & Cook (1976: 67), but miscited as "*T. alba* (see Gates, 1971; cf. *Zapatadrilus*)" in James (1991: 339), as "*Trigaster alba* Gates, 1973" in James (1991: 349), and as "*Z. albus*" or "*Zapatadrilus alba*" (sic) in James (1991: 347, 350, 352); finally corrected to *Zapatadrilus albidus* (Gates, 1973) in Fragoso *et al.*, (1995: 114); nec *Acanthodrilus albus* Beddard, 1895 (?=

Notiodrilus or ?*Microscolex*) from Chile].

- 69. *Diplocardia biprostatica* Gates, 1977
- 70. *Diplocardia bitheca* Gates, 1977
- 71. *Diplocardia bivesiculata* Murchie, 1961
- 72. *Diplocardia californiana* James, 1994
- 73. *Diplocardia caroliniana* Eisen, 1899 [originally *Diplocardia singularis caroliniana* – possibly a junior synonym as the only supposed difference is due to penial setae ornamentation].
- 74. *Diplocardia communis communis* Garman, 1888 (sometimes misspelt "Garmann" or "Garmon").
- ?-75. *Diplocardia communis wolcottii* Macnab & McKey-Fender, 1955 [omitted by James (1990; [1995](#)); type material stated as in the authors' collection].
- 76. *Diplocardia conoyeri* Murchie, 1961
- ?-77. *Diplocardia egglestoni* Murchie, 1958 [Murchie's original description cited online here: https://kb.osu.edu/dspace/bitstream/1811/4559/1/V58N05_270.pdf; sometimes retained as a parthenogenetic subspecies of *D. singularis egglestoni*, it is possibly a junior synonym; omitted by James (1990; [1995: 34, tab. 1](#)) cf. James ([1995: 36](#)) who miscites it as "*D. s. egglestoni* (Murchie 1958)" although braces around author are only needed if original genus is changed].
- #78. *Diplocardia eiseni* (Michaelson, 1894) [originally *Geodrilus eiseni* from Florida, also known from Mexico as a probable exotic; miscited by James ([1995: 34, tab. 1](#)) as "*D. eiseni* Mich. 1894" i.e. without the braces around author's name that are required by the Code – ICZN (1986; 1999) – if a species is removed to other than its original genus].
- 79. *Diplocardia farmvillensis* Gates, 1977
- 80. *Diplocardia floridana* F. Smith, 1924
- 81. *Diplocardia fusca* Gates, 1943 (from Fort Worth, Texas).
- 82. *Diplocardia fuscula* Gates, 1968
- 83. *Diplocardia gatesi* Murchie, 1965 [[Ref.](#)]
- 84. *Diplocardia glabra* Gates, 1967
- 85. *Diplocardia gracilis* Gates, 1943 (from Tennessee).
- 86. *Diplocardia hulberti* James, 1988
- #87. *Diplocardia invecta* Gates, 1955 (from Texas and Mexico).
- 88. *Diplocardia kansensis* James, 1990
- ?#89. *Diplocardia keyesi* (Eisen, 1896) [originally from Ensenada, Baja California, Mexico; listed in "**Table 1. The currently recognized names of North American earthworms from the area east of the Rocky Mountains**" by James ([1995: 34, tab. 1](#)), i.e. from USA, but possibly a mistake and it is thought confined to Mexico; two or three other similar

Californian taxa mentioned by Wood & James ([1993](#)) were subsequently described by James (1994); originally *Aleodrilus keyesi* the type of Eisen's (1896) genus].

?#90. *Diplocardia koebeli* Eisen, 1900: 197 [correction (by Michaelsen, 1900: 325) of "koebeli" from Mexico and listed by James (1990: 383) under Chapter heading "*Oligochaeta: Megascolecidae and other earthworm from southern and midwestern North America*" i.e. from USA, but possibly this is a mistake and it is thought confined to Mexico; this was type species of Eisen's (1900) subgenus *Naillenia*, more recently transferred to *Protozapotecia*].

-91. *Diplocardia komareki* Gates, 1977

-92. *Diplocardia longa* J. Moore, 1905

-93. *Diplocardia longiseta* Murchie, 1963

-94 *Diplocardia macdowellii* Murchie, 1967 (compared to *D. michaelseni*) [[Ref.](#)].

-95 *Diplocardia meansi* Gates, 1977

-96. *Diplocardia michaelseni* Eisen, 1899 [possibly has non-tubular prostates; redescribed by F. Smith (1923) and by Stephenson (1933: 930-934) as "not obviously tubular; each appears to be essentially a rather loose elongated mass irregularly bent on itself, but even when unraveled as far as possible and its bends displayed it does not form a definite cylindrical "tube""]; note that preservation techniques can sometimes distort prostate glands].

-97. *Diplocardia minima* Gates, 1977

-98. *Diplocardia mississippiensis* F. Smith, 1924

-99. *Diplocardia montana* James, 1994

-100. *Diplocardia nova* Gates, 1977 [sometimes held as a sub-species of *D. communis*].

-101. *Diplocardia ornata* Gates, 1943 (from Tennessee).

-102. *Diplocardia patuxentis* Csuzdi & Szlavecz, 2002

-103. *Diplocardia pettiboneae* Gates, 1977 [misspelled "*D. pettibonae* Gates 1977" by James ([1995: 34](#)) and this inadvertently copied to Blakemore ([2005/7](#)) website].

-104. *Diplocardia riparia riparia* F. Smith, 1895

?-105. *Diplocardia riparia prosenderis* Macnab & McKey-Fender, 1955 [possibly a junior synonym of the nominal sub-species Wetzel (1993), or (as by James, 1990: 384; Wetzel, 2007) listed at species level; unrepresented by type material which is listed in the authors' collection].

-106. *Diplocardia rugosa* James, 1988

-107. *Diplocardia sandersi* Gates, 1955

?-108. *Diplocardia singularis fluviatilis* F. Smith, 1915 [omitted by James (1990; [1995](#))].

-109. *Diplocardia singularis singularis* (Ude, 1893) [originally *Geodrilus singularis* from Danville,

Illinois, described as *D. communis singularis* (Ude) by Michaelsen (1900: 326); miscited by James ([1995: 34, tab 1](#)) as “*D. singularis* Ude 1893” – as braces are required when genus is changed from author’s original, cf. “*D. s. egglestoni*”].

- 110. *Diplocardia smithii* MacNab & McKey-Fender, 1955
- 111. *Diplocardia sylvicola* Gates, 1977
- 112. *Diplocardia texensis* F. Smith, 1924 (originally *Diplocardia keyesi* var. *texensis*).
- 113. *Diplocardia udei* Eisen, 1899 [possibly has non-tubular prostates and thus meriting transfer to another genus; not "*D. udei* Gates, 1955" as stated by James ([1995: 34, tab. 1](#))].
- 114. *Diplocardia vaili* Gates, 1977
- 115. *Diplocardia varivesicula* Murchie, 1966 (often misspelt "varivesiculata") [[Ref.](#)].
- ?-116. *Diplocardia verrucosa recta* Murchie, 1962 [omitted by James (1990; 1995)] [[Ref.](#)].
- 117. *Diplocardia verrucosa verrucosa* Ude, 1895 [type of Ude's (1900) subgenus *Omahania*, from Nebraska, Omaha and also recorded from New Mexico state, USA]. [[Ref.](#)].
- 118. *Diplocardia woodi* James, 1994
- 119. *Microscolex benhami* (Eisen, 1893) - from Alameda County, California.
- *120. *Microscolex dubius* (Fletcher, 1887) (synonyms include *Deltania dubia* Eisen, 1894, and *M. carolinae* Eisen, 1900 although this latter is sometimes retained without validation).
- 121. *Microscolex elegans* (Eisen, 1893) - from Golden Gate Park, San Fransico, California.
- *122. *Microscolex phosphoreus* (Dugès, 1837) [synonyms probably include *Microscolex hempeli* F. Smith, 1896 and its synonyms: *M. parvus* + *M. parvus carolinianus* Eisen, 1900].
- 123. *Microscolex troyeri* (Eisen, 1893) (originally *Deltania troyeri* from Golden Gate Park, San Fransico; synonyms, *Deltania troyeri crassa* + *Deltania troyeri lagunae* Eisen, 1896); possibly a synonym of *M. phosphoreus*.

Family OCTOCHAETIDAE (Benhamiinae)

- *124. *Dichogaster (Diplotheodrilus) affinis* (Michaelsen, 1890) [From Florida and Galapagos by Csuzdi (1997: 37; 2000: 59)].
- *125. *Dichogaster (Diplotheodrilus) bolau* (Michaelsen, 1891)
- *126. *Dichogaster (Diplotheodrilus) modiglianii* (Rosa, 1896) [From Florida by Csuzdi (1997)].
- *127. *Dichogaster (Diplotheodrilus) saliens* (Beddard 1893)

Family MEGASCOLECIDAE

(natives allocated in tribe Argilophilini after Fender & McKey-Fender, 1990: 370 although this name competes for priority with Vejdovsky's (1884: 63) Pontodrilidae and Plutellidae)

- 128. *Arctiostrotus adunatus* McKey *et.al.* in Fender, McKey-Fender & Marshall, 1994
- 129. *Arctiostrotus altmani* (Gates, 1942) [sometimes cited as Macnab & McKey Fender, 1948 due

- to mistake in Reynolds & Cook (1976); replacement name for *Plutellus decathecus* Altman, 1936 non Michaelsen, 1910 (= *Vesiculodrilus decathecus*) from Tasmania].
- 130. *Arctiostrotus fontinalis* McKey *et.al.* in Fender, McKey-Fender & Marshall, 1994
 - 131. *Arctiostrotus johnsoni* McKey *et.al.* in Fender, McKey-Fender & Marshall, 1994
 - 132. *Arctiostrotus perrieri* (Benham, 1892)
 - 133. *Arctiostrotus pluvialis* McKey *et.al.* in Fender, McKey-Fender & Marshall, 1994
 - 134. *Arctiostrotus vancouverensis* McKey *et.al.* in Fender, McKey-Fender & Marshall, 1994
 - 135. *Argilophilus collinus* Eisen, 1900 (originally *Argilophilus marmoratus collinus*).
 - 136. *Argilophilus garloughi* (F. Smith, 1937)
 - 137. *Argilophilus hammondi* (McKey-Fender, 1970: 235)
 - ?-138. *Argilophilus hyalinus* Eisen, 1900 [reported from Guatemala - known only from the description of a single, macerated specimen – and thus an unlikely introduction from NW USA where the remainder of the genus is found in America. Probably requires generic reallocation and removal from the North American list].
 - 139. *Argilophilus margaritae* James, 1994
 - 140. *Argilophilus marmoratus marmoratus* Eisen, 1893
 - ?-141. *Argilophilus marmoratus ornatus* Eisen, 1893; Sebastopol, California
 - 142. *Argilophilus panulirus* (MacNab & McKey-Fender, 1959)
 - 143. *Argilophilus papillifer* Eisen, 1893 (originally *Argilophilus marmoratus papillifer*); Berkeley, California.
 - 144. *Argilophilus sierrae* (Michaelsen, 1921)
 - 145. *Argilophilus woodi* James, 1994
 - 146. *Chetcodrilus exutus* (MacNab & McKey-Fender, 1958: 107) [originally *Plutellus fenderi exutus*].
 - 147. *Chetcodrilus fenderi* (MacNab in MacNab & McKey-Fender, 1958: 103)
 - 148. *Chetcodrilus umbellulariae* (MacNab & McKey-Fender, 1958)
 - 149. *Drilocheaera chenowithensis* (McKey-Fender, 1970: 240)
 - 150. *Driloleirus americanus* (F. Smith, 1897)
 - 151. *Driloleirus cascadenis* (F. Smith, 1937)
 - 152. *Driloleirus eiseni* (F. Smith, 1937)
 - 153. *Driloleirus macelfreshi* (F. Smith, 1937)
 - 154. *Driloleirus michaelsoni* (F. Smith, 1937)
 - 155. *Driloleirus wellsi* (Altman, 1936)
 - 156. *Kincaidodrilus kincaidii* (Altman, 1936)
 - 157. *Macnabodrilus hopsonae* (McKey-Fender, 1970: 225) [Reynolds & Cook (1992: 9) miscite this taxon as the type of the genus (cf. *M. macnabi*), they also misdate it as "1957"].

- 158. *Macnabodrilus macnabi* (McKey-Fender, 1957) [type of genus].
- 159. *Nephrallaxis blacki* (MacNab & McKey-Fender, 1953)
- 160. *Nephrallaxis davisi* (MacNab & McKey-Fender, 1953)
- 161. *Toutellus adecus* (MacNab & McKey-Fender, 1959)
- 162. *Toutellus hyoiedes* (MacNab & McKey-Fender, 1959) (misspelt "hyoides" in Reynolds & Cook, 1992: 16).
- 163. *Toutellus oregonensis* (F. Smith, 1937)
- 164. *Toutellus toutellus* (Altman, 1936)
- *165. *Amyntas agrestis* (Goto & Hatai, 1899) [introduced into North America eg. reported from New York, Connecticut and Louisiana by Gates (1958: 1) and by Gates (1982) who thought it imported from Japan; also from Georgia (Callaham *et al.*, 2004); and North and South Carolina and Tennessee (Wetzel, 2005). (Syn. *Pheretima striata* Ishizuka, 1999, for fuller details - see Blakemore (2003, 2005, 2008b)].
- *166. *Amyntas corticis* (Kinberg, 1867) [many synonyms including *Megascolex diffringens* Baird, 1869].
- *167. *Amyntas gracilis* (Kinberg, 1867) [many synonyms including *Perichaeta hawayana* Rosa, 1891].
- *168. *Amyntas hupeiensis* (Michaelsen, 1895) (first recorded in Washington, D.C. in 1910, since spread to other States, eg. New York, Maine, Connecticut, Florida, Philadelphia, Illinois, North and South Carolina, Tennessee). Gates (1958: 17-20) thought American worms in greenhouses, (?turf farms), and golf courses may have been introduced from Japan.
- *169. *Amyntas loveridgei* (Gates, 1968)
- *170. *Amyntas minimus* (Horst, 1893)
- *171. *Amyntas morrissi* (Beddard, 1892)
- *172. *Amyntas rodericensis* (Grube, 1879)
- *173. *Amyntas tokioensis* (Beddard, 1892) **new US record from synonyms.** [Syns. reported from Schenectady, New York City, and New Jersey as *Pheretima levis* (Goto & Hatai, 1899) by Gates, 1958: 21-24 (?syns. *irregularis*, *ambigua*, *vittata*, *schizopora*) by Gates (1958: 21-22) or as *Metaphire levis* (Goto & Hatai, 1899) by Easton (1981: 53); although incorrectly cited as "*Metaphire levis* (Horst, 1893)" from North Carolina and Tennessee, USA by Wetzel (2005), and as *Amyntas vittatus* (Goto & Hatai, 1898) from Ashford, northeastern Connecticut by Schneider & McDevit (2002); (comb. and syns. novae, *vittata*, *schizopora*, *irregularis*, *levis*, *gucheonensis*, *jiriensis*, *verticosa*, *yongshilensis* Hong & James, 2001, *eastoni* Hong & James, 2001, *boletiformis* Hong & James, 2001, *paiki* Hong, 2001), - see Blakemore (2003, 2005, 2008b) for full details].
- *174. *Metaphire californica* (Kinberg, 1867)

- *175. *Metaphire hilgendorfi* (Michaelsen, 1892) [reported from Louisiana and Middleburgh, Virginia by Gates (1958: 11-12) and from South Carolina and Tennessee by Wetzel (2005); for numerous and full synonymy - see Blakemore (2003, 2005)].
- *176. *Metaphire houlleti* (Perrier, 1872)
- *177. *Metaphire posthuma* (Vaillant, 1868)
- *178. *Perionyx excavatus* Perrier, 1872
- *179. *Pithemera bicincta* (Perrier, 1875)
- *180. *Polypheretima elongata* (Perrier, 1872)
- *181. *Pontodrilus litoralis* (Grube, 1855)

Family GLOSSOSCOLECIDAE

- *182. *Pontoscolex corethrurus* (Müller, 1856)

Family EUDRILIDAE

- *183. *Eudrilus eugeniae* (Kinberg, 1867)

Species dubius

Hypogaeum hirtum Savigny, 1820: 104 terrestrial from Pennsylvania (Philadelphia), listed as *species dubius* in Michaelsen (1900: 519); types missing.

Lumbricus apii Kinberg, 1867:100 described from Sausalita Bay, San Francisco but abandoned after Michaelsen's (1900: 520) *species dubius* listing; types are in Leiden: 1939.

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[End of North American Checklist – an Appendix follows].

***Appendix** – Sims' (1980: 108) reasons for synonymy of Komarekionidae in Ailoscolecidae, presented by him in a footnote:

“The similarities between Ailoscolex Bouché, 1969 and Komarekiona Gates, 1974 have not been recognized previously, possibly because of a printing error in Bouché's monograph (1972). In this work, the diagnosis of the family Ailoscolecidae included the statement "Glande de Morren presente" (p. 197), whereas in the account of the anatomy of A. lacteospumousus there is the conflicting statement "Glande de Morren absente" (p. 199). The absence of calciferous glands however, was previously established in the original descriptions of the family and species (Bouché, 1969: 526, 529 & 530).”