

## Hibernian reports of a new Franco-Iberian worm (Oligochaeta: Megadrilacea: Lumbricidae)

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**Abstract.** A continental European earthworm, *Kenleenus armadas* sp. nov., is newly described from an introduction to a farm in Dublin, Ireland. Previously recognized as Aquitainian *Proselodrilus amplisetosus* Bouché, 1972, the morphology and molecular characteristics rather indicate it as a taxon new to science. Its description has required revision of all proselodrilid genera including Algerian subgenus *Maghrebiella* Baha & Berra, 2001 that is a permanently invalid homonym, here replaced with *Cadanera* nom. nov. A revised checklist is appended that holds *Allolobophora festae* Rosa, 1892 as a *species incertae sedis* pending review of the *Cadanera* type. This report brings the total earthworms known from Britain & Ireland to 72 species, including a new record of cosmopolitan *Pithemera bicincta* (Perrier, 1875) (Megascolecidae) from Dublin's Botanic Gardens.

**Keywords.** Alien exotic earthworms, new species, Ireland, Europe, Mediterranean, DNA barcode.

### INTRODUCTION

Melody & Schmidt (2012) recently reported *Proselodrilus amplisetosus* Bouché, 1972 as an introduction to Ireland, supposedly from Aquitaine France, and attributed its increased range to global warming. Placement of these specimens sent to the author required revision of the Franco-Iberian genus *Proselodrilus* Bouché 1972. Originally comprised of about a dozen species, Qiu & Bouché (1998c) proposed 16 new species or subspecies with a few others transferred to two newly erected subgenera that then raised the total to ca. 30 (sub)species. Baha & Berra (2001) described one further species and proffered: “splitting the genus *Proselodrilus* Bouché 1972 into two subgenera: the nominal one, including the species living in southwestern France, and a new subgenus inhabiting Maghreb and Sardinia.” Oblivious to previous subgenera, they proposed the name *Maghrebiella* but its type was not explicit, possibly *Proselodrilus doumandjii* Baha & Berra, 2001 or the other species they provisionally included: “*P. (M.) festai*” (sic = *Allolobophora festae* Rosa, 1892).

Originally found in Tunisia (most likely by introduction) but soon recognized as abundant on Sardinia (Rosa 1893), this taxon was maintained

as “*Helodrilus (Allolobophora) festae*” by Michaelsen (1900: 486). However, Zicsi (1985: 284) reviewed type material and excluded it from *Helodrilus* Hoffmeister, 1845 because of its U-shaped nephridial bladders [Cs. Csuzdi pers. comm. 21<sup>st</sup> Nov., 2012, although Csuzdi (2012: <http://earthworm.uw.hu/index.php>) again has “*festai*” there]. In contrast, Qiu & Bouché (1998d: 196) maintained “*festai* (Rosa, 1892)” in *Helodrilus* whilst, according to Omodeo *et al.* (2003: 458) and Omodeo & Rota (2008: 72, fig. 5), “*festai*” and its four subspecies belong in *Proselodrilus* (although I can find no report of its subspecies nor their “*Proselodrilus* sp. n.”). Most recently, Blakemore (2008a: 16) held it in its original state as: *Allolobophora festae* Rosa, 1892 *species inquirendum* (cf. Appendix 1).

Three other taxa Baha & Berra (2001) thought similar to *Maghrebiella* were already placed by Qiu & Bouché (1998b) in genus *Eumenescolex*. Recent accounts of these genera by Blakemore (2004, 2008a) questioned some of these inclusions and suggested that all *Proselodrilus* subgenera required revision. Here all three subgenera are reviewed and elevated with some species redistributed. A checklist of revised taxa is appended (Appendix 1) along with mtDNA COI gene barcode for the new species (Appendix 2, plus <http://blast.ncbi.nlm.nih.gov> BLAST results).

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## TAXONOMIC RESULTS

*Maghrebiella* Baha & Bera, 2001 is a permanently invalid junior homonym of *Maghrebiella* Lacourt 1988 (Hymenoptera) (see Nomenclator Zoologicus: <http://uio.mbl.edu/NZ/>) thus a replacement name is required. The name *Cadanera* nom. nov. (feminine) is newly provided based on a noun in apposition of a variety of orange (*Citrus sinensis* L.) cultivated in both Spain and Algeria (hence a possible route of its introduction and distribution). The type-species is here fixed as *Proselodrilus doumandjii* Baha & Berra, 2001 since the authors merely state that “the same applies to *H. festai*”.

### Revision of Genera (chronological)

#### *Proselodrilus* Bouché, 1972 *sensu stricto*

*Diagnosis.* (Following Qiu & Bouché, 1998c *cf.* Baha & Berra, 2001: 90, tab. 1). Lumbricidae. Small to large size (48–232 mm). Unpigmented (mostly). First dorsal pore 4/5–9/10(12/13). Setae closely paired (*cf.* wide in *Kenleenus*). Clitellum in some of 19–32. TP in some of 21–28. Spermathecae paired or multiple in 12/13–13/14 or 13/14–14/15. Calciferous glands in 11–14 with dilations in 11 and sometimes in 13 too (*cf.* in 10–14 with diverticula in 10 in *Cadanera* and *Eumenescolex*). Nephridial vesicles vary: J- or U-shaped often (but not always, despite Qiu & Bouché’s claim which differs from their figures!) with a proximal bulb, at least after anterior; never digitoid (as in *Pyrenodrilus*). (Seminal vesicles in 11 & 12). Typhlosole bifid or trifold/multiple.

#### *Pyrenodrilus* Qiu & Bouché, 1998 *stat. nov.*

*Diagnosis.* As for *Proselodrilus* (size 35–335 mm; setae closely paired; dorsal pores from 4/5–9/10; calciferous glands 11–14 with dilations in 11), but nephridial vesicles (except in anterior segments) digitoid or sometimes ocarina-like with meatus opening ventrally (or in *bidasoanus*, mesially) into basal bulb. Typhlosole bifid or trifold/multiple.

#### *Kenleenus* Qiu & Bouché, 1998 *stat. nov.*

*Diagnosis.* As for *Proselodrilus* but small <100 mm and setae separate (or ‘loosely’ paired). Prostomium prololobous to tanylobous. Dorsal pores from 4/5(6/7) (or newly 7/8 in *Ke. armadas* sp. nov.). Clitellum some of 19–29(30). TP some of 19–23. Spermathecae paired in (12/13) 13/14–14/15. Calciferous glands variable, absent or in some or all of ½10, 11, 12–14 with dilations in 10 or 11 (or sometimes in 13 in type and *Ke. armadas*). Nephridial vesicles U-shaped sharply curved and reclining almost their whole length (hairpin-like) without bulbs (as in some *Proselodrilus*). Typhlosole bifid.

#### *Eumenescolex* Qiu & Bouché, 1998 *stat. nov.*

*Diagnosis.* Lumbricidae. Size 37–112 mm. Setae closely paired. Dorsal pores from 10/11–13/14 (*cf.* *Cadanera*). Clitellum some of (21)22–36. TP in some of (23)25–33. Spermathecae paired in 11/12–13/14, 12/13/14 or just 13/14. Calciferous glands in 10–14 with diverticula in 10 (as in *Cadanera*, *cf.* *Proselodrilus*). Nephridial vesicles fish-hook or J-shaped (longest arm proximal without bulb *cf.* *Proselodrilus*). Typhlosole pin-nate (“laminated” in *proclitellatus*; unclear in *simplex*).

#### *Cadanera* gen. nov.

Nom. nov. pro *Maghrebiella* Baha & Bera, 2001 (non Lacourt 1988, Hymenoptera); *genus inquirendum*.

*Diagnosis.* As for *Proselodrilus* [setae closely paired (*cf.* *Kenleenus*), dorsal pores from 4/5/6, spermathecae paired in 13/14/15 (*cf.* 12/13/14 in *Eumenescolex* and *festae*), but small (<55 mm) and calciferous glands in 10–14 with diverticula in 10 (as in *Eumenescolex* *cf.* 11–14 in *Proselodrilus* and in *festae*)]. Clitellum 23,24–33. TP 29–31. Nephridial vesicle form unreported (hence *inquirendum*). Typhlosole bifid (or trifold or sometimes absent? *cf.* cylindrical in *festae*). (Seminal vesicles four pairs, *cf.* two in *festae*).

*Remarks.* *Allolobophora festae* Rosa, 1892 is now held *incertae sedis* (Appendix 1), whereas

*Proselodrilus (Kenleenus) occidentalis* Qiu & Bouché, 1998 (?= *Pr. amplisetosus* sensu Souto *et al.*, 1991) is possibly congeneric, despite its wide setae, by virtue of calciferous diverticula in 10 – these placements dependent upon determination of the type-species’ nephridial state (see Tab. 1).

### Distribution of Genera

Genus *Eumenescolex* is from Provence (Maures, France), Corsica, Sardinia, Campania (Italy) and Valencia (Spain); Qiu & Bouché’s other genera are mainly from Aquitaine region of SW France, the Pyrenees and the Basque region into

northern Spain with a few Mediterranean records [e.g. southern Italy and, according to Omodeo & Rota (2008: 72), Catalonia – although I cannot find this latter report, there is one from adjacent Valencia]. Genus *Cadanera* is from Algeria (imported?) (*cf. festae* in Tunisia and Sardinia). Souto *et al.* (1991) found “*Proselodrilus amplisetosus*” as a human-mediated introduction to La Coruña (Galicia, Spain) – this same material (really?) later described as *Pr. occidentalis* Qiu & Bouché, 1998 extending the generic range past the Cantabrian Cordillera (although likely introduced to Spain too), and Krough *et al.* (2007) reported *Pr. amplisetosus* from Dijon in central France.

**Table 1.** Contingency table of ‘Proselodrilid’ genera having spermathecal pores ca. 11/12-14/15

Genus	Setae	Nephridial vesicles	Ca Glands	Typhlosole
<i>Proselodrilus</i>	Close	J- or U-shaped (bulb)	11-14 dilated 11 (& 13)	Bifid-trifid/multi
<i>Pyrenodrilus</i>	Close	Digitoid/ocarina	11-14 dilated 11 (& 13)	Bifid-trifid/multi
<i>Kenleenus</i>	Wide	U-shaped (no bulb)	Variable (10,11-13,14) dilated in 11 (& 13)	Bifid
<i>Eumenescolex</i>	Close	J-shaped (no bulb)	10-14 diverticula in 10	Pinnate (always?)
<i>Cadanera</i>	Close?	?	10-14 diverticula in 10	Bifid (always?)

### Description of a New Species

#### *Kenleenus armadas* sp. nov.

(Figures 1–2)

*Proselodrilus amplisetosus*: Souto *et al.* 1991: 79, fig. 1?, Keith & Schmidt 2012; Melody & Schmidt 2012 – identifications revised herein.

**Material examined.** *H*, holotype (Natural History Museum London NHMUK 2012.96), figured (Fig. 1) and dissected plus DNA sampled (Appendix); *PI* (NIBR INV0000261271) figured (Fig. 2) and bisected; *P2* (NHMUK 2012.97); *P3–P5*, paratypes in formalin inspected (NIBR INV 0000261272). Specimens mainly matures, in two batches sent by O. Schmidt from Dublin 22<sup>nd</sup> Oct., 2012: one set of three (#1) ethanol preserved, the other (#2) fixed in formalin. Earlier specimens (topotypes) as “*Pr. amplisetosus*” sent by Olaf Schmidt to Emma Sherlock in NHMUK London. First found from near Dunleer, County Louth, a single specimen sampled 3<sup>rd</sup> October 2006 in the National Museum of Ireland (Dublin NHM) (O. Schmidt pers. comm. 10<sup>th</sup> April, 2010). The cur-

rent specimens were reported as common on urban “Airfield farm” Dundrum in County Dublin (53°14’N, 6° 14’W, 75 m elevation).

**Etymology.** Noun in apposition, alluding to Spanish and French Armadas of 1588 and 1779 having slight historical connection of these countries (whence the species is presumed to originate) with Britain & Ireland, albeit introduction of this worm is presumably more recent.

**Description.** In life, a rosy, pinkish colour due to sub-cutaneous capillaries. Preserved, an unpigmented pale yellow, dorsal vessel intermittently visible; clitellum white. First and last segments are slightly striated. Length *H* 35 mm, *Ps* ca. 40–65 (all appear somewhat contracted). Segments *H* 165, *PI* 154. Prostomium small, closed epilobous. Setae widely paired, some slightly irregular in anterior and after clitellum. First dorsal pore 7/8. Nephropores not readily visible (possibly in b lines from internal inspection). Spermathecae 13/14/15 in *d* lines. Female pore indistinct as slits lateral of *b* setae on 14. Male pores in 15/16 la-

teral of *b* lines within tumid lips. Genital tumescences around *ab* on 11 and 13 (*H*) or just on 13 (*Ps* plus unilateral on 11lhs in one and 14rhs in another). Clitellum  $\frac{1}{2}$ 19–28,  $\frac{1}{2}$ 29. Tubercula pubertates (TP) flared, mostly in 20–21 but slight lateral bands extend into 19 and/or 22. Segment 22 is slightly expanded ventrally in two paratypes.

Internally (*H*, *PI*), septa stronger to 8/9/10. Hearts 7,8–11. Testis free and iridescent in 10 & 11. Seminal vesicles small and difficult to see, apparently weak anteriorly in 11 & 12 in *H*, possibly also in 10 in *PI*. Ovaries as long egg-string in 13, small ovisacs seen anteriorly in 14. Nephridial bladders difficult to discern in anterior, possibly sausage-shaped, after about segment 10 they are tightly U-shaped (almost like blunt hairpin) without pronounced terminal bulb. Calciferous glands in 11–13, less dilated in 12, with some incursion into 10 and 14 (so range within 10–14). Oesophagus dilates in 15 to crop in 16 and muscular gizzard in 17–18 (septum 17/18 to its midriff). Typhlosole bifid (like an inverted T-shape) from around 21. Gut contains mainly colloidal mucus (specimens stored and starved before preservation?). No obvious parasites. DNA in Appendix.

*Remarks.* *Proselodrilus*-like species known to have clitella in 19–29 (or 20–28) are: *Proselodrilus biserialis* and *Pr. proporus* or *Kenleenus amplisetosus* and *Ke. ticalus*, possibly also *Ca. occidentalis*. Of these, those with TP in or near 20–21 are: *Pr. proporus*, *Ke. amplisetosus* and *Ca. occidentalis*. However, *Pr. proporus* in Qiu & Bouché (1998c: 42, fig. 5, tabs. 1, 2) differs from *Ke. armadas* in having a prolobous prostomium; female pores anteriorly on 14 in setal *a* lines (hence its specific epithet); clitellum in 20–29,30; TP in 20–22 inclusive; spermathecae in 13/14/15 in *c–d* (described) or *d* and above (figured) that are simple or doubled or sometimes tripled, and also by virtue of characteristics of its nephridial bladders. Both *Ke. amplisetosus* and *Ca. occidentalis* differ according to their prostomia, dorsal pore commencement and apparently on genital papillae and tubercula pubertates. Nephridial bladder and calciferous gland details appear variable in these two taxa despite being critical even for generic placement (see Tab. 2).

Subspecies, *Ke. am. hexathecosus* Bouché, 1972 was for the first time formally described and distinguished from its nominal subspecies by Qiu & Bouché (1998c: 40, fig. 3, tab. 4) on its epilobic prostomium, first dorsal pore in 4/5, spermathecal pores simple in *c* (described) or in mid *c–d* lines (figured), clitellum in 19–27 and TP in 19–21 with genital papillae in 14 & 20. Despite its name, rather than six only four spermathecae occur in this subspecies from Qiu & Bouché (1998c) with six possible in *Pr. am. amplisetosus*.

Possibly the current taxon only merits subspecific status too, nevertheless morphological differences presumably exclude additions by Souto *et al.* (1991) that perhaps came closer to *Ke. armadas* albeit these same specimens (“Ce taxon a été initialement identifié comme *Proselodrilus amplisetosus amplisetosus* (Souto *et al.*, 1991) [sic]” – Qiu & Bouché 1998c: 45) were apparently redescribed as *Pr. occidentalis* Qiu & Bouché, 1998 that “differs by the position of the dorsal pore, absence of longitudinal striations on peristomium, the form of the clitellum, the well developed male pores and the calciferous glands with diverticula in 10. The last character is exceptional in the genus [*Proselodrilus*]” (translation of Qiu & Bouché 1998c: 46). Data and discrepancies are summarized in Table 2.

## DISCUSSION

Of 23,000 Annelida with 10,000 Oligochaeta and 6,000 Megadrilacea, the Family Lumbricidae from a total of about 1,130 names (~17% of megadriles) has about 670 valid species with another 55 or so uncertain shared amongst 63 genera (see Blakemore 2008a). Justification of lumbricid genera on their nephridial vesicles has precedent from, for example, *Eisenia* Malm, 1877 and *Eiseniella* Michaelsen, 1900 that are usually described with sausage-shaped bladders while *Eisenoides* Gates, 1969 from North American has U-shaped bladders – this being all that morphologically separates *Eisenoides carolinensis* Michaelsen, 1903 from *Eisenia koreana* (Zicsi, 1972) and similar new species in Korea (see Blakemore & Park 2012).

Table 2. *Kenleenus* and *Prosellodrilus* species after Qiu & Bouché (1998c) and pers. obs.

Character	<i>Ke. armadas</i> sp. nov.	<i>Pr. proporus</i>	<i>Ke. a. amplisetosus</i> *
Length (mm)	35–65	58–95	40–60
Segments	154–165	112–236 (or 262?)	142–173
Prostomium	Epilobic, closed	Prolobic	Prolobic (or open epilobic*)
Setae	Widely paired (= separate)	Closely paired	Separate
Ratio aa:ab	4:1	3:1	2:1 (or 4:1*)
1 <sup>st</sup> dorsal pore	7/8	7/8	(5/6*)6/7
Female pores	Lateral of <i>b</i> on 14	Anterior of <i>a</i>	(Anterior of <i>b</i> *)
Spermathecal pores	13/14/15 in <i>d</i>	13/14/15 in <i>cd</i> , simple or double	(12/13)13/14/15 in <i>d</i> lines, simple or double
Papillae in ab	10(11 lhs) and/or 13(14 rhs)	13, 14 & 15	(13, 14, 20 & 22*)
Clitellum	19, ½19–28, ½29	20–29, 30	19–28 (or 19–28, 29*)
TP	(½19)20–22 (mostly 20–21)	20–22	19–½22 (or ½19–22*)
Nephridial bladders	U-shaped (indistinct in anterior) without bulb	J-shaped often with bulb at base	U-shaped (or J-shaped*) without bulb
Spermathecae	Round in 14 and 15, paired	Pyriform, simple or double (triple)	Simple pair (or variable, double sometimes extra in 13*)
Seminal vesicles	(10) 11 & 12 weakly developed	11 & 12	11 & 12 (racemose*)
Ovisacs in 14	Weak	Well developed	Small or absent
Ca Glands	10, 11–13, 14 dilated in 11 & 13	11–14 dilated in 11 & 13	Variable, absent or in (10), (11), 12–14 with dilation in 13 (or 11–13 with dilation in 11*)
Gizzard	17–18	17–18	17–18
Typhlosole	Bifid or T-shaped from 21	Bifid from 21/22	Bifid from 21/22

\*Additional information from Souto *et al.* (1991) – but see Discussion on *Ca. occidentalis*.

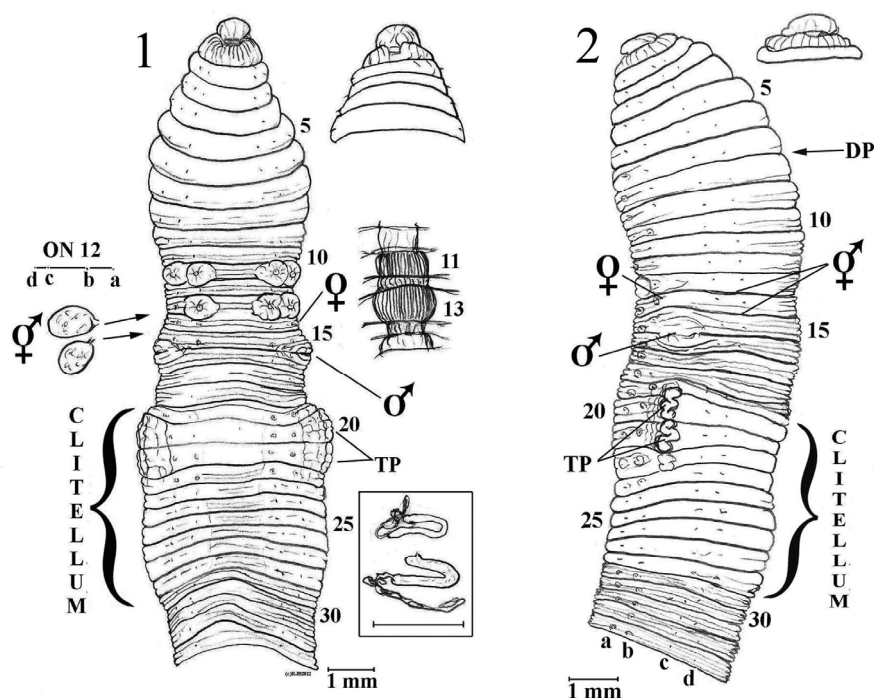


Figure 1-2. 1 = *Kenleenus armadas* sp. nov. Holotype, ventral view of body and dorsal view of prostomium; spermathecae and calciferous glands *in situ*; actual setal ratios on segment 12. [Boxed is X2 enlargement of nephridia in 19rhs and ca. 40rhs].  
2 = *Ke. armadas* P1, lateral view of body and dorsal view of prostomium. DP – dorsal pores; TP – tubercula pubertates.

It was noted that athecal worms in genus *Bimastos* Moore, 1893 in America when preserved may superficially resemble *Proselodrilus* during description of another similar but athecal lumbricid, *Eisenia anzac* Blakemore, 2011 from Japan (see Blakemore & Grygier 2011). As already noted, *Helodrilus* Hoffmeister, 1845 was characterized by lack of nephridial bladders, but these were intermittent in *Helodrilus hachiojii* Blakemore, 2007 also from Japan, with the extent of reduction of bladders probably no less subjective than cut-off for whether setae are closely or widely paired, despite this being a key character for lumbricids.

The new Franco-Iberian species (*Ke. armadas*) introduced directly or indirectly to Ireland raises the total of earthworm species from Britain and Ireland to ca. 72 taxa (Blakemore 2008b), including cosmopolitan megascolecids *Amyntas corticis* (Kinberg, 1867) and *Pithemera bicincta* (Perrier, 1875) from Dublin Botanic Gardens (material in Tokyo National Museum sent by Dr Olaf Schmidt of University College Dublin to the author for identification in 2011). Also kindly sent by Dr Olaf Schmidt were an unidentified “monster” specimen from grassland in Dublin Airport (courtesy of Alice D’Arcy, University College Cork, NHMUK 2012.98) with clitellum 49–65 having two sets of female pores, displaced male pores and asymmetrical markings; plus three specimens (NIBR INV0000261273) from Tomnafinnogue Wood, from Waterford and Dublin’s Botanic Gardens of *Dendrobaena attemsi* (Michaelsen, 1903) that was also recently discovered in New Zealand (Blakemore 2012).

Type specimens of *Cadanera doumandjii* (Baha & Bara, 2001) were found “in an orange plantation on hydromorphic soil” possibly with soil moisture due to drainage or irrigation. Previously, Baha (1997) had recorded other species from the same site, but collected at different times with different methods to those used in Baha & Berra (2001). They said *P. doumandjii* specimens numbered 500 – a large population and coincidentally the same number as identified by Baha (1997: 252) from the whole of Algeria – and they

gave a segmental range of 60 adults but only listed six types and no other species. Claimed earlier from the same site by Baha (1997) were: “*Nicodrilus caliginosus*” (sic = *Aporrectodea caliginosa* spp-complex including *A. borellii*), *Allolobophora chlorotica*, *A. rosea* (= *Aporrectodea rosea*), *A. minuscula* (sic = *Murchieona minuscula*), *A. molleri* (= *Eophila molleri*), “*Helodrilus antipai* (Michaelsen, 1891)” (sic = *Proctodrilus antipae*), *Octodrilus complanatus*, *Eiseniella tetraedra* and *Microscolex phosphoreus* plus an *Amyntas* sp.” (this oriental genus was mistakenly classed as a “cosmopolitan taxon, native of India”!). All these common exotic species (Blakemore 2010) give more weight to *Cadanera doumandjii* similarly being a non-endemic introduction rather than an endemic worm as thought by Omodeo *et al.* (2003: 463).

Melody & Schmidt (2012) discovered “*Proselodrilus amplisetosus*” (here as *Ke. armadas* sp. nov.) with its range extension inferred as due to ‘global warming’. However, recent and historical trade are likely routes of introduction to Ireland and, moreover, soil temperature is more equable at depth, it being a subsoil species. Aside from legendary “Míl Espáine” or archaeological evidence of tribal “Brigantes” and Roman occupancy (e.g. at Drumanagh near Dublin), Aquitaine was historically linked with Anglo-Norman dominion until the end of the Hundred Years’ War in 1453 and much Bordeaux wine at least was imported. Transportation of species to Algeria (from Spain and/or Sardinia?) was possibly with citrus trees/ root stocks, as is suggested for *Ca. doumandjii*.

*Kenleenus armadas* appears particularly similar to what Souto *et al.* (1991) had reported as “*P. amplisetosus*” in Spain that they noted differed somewhat from the original description, as well as with that presented in Qiu & Bouché (1998c) (see Tab. 2), based on material which became types of what Qiu & Bouché (1998c: 45, fig. 8, tab. 4) redescribed (quite differently!) as *Proselodrilus occidentalis*, here provisionally placed in genus *Cadanera* as *Ca. occidentalis* due to its calciferous diverticula in segment 10. Considerable discrepancies between these two sets of authors’

descriptions of what are supposed to be the same specimens (with regards to Souto *et al.* 1991 vs. Qiu & Bouché 1998c, respectively) include:

1/. Prostomium (epilobous vs. prolobous); 2/. Dorsal pores (5/6/7 vs. 4/5); 3/. Female pore location (lateral of *b* vs. anterior of *b*); 4/. Spermathecal pore location (in *d* vs. in *c*); 5/. Clitellum (19–28,29 vs. 19–½29); 6/. TP (½19–22 vs. just 20–21 as figured); 7/. Genital tumescences (13 & 14, 21, 22 vs. “13, 22: 23”?) or figured in just 13 and 22); 8/. Nephridial form (J-shaped vs. U-shaped); 9/. Calciferous glands (11–13 dilated in 11 vs. ½10–14 with diverticula in 10! and dilated in 13); 10/. Spermathecae (variation and duplication vs. simple paired).

Original authors are invited to reconfirm their respective descriptions.

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## APPENDIX 1

### Species Checklist (alphabetical and annotated)

Although there seems no rational system in the order of taxa in Qiu & Bouché (1998c), their Tables 2–4 have what I take to be the type-species of subgenera as first entries; but since explicit designations are not found in this paper, they may have been fixed earlier (see Blakemore 2004: 111 or 2008a: 60.) and are as given herein. In their *Proselodrilini* tribe, Qiu & Bouché (1998d: 184) include *Italobalkaniona* Mrsic & Sapkarev, 1988 (type-species: *Eophila pyrenaicoides* Sapkarev, 1977) that is comparable to both *Eophila* and *Karpatodinariona* (see Blakemore 2008a).

*Cadanera* Blakemore, 2012 nom. nov. pro *Maghrebiella* Baha & Berra, 2001 (preocc.). (Type-species *Proselodrilus doumandjii* Baha & Berra, 2001, new designation; cf. *A. festae* Rosa, 1892).

*Ca. doumandjii* (Baha & Berra, 2001: 88). Comb. nov.; *species inquirendum*. [Possibly it belongs in *Eumenesclex*, *Proselodrilus* or *Pyrenodrilus* depending on its nephridia].

?*Ca. occidentalis* (Qiu & Bouché, 1998c: 45) (non *occidentalis* Michaelsen, 1922, nec Graff, 1957). Comb. nov.; *species inquirendum*. [Probably to be returned to *Kenleenus*].

*Eumenesclex* Qiu & Bouché, 1998b: 4 [sometimes misspelt “Emumenesclex”]. (Type-species *Eumenesclex heideti*, by original designation Qiu & Bouché, 1998b: 4).

*Eu. emiliae* Qiu & Bouché, 1998b: 5.

*Eu. gabriellae gabriellae* (Omodeo, 1984: 118) [formerly *Eiseniona gabriellae*].

*Eu. gabriellae gallurae* (Omodeo, 1984: 120). [Qiu & Bouché (1998b, d) overlook this subspecies].

*Eu. heideti* Qiu & Bouché, 1998b: 4.

*Eu. pereli* (Bouché, 1972: 458) [originally *Allolobophora pereli* and as in Qiu & Bouché (1998b) and by Omodeo & Rota (2008: 71), yet quoted as “*Allolobophora* (sensu lato) *perelae* (correction pro *pereli*) Bouché 1972” by Baha & Berra (2001: 90) (non *perelae*]



- Kvavadze, 1973). The change to “perelae” is most likely invalid albeit Dr Tamara Perel is female and the previous genus was feminine; cf. *antipae* and *festae* herein and in Blakemore (2008a, 2010)].
- Eu. proclitellatus* Perez-Onteniente & Rodriguez-Babio, 2004: 59 [from Valencia, Spain and not included in Blakemore (2004), for obvious reasons].
- Eu. simplex* (Zicsi, 1981: 177) (from Italy; originally as *Allolobophora* (s. lat.) *corsicana simplex*, later transferred as a subspecies of the *Scherotheca corsicana* (Pop, 1947) species-complex that has many invalid names; Omodeo & Rota (2008) say it “fits only partially the diagnosis of the genus [*Eumenesclex*]”).
- Kenleenus** Qiu & Bouché, 1998a: 188, 1998c: 60 [misspelt “Kenlnus” by Qiu & Bouché, 1998a: 187 and variously as “Keeleenus” or “Kelleenus” in Qiu & Bouché 1998: 269]. (Type-species *Proselodrilus amplisetosus amplisetosus* Bouché, 1972).
- Ke. amplisetosus amplisetosus* Bouché, 1972: 244.
- Ke. amplisetosus hexathecosus* Bouché, 1972: 246 (validated by Qiu & Bouché, 1998c: 40).
- Ke. armadas* Blakemore, 2012 sp. nov.
- Ke. ticalus* Qiu & Bouché, 1998c: 44.
- Proselodrilus** Bouché, 1972: 231. (Type-species: *Proselodrilus idealis* Bouché, 1972).
- Pr. albus* Zicsi & Csuzdi, 1999: 1000 [from France; Haute Garonne, Audressein; non *Cataladrilus* (*Cataladrilus*) *albus* Qiu & Bouché, 1998: 78].
- Pr. biserialis* Bouché, 1972: 88 [misspelt “bise- arilis” in Qiu & Bouché (1998c: 61), formerly *Pr. fragilis biserialis*; non Černosvitov, 1937].
- Pr. calcicolus* Qiu & Bouché, 1998c: 54 [emend. Blakemore (2008) of original “*calcicola*” (sic)].
- Pr. dactylotheucus* Qiu & Bouché, 1998c: 58.
- Pr. dipterus* Qiu & Bouché, 1998c: 55.
- Pr. elusatus* Bouché, 1972: 88 (sometimes misspelt “elisatus”; formerly *Pr. fragilis elusatus*).
- Pr. idealis* Bouché, 1972: 232.
- Pr. ombrophilus* Qiu & Bouché, 1998c: 46.
- Pr. praticolus* Bouché, 1972: 234 (emend. from original “*praticola*”).
- Pr. proporus* Qiu & Bouché, 1998c: 42.
- Pr. psammophilus* Qiu & Bouché, 1998c: 47 [syns. *Pr. psammophilus magnus* Qiu & Bouché, 1998c: 48; *Pr. jamiesoni* Qiu & Bouché, 1998c: 49; *Pr. arenicolus* Qiu & Bouché, 1998c: 56 [emend. Blakemore (2008) of original “*arenicola*” (sic), misspelt “*arericola*” by Qiu & Bouché (1998c: 62, 184) with clitellum miscounted compared to Qiu & Bouché (1998c: fig. 18)]; synonyms of *psammophilus* as per Csuzdi (2012)].
- Pyrenodrilus** Qiu & Bouché, 1998a: 187; 1998c: 60. (Type-species *Proselodrilus fragilis fragilis* Bouché, 1972).
- Py. alatus* Bouché, 1972: 242.
- Py. biauriculatus* Bouché, 1972: 241.
- Py. bidasoanus* Qiu & Bouché, 1998c: 53 (emend., named *bidasoana* after River Bidasoa thus latinized participle changes to agree in gender).
- Py. fragilis* Bouché, 1972: 238 [misspelt “*fragilus*” in Qiu & Bouché (1998c: 37)]. [Note: Csuzdi (2012) has *Pr. biserialis* and *Pr. Elusatus* in synonymy of *Py. fragilis*, this not fully accepted here based on their present generic reassignments].
- Py. hyperopterus* Qiu & Bouché, 1998c: 52.
- Py. matoi* Qiu & Bouché, 1998c: 57. [As “*P. milo*” lapsus Blakemore & Grygier (2011: 269)].
- Py. polythecosus* Bouché, 1972: 88 (originally as subspecies of *fragilis*; sometimes misspelt “*polytheca*”).
- Py. pyrenaicus abduhi* Qiu & Bouché, 1998c: 37 [misspelt “*abdulridai*” in Qiu & Bouché (1998c: 63)].
- Py. pyrenaicus aragonicus* (Álvarez, 1971: 43, 69) (originally *Eophila pyrenaica aragonica*).
- Py. pyrenaicus haasi* (Michaelsen, 1925: 186).
- Py. pyrenaicus postandrus* Qiu & Bouché, 1998c: 43.
- Py. pyrenaicus pyrenaicus* (Cognetti, 1904: 7) (sometimes misspelt “*pirenaicus*”, e.g. in plos-one.org/article/info:doi/10.1371). [Note: Csuzdi (2012) has *Eophila haasi*, *Proselodrilus p. abduhi* and *P. p. postandrus* in synonymy of nominal subspecies].
- Py. trigoi* Qiu & Bouché, 1998c: 50.

*Species incertae sedis* [= “of uncertain taxonomic position” – ICZN (1999: Glossary)]

*Allolobophora festae* Rosa, 1892: 1 (non *Aptodrilus festae* Cognetti, 1904); originally “*Festae*” named after “Dott. Enrico Festa” and maintained as “*Helodrilus (Allolobophora) festae*” by Michaelsen (1900: 486) sometimes noun (invalidly?) amended to “*festai*”. Inclusion in *Maghrebiella* (now = *Cadanera*) as Baha & Berra (2001) suggested is dubious and suspect, pending morphological determination of their genus’ type-species.

*Taxonomic Note.* ICZN (1999: Art. 31.1.1) says: “A species-group name, if a **noun** in the genitive case formed from a personal name that is Latin, or from a modern personal name that is or has been latinized, is to be formed in accordance with the rules of Latin grammar.

*Examples.* Margaret, if latinized to Margarita

or Margaretha, gives the genitives margaritae or margarethae; similarly Nicolaus Poda, even though the name of a man, if accepted as a Latin name, gives podae;...”. Also, ICZN (1999: Art. 32.5.2.4.2): “Example. R.P.Podae, a specific name dedicated to the Reverendissimus Pater (Most Reverend Father) Poda, becomes podae.”

Thus the latinized genitive of a man’s name as a noun may end in feminine “e”; and a specific name changes to agree with genus gender only “if it is or ends in a Latin or latinized **adjective** or **participle** in the nominative singular” (Art. 31.2). Moreover, ICZN (1999: Art. 33.5) states: “In any case of doubt whether a different subsequent spelling is an emendation or an incorrect subsequent spelling, it is to be treated as an incorrect subsequent spelling (and therefore unavailable), and not as an emendation”, just as *festae* is held herein.

## APPENDIX 2

### mtDNA Barcode

*Kenleenus armadas* sp. nov. *H* mtDNA COI gene barcode (courtesy of Dr Hong-Yul Seo of NIBR).

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GGTCAACAAATCATAAAGATATTGGAACCTATACTTTATTCTTGGAGTGTGAGCCGGAATAGTAGGAGCCGGAA  
TAAGACTCCTTATCCGTGTTGAACTAAGACAACCCGGAGCATTTCTAGGCAGAGACCAACTATAACAACAATTGT  
CACAGCTCACGCATTTCGTAATAATCTTCTTTTTAGTTATACCTGTCTTTATTGGAGGATTTGGAAATTGACTTCTAC  
CTTTAATATTAGGAGCCCCAGACATAGCATTTCCCCGGCTAAATAATATAAGATTCTGACTACTTCCACCATCATT  
ATTCTACTTGTATCTTCTGCAGCAGTAGAGAAGGGGGCAGGTACAGGCTGAACAGTATACCCGCCTCTAGCTAGAA  
ATCTAGCACACGCTGGTCCATCAGTAGACCTAGCTATTTTCTCCCTCCATTAGCAGGGGCCTCGTCTATTCTAGGG  
GCCATCAACTTTATTACCACGGTAATTAATATACGGTGAAGTGGCCTACGCTTAGAGCGCATCCCCCTATTGTAT  
GAGCTGTGGTTATTACAGTCGTTCTTCTTCTCCTATCCCTACCAGTATTAGCGGGAGCCATTACAATACTCCTAACT  
GATCGAAACCTAAACACCTCTTCTTCGATCCAGCCGGAGGCGGGGATCCAATTTTATATCAACATCTATTTTGATT  
TTTTGGTCACCCTGAAGTTTA
```

BLAST (<http://blast.ncbi.nlm.nih.gov>) max. alignment =<83% for GU013841 an “unclassified Lumbricidae” from Romania or for several *Hormogaster* spp. from Spain; *i.e.*, no similar data presently provided on GenBank (<http://www.ncbi.nlm.nih.gov/genbank/>).