



Global Checklist of *Sparganophilus* Species (Annelida: Clitellata: Oligochaeta: Sparganophilidae) by County Equivalents

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Abstract

This paper presents the known global distribution of all species in the genus *Sparganophilus* which includes 11 species and two subspecies, in order of description: *Sparganophilus tamesis* Benham, 1892, *S. smithi* Eisen, 1896, *S. sonomae* Eisen, 1896, *S. pearsei* Reynolds, 1975, *S. tennesseensis* Reynolds, 1977, and in Reynolds, 1980 – *S. gatesi*, *S. helenae*, *S. komareki*, *S. kristinae*, *S. meansi*, *S. wilmae* and subspecies *S. pearsei libertiensis*, *S. pearsei sarasotae*.

Keywords: Annelida; Oligochaeta; Crassilittellata; Sparganophilidae; *Sparganophilus* Species; History; Distribution

Abbreviations: ICZN: International Commission on Zoological Nomenclature.

Introduction

One of my early mentors described a checklist as “A checklist is literally a list of names prepared for the purpose of checking off certain ones. Through extension of meaning, the word checklist has come to refer to any tabulation of species, even if it includes most of the features usually found in catalogues” [1]. This checklist presents the known global distributions of the species in the genus *Sparganophilus* without any features usually found in catalogues. Recently, along with two long-time colleagues, Will Reeves and Mark Wetzel, we presented new data on *Sparganophilus* in North America. With their permission, I believe the following repeated introduction is the best one for this checklist [2].

Oligochaetes in the family Sparganophilidae are primarily limicolous, or mud-dwelling species – living in very wet habitats that include the saturated soils along the banks and in submerged sediments of streams, ponds, lakes, springs, spring-runs, wetlands, caves, floodplains, as well as in moist litter covering the soil / muddy surfaces, and occasionally in saturated tree-wood in these areas [3-18].

Sparganophilus appear to thrive in relatively oxygen-poor, waterlogged soils of permanent streams and lakes and have been collected from aquatic habitats several metres in depth with the aid of Ekman dredges and other substrate sampling devices [6,19,20]. *Sparganophilus pearsei* (first described from North Carolina by Reynolds [21] in 1975) was recently reported from several sandy riverside habitats across several western U.S. states (California, Colorado, New Mexico), indicating it is established in riparian habitats and might be a previously overlooked native to the western USA [2,22].

The Family Sparganophilidae, most likely originating in the Nearctic Region, consists of one genus, *Sparganophilus* (typ: *Sparganophilus tamesis* Benham, 1892), found in North America and Europe [6,9].

When Benham originally described *S. tamesis* he had placed it in the Family Rhinodrilidae. Michaelsen [23] then placed *Sparganophilus* in the Subfamily Criodrilinae in the Family Glossoscolecidae. Michaelsen [24] placed *Sparganophilus* in a newly created Subfamily Sparganophilinae within the Family Lumbricidae. Soon after, Michaelsen [25] elevated the Subfamily to full Family status – even though Stephenson [26], in his book The Oligochaeta, had positioned Sparganophilinae as a Subfamily

in Glossoscolecidae. Less than three decades later, Gates [27] re-elevated Sparganophinae to Family status, where it remains today [2,28].

The monotypic South American genus *Areco* [29] included originally in the family Sparganophilidae – was recently placed in the newly described family Arecoidae erected by James, Csuzdi and Brown, in Misirlioglu et al. [30].

Currently, we recognize 11 species and two subspecies of *Sparganophilus*: *S. tamesis* Benham, 1892 [31], *S. smithi* Eisen, 1896 [32], *S. sonomae* Eisen, 1896 [33], *S. pearsei* Reynolds, 1975 [21], *S. tennesseensis* Reynolds, 1977a [20], *S. gatesi* Reynolds, 1980 [6], *S. helenae* Reynolds, 1980, *S. komareki* Reynolds, 1980, *S. kristinae* Reynolds, 1980, *S. meansi* Reynolds, 1980 [6], *S. wilmae* Reynolds, 1980 [6], *S. pearsei libertiensis* Reynolds, 1980 [6], and *S. pearsei sarasotae* Reynolds, 1980 [6]. With the exception of *S. tamesis* – all other *Sparganophilus* taxa occur exclusively in the continental United States [2,6,7,9,20,28,33-36].

Two other enigmatic taxa, *Helodrilus elongatus*, then later *Sparganophilus elongatus* and *Sparganophilus langi*, are considered synonyms of *S. tamesis* [2,37-40].

Sparganophilus species are semiaquatic, meaning they inhabit the interface between aquatic and terrestrial environments. They are typically found in damp soils, leaf litter, and near streams, ponds, or wetlands. Their preference for moist habitats allows them to thrive in areas with high humidity.

Sparganophilus earthworms are detritivores, feeding on decaying organic matter. They play a crucial role in nutrient cycling by breaking down dead plant material and contributing to soil fertility. These earthworms create burrows in the soil, which enhances soil aeration and water infiltration. Their burrowing activities facilitate the movement of water and nutrients through the soil profile.

Sparganophilus species are adapted for both aquatic and terrestrial locomotion. Due to their habitat in mud next to rivers and streams, *Sparganophilus* species may encounter various aquatic and semi-aquatic predators. These could include aquatic insects, amphibians, and fish that inhabit similar environments.

Unfortunately, specific research on *Sparganophilus* predation is scarce. Most studies focus on their ecology, distribution, and taxonomy rather than interactions with predators [20,28].

Methods

The distributional information for *Sparganophilus* records presented in this paper are based on specimens in my personal collection (Oligochaetology Laboratory), specimens sent to me by colleagues and the general public for identification, and data presented in the literature cited and references included herein, most recently in Reeves, et al. [2].

Checklist

Phylum – Annelida Lamarck [40]

Class – Clitellata Michaelsen [41]

Subclass – Oligochaeta Grube [42]

Order – Crassicitellata Jamieson, [43]

Suborder – Lumbricina Bouché [44-49]

Family – Sparganophilidae Michaelsen [41]

Genus – *Sparganophilus* Benham [31]

The known global distributions of *Sparganophilus tamesis* – based on published records, those in my own collection, and those specimens sent to me for study – are shown in Figure 1. The known distributions of the other species in the genus *Sparganophilus*, thus far known to occur only in the USA, are shown in Figure 2.



Figure 1: The known global distributions of *Sparganophilus tamesis* Benham, 1892. Dots may represent more than one record of *S. tamesis* from sites that, at this scale, are in close proximity to one another.

***Sparganophilus tamesis* Benham, 1892**

- 1892 *Sparganophilus tamesis* Benham, Quart. J. Microsc. Soc. (n.s.), 34: 156. Types in British Museum Natural History, cat. no. 1892:12:16:1-2 [46].
- 1895 *Sparganophilus eiseni* Smith. Illinois St. Lab. Nat. Hist. 4(5): 142. Types are missing [46].
- 1911 *Helodrilus elongatus* Friend, Zoologist (4), 15: 192. Types in British Museum Natural History, cat. no. 1923:12:31:267-7 [46].
- 1921 *Sparganophilus elongatus*-Friend, Ann. Mag. Nat. Hist. (9), 7: 137.
- 1934 *Pelodrilus cuenoti* Tétrý, C.R. Acad. Sci. Paris 199: 322. Types in British Museum Natural History, cat. no. BMNH 1949:3:1:190 [46].
- 1934 *Eiseniella tetrahedra* (laps.)-Moon, J. Anim. Ecol. 3: 17.
- 1998 *Sparganophilus langi* Qui and Bouché, Doc. Pédozoöl. Integral. 4: 179. Types in La Collection Ouest-Européenne Centrale d'Oligochètes, c/o Station de Recherche sur la Faune du Sol 7 rue Sully, F-21 034 Dijon-Cedex, France, cat. no. 2/2/1988/7712 [46].

Canada

- British Columbia** (Vancouver Co.) [2]
New Brunswick (Carleton, Kings, Madawaska, Queens, York, Cos.) [28,50]
Ontario (Bruce, Haldimand, Halton, Kent, Manitoulin, Norfolk, Parry Sound Cos.) [20]
Quebec (Gatineau, Nicolet Cos.) [15]

United States

- Alabama** (Calhoun, Clay, Coosa, Crenshaw, Dallas, Lee, Limestone, Perry, Pike Cos.) [51]
Arkansas (Cross, Lincoln, Madison Cos.) [52]
Colorado (Huerfano, Yuma Cos.) [53]
Connecticut (New Haven Co.) [54]
Florida (Alachua, Dade, Franklin, Gadsden, Hillsborough, Leon, Okeechobee, Orange, Santa Rosa, Sarasota, Taylor, Wakulla, Walton, Washington Cos.) [2,55-57]
Georgia (Clarke, Cobb, Grady, Harris, Jasper, Morgan, Rabun, Thomas Cos.) [58]
Idaho (Bonneville, Franklin Cos.) [2]
Illinois (Adams, Bureau, Carroll, Champaign, Christian, DeWitt, Edgar, DuPage, Fayette, Franklin, Gallatin, Grundy, Hardin, Henderson, Iroquois, Jefferson, Jo Daviess, Kane, Kankakee, Kendall, Lake, LaSalle, Lee, Livingston, Marshall, Mason, McHenry, McLean, Monroe, Montgomery, Ogle, Pope, Putnam, Rock Island, Saline, Sangamon, Tazewell, Union, Vermilion, Warren, Washington, Whiteside, Will, Williamson Cos.) [2,16,18,55]

- Indiana** (Boone, Brown, Cass, Fulton, Gibson, Henry, Howard, Huntington, Knox, Kosciusko, LaPorte, Lawrence, Madison, Marshall, Martin, Porter, Pulaski, Tippecanoe, Tipton, Vanderburgh, Wayne, White, Whitley Cos.) [2,59,60]
Iowa (Clayton, Jefferson Cos.) [31,61]
Kansas (Wabaunsee Co.) [2]
Kentucky (Garrard, Knott, McCreary Cos.) [62]
Louisiana (East Baton Rouge, Lincoln, Orleans Parishes) [55]
Maryland (Baltimore, Montgomery Cos.) [63,64]
Massachusetts (Suffolk Co.) [54]
Michigan (Cheboygan, Emmet, Kent, Macomb, St. Joseph Cos.) [2,55,56]
Minnesota (Lincoln Co.) [2]
Mississippi (Attala, Choctaw, Marshall, Perry, Union, Walthall, Washington Cos.) [6,65]
Missouri (Crawford, Holt Cos.) [66]
Nebraska (Buffalo, Cuming (new record), Dixon (new record), Hamilton, Madison (new record), Merrick, Pierce (new record), Polk Cos.) [12]
New Jersey (Morris Co.) [8,67]
New York (Chautauqua, Clinton, Erie, Niagara, Onondaga, Ontario, Oswego, Otsego, Tioga, Tompkins, Ulster Cos.) [2,68]
North Carolina (Brunswick, Cherokee, Duplin, Johnson, Macon, Mecklenburg, Moore, Onslow, Pitt, Richmond Cos.) [69]
Ohio (Butler, Fairfield, Hamilton, Lake, Licking, Logan, Lucas, Mahoning, Mercer, Ottawa, Summit, Washington Cos.) [70,71]
Oklahoma (Creek, Marshall, Murray Cos.) [13]
Oregon (Columbia (new record), Yamhill Cos.) [72]
Pennsylvania (Dauphin, Montgomery, Philadelphia Cos.) [73]
South Carolina (Anderson, Barnwell, Berkeley, Dorchester, Greenville, Greenwood, Marion, McCormick, Oconee, Pickens, Saluda, Spartanburg, Union, York Cos.) [74]
South Dakota (Minnehaha Co.) [2]
Tennessee (Blount, Campbell, Chester, Dickson, Franklin, Hardeman, Johnson, Knox, Macon, Obion, Scott, Sevier, Sullivan Cos.) [5,75]
Texas (Goliad, Uvalde Cos.) [2]
Utah (Cache Co.) [2]
Virginia (City of Virginia Beach, Page Cos.) [76,77]
Washington (Columbia (new record), Island, Jefferson, Pacific, Whatcom Cos.) [2]
Wisconsin (Green Lake Co.) [55]
Wyoming (Laramie Co.) [2]
Guatemala [31,78-82]
Alta Verapaz Dept. (Santo Domingo de Corbán, as *S. benhami guatemalensis*)
Guatemala Dept. (Guatemala City, as *S. benhami guatemalensis*)
Mexico [31,51,78]
Nayarit State (Tepic, as *S. benhami*)

Tamaulipas State
Veracruz de Ignacio de la Liave State

Europe

France [3,80]
Lorraine Dept. (Moselle, as *Pelodrilus cuenoti* Tétry [3])
Germany [81]
Schleswig-Holstein State (Alster, Hamburg)
Italy [6]
Lombardy Region (Mincio)
Switzerland [39,83]
Geneva Canton [39]

United Kingdom

Cornwall Co. (Pencarrow) [84]
Cheshire Co. (Cheshire Meres) [84]
Greater London Co. (Greenford, Kew) [31]
Oxfordshire Co. (Goring-Thames) [84]
Westmoreland Co. (Windermere) [85]

Asia

Philippines
Cordillera (Provinces: Nueva Ecija, Mountain, Kalinga, Ifugao) [86,87].

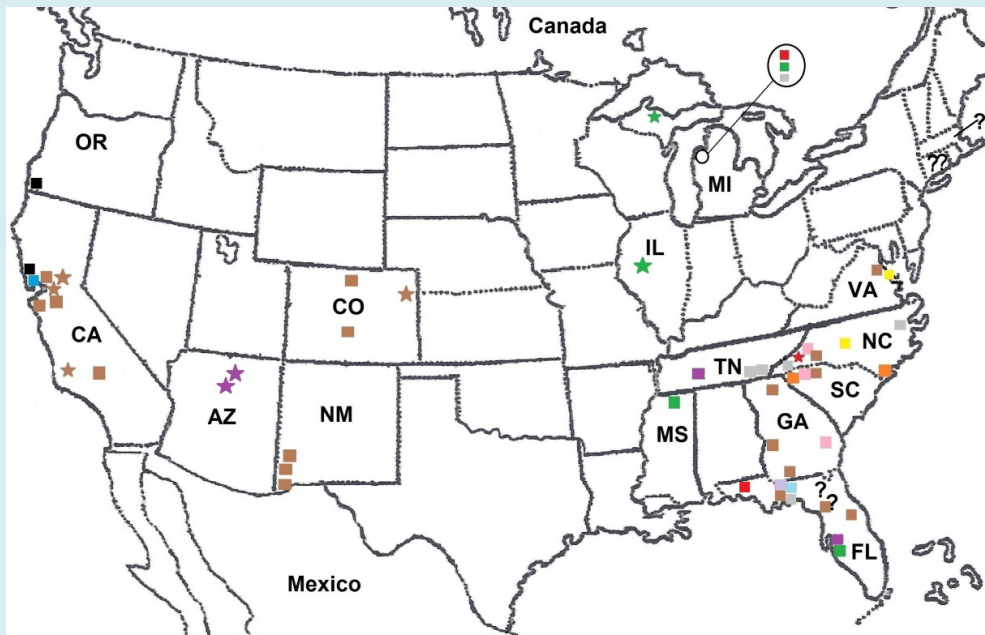


Figure 2. New [★] and previously [■] published known records of *Sparganophilus* species other than *S. tamesis*. Legend: *S. gatesi* [■], *S. helenae* [■], *S. komareki* [■], *S. kristinae* [■], *S. meansi* [■], *S. pearsei* [■], *S. p. libertiensis* [■], *S. p. sarasotae* [■], *S. smithi* [■], *S. sonomae* [■], *S. tennesseensis* [■], *S. wilmae* [■], [?] Unconfirmed *S. tennesseensis* in Florida (modified from Reeves, Reynolds and Wetzel, 2024; Reeves et al., 2018) and in Connecticut and Massachusetts (Khalil et al., 2023).

Sparganophilus gatesi Reynolds, 1980 [46]

1980 *Sparganophilus gatesi* Reynolds, Megadrilologica 3(12): 194. Types destroyed [46].

Florida (Okaloosa Co.) [6]

Michigan (Benzie, Leelanau Cos.) [90]

North Carolina (Avery Co.) [69]

Sparganophilus helenae Reynolds, 1980

1980 *Sparganophilus helenae* Reynolds, Megadrilologica 3(12): 195. Types destroyed [46].

North Carolina (Brunswick Co.) [6]

South Carolina (Oconee Co.) [74]

Sparganophilus komareki Reynolds, 1980

1980 *Sparganophilus komareki* Reynolds, Megadrilologica 3(12): 195. Types in New Brunswick Museum, Saint John, cat. no. 980.79.6. [46].

Georgia (Toombs Co.) [6]

Michigan (Leelanau Co.) [90]

North Carolina (Cherokee, Hayward Cos.) [69]

South Carolina (Greenville Co.) [74]

Sparganophilus kristinae Reynolds, 1980

1980 *Sparganophilus kristinae* Reynolds, Megadrilologica 3(12): 195. Types in New Brunswick Museum, Saint John,

cat. no. 980.79.3 [52].

North Carolina (Chatham Co.) [6]

Virginia (Virginia Beach Co.) [76]

***Sparganophilus meansi* Reynolds, 1980**

1980 *Sparganophilus meansi* Reynolds, Megadrilogica 3(12): 195. Types in New Brunswick Museum, Saint John, cat. no. 980.79.5. [46].

Florida (Sarasota Co.) [63]

Illinois (Peoria Co.) [2]

Michigan (Marquette Co.) [2,17]

Mississippi (Benton Co.) [6,65]

***Sparganophilus pearsei* Reynolds, 1975**

1975 *Sparganophilus pearsei* Reynolds, Megadrilogica 2(2): 10; Types in British Museum Natural History, cat. no. 1935:2:28:50-1 [46].

California (Contra Costa, Kern, San Luis Obispo, Santa Clara, Solano Cos.) [2,33]

Colorado (Freemont, Weld, Yuma Cos.) [91]

Florida (Bay, Marion, Orange Cos.) [56]

Georgia (Grady, Harris, Lumpkin Cos.) [58]

New Mexico (Catron, Grant, Hidalgo Cos.) [22]

North Carolina (Buncombe, Swain Cos.) [63]

Virginia (Westmoreland Co.) [6]

***Sparganophilus pearsei libertiensis* Reynolds, 1980**

1980 *Sparganophilus pearsei libertiensis* Reynolds, Megadrilogica 3(12): 195. Types in New Brunswick Museum, Saint John, cat. no. 980.79.5. [46].

Florida (Liberty Co.) [6]

***Sparganophilus pearsei sarasotae* Reynolds, 1980**

1980 *Sparganophilus pearsei sarasotae* Reynolds, Megadrilogica 3(12): 196. Types in New Brunswick Museum, Saint John, cat. no. 980.79.11. [46].

Arizona (Coconino Co.) [2]

Florida (Sarasota Co.) [6]

Tennessee (Maury Co.) [75]

***Sparganophilus smithi* Eisen, 1896**

1896 *Sparganophilus smithi* Eisen, Mem. Calif. Acad. Sci. 2(5): 154. Types unknown. [46].

California (San Francisco Co.) [32]

***Sparganophilus sonomae* Eisen, 1896**

1896 *Sparganophilus sonomae* Eisen, Mem. Calif. Acad.

Sci. 2(5): 154. Types unknown [46].

California (Sonoma Co.) [32]

Oregon (Curry Co.) [72]

***Sparganophilus tennesseensis* Reynolds, 1977a**

1977 *Sparganophilus tennesseensis* Reynolds, Megadrilogica 3(3): 63; Types in National Museum of Natural Sciences, National Museums of Canada, cat. no. 1978-375 [46].

Connecticut (New Haven?, New London? Cos.) [89]

Florida (Wakulla Co.) [56]

Massachusetts (Essex Co.?) [89]

Michigan (Leelanau Co.) [12]

North Carolina (Haywood, Pitt Cos.) [92]

Tennessee (Hamilton, Polk Cos.) [5,75]

Florida (Alachua?, Columbia?, Indian River Cos.) [88]

? Based on blood meal from the fly (Diptera: Uranotaenia sapphirina), the identification of the oligochaetes can't be verified. Outreach to the senior author for varification has been unsuccessful.

***Sparganophilus wilmae* Reynolds, 1980**

1980 *Sparganophilus wilmae* Reynolds, Megadrilogica 3(12): 198. Types in New Brunswick Museum, Saint John, cat. no. 980.79.2. [46].

Florida (Leon Co.) [6]

Discussion

Many synonyms have occurred over the years since Benham first described *Sparganophilus tamesis* in 1892 from Kew Gardens in the United Kingdom (England). The first synonym, *S. eiseni*, was described by Frank Smith in 1895 from Havana in Mason County, Illinois. This name persisted in the literature in North America until recently [2,19,28].

Eisen [32] described a new species with two subspecies/ varieties from Guatemala, *S. benhami* and two subspecies, *S. benhami* var. *guatemalensis* and *S. benhami* var. *carnea*. Fifteen years later, Friend [37] introduced the name *Helodrilus elongatus* Friend [37] into the literature, but with little other descriptive information. *Sparganophilus elongatus* [37,38,93-95] is unaccepted, considered a synonym of *S. tamesis*.

Throughout the historical and more recent literature, Friend [37] has been referenced as having described *Helodrilus elongatus* (*Sparganophilus tamesis*). Subsequent authors have attributed, or misattributed, Friend's original description to his very brief 1911a paper. In that paper, he stated "31. *H. elongatus* Friend. Found in Cornwall in April 1910, by Mr. Bartlett of Pencarrow. Girdle [clitellum] from 15th to 24th segment. Related to *Criodrilus* and *Pontodrilus*."

In my opinion, this cannot be considered the description of a new species based on insufficient information. Additional papers of Friend's at that time (e.g., 1911b, 1911c, 1911d, 1911e, 1912a, 1912b) made no mention of *H. elongatus* [93,96-99]. In the following year, Friend [94] he stated, "*Helodrilus elongatus* Friend (a species which has not yet been described) in a garden in Cornwall, to say nothing of certain more or less well-known species which occur in Kew Gardens." This indicates to me that, in 1913, Friend did not consider *H. elongatus* as a described species and added no additional information on the species. Friend [95] repeated the information first included in his paper, as well as provided some characteristics differentiating *S. elongatus* from *S. benhami* [37]. In 1921, Friend [38] provided significant characterization of *S. elongatus*, in my opinion suggesting that *S. elongatus* should be the year and designated publication in which the description should be attributed [38].

However, after consultation, I have reluctantly changed my opinion. "Friend [37] did present a brief description, although not by the standards of current taxonomy, it should be considered valid. If we only regard species names valid if there is a more detailed description according to current standards, then we must exclude many species described in the 18th and 19th centuries, including those by Linnaeus." (Ton van Haaren, pers. com., 18 May 2024). In chapter 4 of the International Code of Zoological Nomenclature (International Commission on Zoological Nomenclature [ICZN] [100]), Section 12.1, Requirements, of Article 12, Names published before 1931, states "To be available, every new name published before 1931 must satisfy the provisions of Article 11 and must be accompanied by a description or a definition of the taxon that it denotes, or by an indication." "It doesn't say anything about how extensive it should be." (Ton van Haaren, pers. com., 18 May 2024).

Jamieson, in Brinkhurst and Jamieson [101], Zicsi and Vaucher [83] and Reynolds [28] considered *S. elongatus* a synonym of *S. tamesis*.

Tetry [49] described another synonym, *Pelodrilus cuenoti* and then Qiu and Bouché [39] described yet another synonym, *S. langi*. Gates [78] made Eisen's [32] species and subspecies synonyms of *S. eiseni*, now *S. tamesis*.

Sherlock and Carpenter [102] stated that Friend [103] considered *Sparganophilus elongatus* and *Sparganophilus tamesis* to be two species, also referencing Jamieson (p. 812, in Brinkhurst and Jamieson [97] who listed *S. elongatus* as a junior synonym of *S. tamesis*.

The research of Anderson, et al. [104] clarified "earthworm phylogeny and evolution, by supporting several recently proposed revisions to our understanding of

earthworm relationships and resolving others, most notably including 1) placement of Kynotidae (Madagascar) with a group containing the North American taxa *Komarekionidae* and *Sparganophilidae*, 2) a clade comprising *Lutodrilidae*, *Criodrilidae*, *Hormogastridae* and *Lumbricidae*, 3) *Dichogaster paraphyly*, 4) affirmation of a restricted *Glossoscolecidae* and 5) *Hormogastridae* monophyly. Recovery of two major clades, each consisting of a Northern Hemisphere subclade and a Southern Hemisphere subclade, suggested a major role for vicariance (specifically, the breakup of Pangaea during the Mesozoic) in earthworm phylogeny and biogeography. Divergence time estimation provided additional support for this hypothesis, dating the north-south splits within each major clade to approximately 161–185 Million years ago."

Rota, et al. [82] provided mitochondrial evidence that all European populations of *Sparganophilus*: 1) belong to the same species, 2) derive from a recent introduction, 3) are conspecific with the most widespread species of *Sparganophilus* in North America (specimens from Ontario, Illinois, Tennessee, and Washington state), and 4) that *S. tamesis* Benham [31] is a senior synonym of *S. eiseni* Smith [47].

Although *S. tamesis* was described from specimens collected in the United Kingdom, it is believed that these specimens were transported from North America on plant material sent to Kew Gardens. The wide distribution in North America is seen in Figure 1. Aside from Tetry's 1934 record, it is only in the past 26 years that this species has been recorded from other countries in Europe: Switzerland, United Kingdom, Germany, and Italy [39,81,82,84]. In a recent study, Mathieu et al. [105] presented multiple invasion routes that have led to the pervasive introduction of earthworms in North America, but none of the suggested routes specifically suggested a route for North America [106].

Conclusion

This paper represents the most recent overview of the known global distribution of species in the genus *Sparganophilus* (Spaaganophilidae).

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Code availability (software application or custom code): The author confirms that the software applications used in the present study are freely available in the public domain and no copyright was breached.

Statement Ethical approval: This article does not contain any studies with human participants performed by any of the authors.

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