

The Centipeds (Chilopoda) of Virginia: A First List

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Introduction

Centipeds are important predators in soil and leaf biotopes, and have evolved a wide variety of sizes and shapes appropriate to their specific niches. The smallest resemble tiny bits of white thread, the largest achieve lengths of more than 300 mm. The class Chilopoda enjoys the dubious distinction of containing the only animals in which the first pair of legs has been modified into a pair of poison fangs that dominate the entire body architecture. The corresponding disposition (of the larger species at least) is such as to have inspired Sir John Lubbock's reference to "the melancholy ferocity" of centipeds.

Despite their somewhat unappealing image, centipeds are extremely interesting animals which have been seriously neglected; much of what we know about their classification, structure, and biology derives from the work of only a dozen or so, mostly European, investigators. Between about 1900 and 1960, study of the rich North American fauna was the exclusive domain of Prof. Ralph Vary Chamberlin (University of Utah), who described the majority of Nearctic species (as well as a great number from other places). Chamberlin was an admitted "alpha taxonomist" whose main interest was naming new species; since he worked simultaneously with spiders and millipeds on a worldwide basis, his research time was spread very thin and did not accommodate a careful and reflective scientific approach. Perhaps the prodigious number of his largely unrelated publications discouraged potential students of centipeds as much as the very refractive nature of their classification, the external structural characters being quite limited as well as cryptic, subjective, and variable. For whatever reason(s), knowledge of American centipeds is not at the point reached by entomologists over a century ago.

At present, research on Chilopoda is effectively handicapped by the fact that virtually *all* of the existing

classification must be revised *de novo*, in the context of modern systematic principles. Specific, generic, and familial criteria need to be evaluated and refined, which can be realized only following careful redescription at the species level. A promising start was made in the years 1950-1970 by Ralph E. Crabill, but a long period of illness leading to his lamented demise in 1992 prevented the publication of little more than a title of his knowledge. In North America, only Rowland M. Shelley is currently active in centiped taxonomy, and he only in the relatively small order Scolopendromorpha. No synopses of our fauna have appeared since Chamberlin's serial treatment of Lithobiomorpha in 1912-1925 (the Geophilomorpha have never been monographed), and no comprehensive checklist since that of Charles H. Bollman in 1893. It follows that there are no manuals or handbooks for identification at the level of genera and species.

The situation as regards the centipeds of Virginia is a microcosm of what has been outlined above. No list of species known from the state has been published, although a substantial number are recorded in the widely scattered literature. The present attempt at synthesis must be understood as highly provisional and manifestly incomplete, yet a baseline inventory is needed for the simple reason of summarizing existing knowledge, if not to direct the attention of potential students to an interesting and productive field of study.

For several decades I collected centipeds for Dr. Crabill, the majority of them from Virginia; some were deposited in his personal collection, others in the National Museum of Natural History. Following his incapacitation this activity lagged until establishment of the Virginia Museum of Natural History in 1989 provided the motivation and opportunity for renewed studies on the arthropod fauna of the state. Systematic sampling with pitfall and soil extraction techniques has provided extensive material of both known and undes-

cribed species. Some of the chilopods have been identified and reported in, e.g., previous issues of *Banisteria*, but the majority remain unstudied because of pervasive taxonomic problems.

The following annotated list derives from a variety of sources. During the period 1952-1962 Dr. Crabill developed a card catalog for his personal collection (much of which originated in Virginia). In the late 1950's he compiled a state list of 43 species, with records cited by county, based on his material as well as literature records thought to be reliable. That list, made available to me, is the nucleus for what follows, supplemented by information more recently extracted from his card index. Additional records were obtained from specimens sent at various times to Dr. A. A. Weaver, then at the College of Wooster, Ohio. Material at VMNH has been acquired partly from departmental field work, but also in large measure from extensive sampling by the Virginia Division of Natural Heritage, conducted by zoologists Christopher A. Pague and Kurt A. Buhlmann in 1989-1991. Many specimens taken during their personal field activities have been donated by friends of the museum such as Dr. Joseph C. Mitchell (Richmond) and Prof. William A. Shear (Hampden-Sydney). I am much indebted to Dr. Shelley for records of Virginia scolopendromorphs noted by him in American museum collections.

That the majority of records are centered on the western third of the state reflects collection bias, not an impoverished fauna in the Coastal Plain. Future collecting will surely result in better balance in our knowledge of these geographic regions. Improving our knowledge of Virginia centipeds will entail a lot of fine-tuning: species will be added as collections are made especially in peripheral areas, and some will be deleted as junior synonyms or of dubious origin. Some additional undescribed species will surely be found, particularly among the geophilomorphs. Thus the present total of 56 species may be extended to as many as 70, a respectable number for an eastern state in North America. 63 nominal species are known for North Carolina (Wray, 1967) and 45 for Illinois (Summers et al., 1980). Many of the names listed for North Carolina are probably either misidentifications or junior synonyms, especially in the Lithobiomorpha recorded from Duke Forest.

In the following list species which are known from less than 50 miles (80 km) away and likely to occur within the state boundaries are bracketed without prefix

number, with an indication of their nearest known occurrence.

Class CHILOPODA

The only recent account in English of the structure and biology of centipeds is that of Lewis (1981). A highly provisional synopsis of the orders and families, with information on biology and distribution was published by me in 1982.

Centipeds are frequently taken in pitfall traps, or may be found under stones or loose bark, or in leaf litter. Most Virginian species may be collected by hand (a moistened fingertip is effective for the smaller species). Only several species of Scolopendromorpha are large enough to inflict a "bite" and such are best taken with forceps. 70% isopropyl or ethyl alcohol is the preservative of choice, but specimens may be collected into tubes charged with ethyl acetate and later transferred into alcohol. Straightening the bodies of geophilomorphs prior to fixation greatly facilitates their subsequent study (these animals often assume pretzel shapes posthumously, making even the counting of legs extremely tiresome). By a perverse twist of evolution, some of the most important details used in lithobiomorph classification occur on the last legs of males, which are readily broken off by clumsy handling during capture. Lithobiomorphs should be seized by the anterior end, the small species by a moistened fingertip (not always easy, since these animals run like the wind when exposed). Specimens taken in pitfalls or with Berlese funnel extraction are generally the most complete and usable.

Order GEOPHILOMORPHA

Autapomorphies of this order include the primary absence of ocelli, high number (30-150) of body segments each provided with pleural stigmata in an uninterrupted sequence, and fixed number of 14 antennomeres. Both familial and generic distinctions are drawn heavily from details of mouthparts, difficult to investigate in species whose total body length is less than 10 mm. The taxa of regional faunas may often, however, be distinguished on the basis of more obvious external details. Geophilomorphs are basically fossorial animals living in deep soil, although frequently found on the surface in litter, or under stones or bark. Our species are mostly some shade of yellow or light red, a few have darker middorsal lines,

some are nearly white even as adults.

Family Schendylidae

Most members of this family are tropical, many occur along the seacoast in intertidal biotopes. A number of species, however, are circumboreal in range, restricted to high latitudes or to high elevations southward. Members of our fauna are most frequently collected during the colder months of the year.

1. *Escaryus cryptorobius* Pereira & Hoffman, 1993

Originally described from White Top Mountain, near the junction of Grayson, Washington, and Smyth counties, this species is known also from Buffalo Mountain, Floyd Co., and The Priest, Nelson Co., at elevations ranging from 3500 to 5500 ft.

[*Escaryus liber* Cook & Collins, 1893]

Described from New York, this small species has been recorded from both Maryland and the District of Columbia, making its occurrence in northern Virginia almost a certainty.

2. *Escaryus orestes* Pereira & Hoffman, 1993

The type material of this species was taken in the same soil sample as that of *E. cryptorobius* on White Top Mountain. Unlike that form, however, it has not been found further along the Blue Ridge than Grayson Highlands State Park, about 6 mi/10 km to the northeast in Grayson County.

3. *Escaryus urbicus* (Meinert, 1885)

This species ranges from the Great Lakes region to Massachusetts, thence southward in the Appalachians to Alleghany, Augusta, Bland, Giles, and Nelson counties. It is sympatric with *E. cryptorobius* at The Priest, but otherwise its known Virginia range seems confined to the Ridge & Valley Province.

Family Dignathodontidae

This family (treated in older literature as Linotaenidae) is largely endemic to the Northern Hemisphere. Most species are recognizable to family by the unusually small head, from which the body gradually increases in

width posteriorly to about midlength. Our five species are small to moderate in length (15-60 mm), but the crimson *Tomotaenia epileptica* (Wood) of the Pacific Coast region attains a length up to 150 mm.

4. *Agathotus gracilis* (Bollman, 1888)

A small, yellowish species originally described from Jefferson Co., Tennessee, *gracilis* was subsequently collected at Johnson City by Chamberlin in 1910. There is one known Virginia locality, along Va. Rte. 274 about 4 mi/6 km east of Independence, Grayson County, where I found a single specimen on 12 August 1985 (identification by L. A. Pereira).

Wray (1967: 156) records "*Agathotus carolinus* Chamberlin" from Duke Forest, NC. I can find no reference to a validation of this combination, and assume it to be an unpublished MS name supplied by Chamberlin to N. B. Causey or A. S. Pearse. The record, however, does imply that *Agathotus* occurs in the Piedmont and may be present also in southside Virginia.

5. *Strigamia bidens* (Wood, 1862)

This crimson centiped, not uncommon in leaf litter in early spring, is recorded from Alleghany, Bedford, Botetourt, Floyd, Grayson, Montgomery, Nelson, and Tazewell counties, generally above 2000 ft. The record by Chamberlin (1912) for Lynchburg, Campbell County, invites verification.

6. *Strigamia bothriopa* (Wood, 1862)

Existing records suggest that this species occurs at lower elevations than the preceding. Albemarle, Alleghany, Grayson, Henrico, Montgomery, Pittsylvania, Prince Edward, and Rockbridge counties. It is probably statewide.

7. *Strigamia branneri* (Bollman, 1888)

This small tawny species is widespread in eastern United States at low elevations, recorded in Virginia from Albemarle, Montgomery, Patrick, and Pittsylvania counties.

8. *Strigamia chionophila* Wood, 1862

In contrast to the preceding, this likewise small species with reduced segment number is markedly boreal

in range, extending from Alaska entirely across Canada and southward along the major mountain systems. Our only confirmed records to date are for Humpback Mountain, Nelson Co., and Potts Mountain, Craig Co., both above 3000 ft. in elevation. At the latter locality, it was found to be common on 22 January 1972.

Family Geophilidae

This, the largest family of geophilomorphs, is essentially worldwide in range and contains some of Virginia's commonest species.

9. *Arctogeophilus fulvus* (Wood, 1862)

The two eastern species of this genus were indistinguishable until their characters were established by Crabill in 1952. *A. fulvus* has been found in Alleghany, Botetourt, Grayson, Highland, and Nelson counties, at localities above 3000 ft. elevation, suggesting a subboreal range in the Appalachians.

10. *Arctogeophilus umbraticus* (McNeill, 1887)

Sharing with the preceding the character of an elongated head sclerite, this species is by far the most frequently collected geophilomorph in Virginia, known from Albemarle, Alleghany, Augusta, Bland, Botetourt, Buchanan, Campbell, Floyd, Giles, Grayson, Louisa, Lunenburg, Madison, Montgomery, Page, Patrick, Pittsylvania, Rockingham, Smyth, Tazewell, and Wythe counties, and the City of Virginia Beach.

11. *Brachygeophilus rupestris* Crabill, 1949

This tiny centiped was described from material collected in western New York state and a sample taken at 4000 ft on Warm Springs Mountain, Alleghany Co., VA, and no additional records have been published. A specimen (VMNH) taken at 3900 ft. on The Priest, Nelson Co., 20 January 1992 (J. Anderson) is very likely *rupestris*.

12. *Arenophilus bipuncticeps* (Wood, 1862)

The common member of this genus in southern United States, *bipuncticeps* is recorded from Albemarle, Alleghany, Henry, Mecklenburg, and Surry counties, and the City of Virginia Beach, implying a nearly statewide distribution.

13. *Arenophilus watsingus* Chamberlin, 1912

Somewhat more northern in range, this species is known only from Alleghany, Buchanan, and Pittsylvania counties. Chamberlin stated that his description of *watsingus* was based chiefly on material from Chatham which may thus be considered the type locality.

14. *Geophilus ampyx* Crabill, 1954

A crimson species described from Clemson S. C., *ampyx* is apparently widespread over the southeastern States although localities are not numerous. The only Virginia specimen known to me was found at Cave Spring Recreation Area near Olinger, Lee Co. on 3 September 1972 (det. A. Weaver).

15. *Geophilus cayugae* Chamberlin, 1904

This Appalachian species was reported by Crabill (1954) from Ithaca, New York (the type locality), Mountain Lake, Giles Co., Virginia, and Mount Mitchell, Yancey Co., North Carolina. The Mountain Lake record is based on a sample in Crabill's collection, taken by me on 1 January 1952, along the road north of the Biological Station. VMNH now has material from three additional sites in Virginia: Bedford Co.: Peaks of Otter, 17 December 1994, M. W. Donahue; Grayson Co.: White Top Mountain, 5000 ft., 18 November 1993-16 March 1994, pitfall in beech woods, VMNH survey; Nelson Co., The Priest, 4 mi/6.4 km SW of Montebello, pitfall site at 3900 ft., 20 September-18 October 1992, VMNH survey. The montane-boreal aspects of the species are reflected by its strictly high-elevation occurrence, above 3500 ft., in Virginia.

It is appropriate to record here a substantial extension in the known range of *cayugae*. A sample in Crabill's collection (REC 1835) from Clingman's Dome, Great Smoky Mountains National Park, Sevier Co., Tennessee, 14 June 1954 Howard E. Evans. This locality is approximately 70 mi/130 km southwest of Mount Mitchell.

16. *Geophilus mordax* Meinert, 1886

The taxonomic status of this name is unsatisfactory. Prior to 1954 it encompassed several species, one of which was distinguished by Crabill as *G. ampyx*. In my opinion, another locally-based name, *virginiensis* Bollman (q.v.), seems to be valid and would claim most of the

previous records for *mordax* in Virginia. In this restricted sense, *mordax* is known in the state only from material taken by me at Seashore State Park, City of Virginia Beach, 17 April 1951. Quite possibly it will be found to occupy a Lower Austral distribution in southeastern United States.

17. *Geophilus varians* (McNeill, 1887)

Easily distinguished from other local species of *Geophilus* by its unusually long ultimate legs, *G. varians* seems to be widespread across Virginia, with records for Albemarle, Alleghany, Fairfax, Floyd, Greenville, Lunenburg, Montgomery, Patrick, Prince Edward, Rockbridge, and Tazewell counties.

18. *Geophilus virginianensis* Bollman, 1889

This species was described from material taken at Natural Bridge, and so far is not recorded outside this state. Bollman's successors combined the name with the older *G. mordax*, but material which I have seen suggests that *virginianensis* is a valid species differing from *mordax* at least in color: tawny yellow instead of crimson. A review of this problem awaits the accumulation of further study material. At present, specimens considered to be *virginianensis* are known from Brunswick, Charles City, Charlotte, Henry, Lunenburg, and Rockbridge counties, and the cities of Chesapeake and Virginia Beach.

19. *Geopitilus vittatus* (Rafinesque, 1820)

The name *G. rubens* Say was incorrectly used for this species for many years. The applicability of Rafinesque's earlier name was shown by Hoffman & Crabill (1953); moreover, Say's name was very likely based on a specimen of what is currently being called *Strigamia bidens*.

G. vittatus is widespread over much of eastern United States, and in Virginia at least is found almost exclusively under the outer loose bark flakes of *Pinus taeda*. It seems to be statewide although there are no records higher than 2000 ft. ASL. Albemarle, Alleghany, Bedford, Brunswick, Fairfax, Halifax, Henry, Isle of Wight, King William, Louisa, Roanoke, and Wythe counties, and the City of Virginia Beach.

20. *Pachymerium ferrugineum* (Koch, 1835)

Whether this small geophilid is native to both Eurasia and North America, or was introduced into this

country remains to be established. All Virginia records seem to be from "natural" habitats, usually under stones in low, wet places. Albemarle, Alleghany, Rockingham, and Sussex counties, and the City of Virginia Beach.

[*Sogona minima* Chamberlin, 1912]

The original material of this minute species was found by R. V. Chamberlin at Johnson City, Tennessee, less than 20 mi/32 km from the Virginia state line, which almost guarantees that *minima* occurs in the Commonwealth.

Order SCOLOPENDROMORPHA

Species of this order represent the popular concept of "centipeds" as they are large enough to be easily seen, and in many parts of the world become urban nuisances, entering gardens and homes and often biting people. Three Virginia species are large enough (2-3 inches long) to inflict a temporarily painful injury but one only habitually does so.

All of the Virginia species occur in North Carolina, and are documented in detail in Shelley's treatment (1987) of Carolinian scolopendromorphs, which provides keys, maps, and illustrations.

Family Scolopendridae

Species of Scolopendridae are characterized by the presence of several ocelli each side of the head. A number of species occur in western United States, but only one extends east and north as far as Virginia.

21. *Hemiscolopendra punctiventris* (Newport)

This slaty-blue centipede with deep blue legs and antennae is widespread in the southeastern States, extending northward along the Atlantic Coast to central Virginia and to Kentucky and Illinois in the interior. Generally found in association with decaying pines, the species also has a tendency to invade dwellings and is implicated in unprovoked attacks on human residents (Hoffman, 1994).

In Virginia it extends north only as far as the James River (with two exceptions in Gloucester and Northampton counties), and recurs in the Cumberland Mountain area of the far southwestern counties, as mapped in my

1994 paper. Counties of record include Brunswick, Campbell, Dickenson, Gloucester, Henry, Lee, Mecklenburg, Northampton, Patrick, Pittsylvania, Powhatan, Prince Edward, and the cities of Chesapeake and Virginia Beach.

Family Cryptopidae

All of the members of this possibly polyphyletic family lack ocelli.

22. *Cryptops leucopodus* (Rafinesque, 1820)

As pointed out by Hoffman & Crabill (1953) the name *leucopodus*, based on material from Kentucky, seems clearly referable to *Cryptops*. Whether it is a senior synonym of the familiar name *hyalinus* (Say, 1821) cannot be assumed prior to a thorough revision of the genus, since Say's name seems to have been based on Floridian material which perhaps represents a distinct southern species. Although the Virginian form is sometimes taken in Berlese extractions of leaf litter, its preferred habitat is clearly beneath the loose bark of downed tree trunks in broadleaf forests. Instate records are rather sparse and mostly in the western half even though *leucopodus* probably occurs in every county. Alleghany, Bland, Botetourt, Floyd, Montgomery, Nelson, Nottoway, Prince Edward, Rockbridge, and Washington counties.

23. *Theatops posticus* (Say, 1821)

The two local species of *Theatops* are distinguished by their greatly thickened posterior legs, which function as forceps (certainly in defense, and possibly in prey-capture although hunting techniques have not been observed in the genus). In my experience, *posticus* is usually found under deeply imbedded stones; the species almost never is taken in pitfall traps nor found under loose bark. As in North Carolina, it is widespread over much of the state, with records from Albemarle, Alleghany, Botetourt, Buchanan, Floyd, Greensville, Henry, Lee, Montgomery, Page, Patrick, Pittsylvania, Rockridge, and Rockingham counties. The scarcity of Coastal Plain localities is noteworthy, however.

24. *Theatops spinicaudus* (Wood, 1862)

Somewhat more abundant south and west of Vir-

ginia, this species has not previously been recorded from the state, and apparently occurs only along the southern tier of counties. VMNH has single specimens from Scott County: 1.5 mi/2.4 km E of Shelleys, C. A. Pague 2 May 1989, and Carroll County: Stewart's Creek SGNMA near Lamsburg, 23 May 1993 and New River Trail State Park, 3 mi/4.8 km N of Fries, 18 September 1988, both taken by me. The Stewart's Creek site is at the base of the Blue Ridge, and presages capture of the species in the western Piedmont, where it occurs also in North Carolina (Shelley, 1987, fig. 13). Probably, *spinicaudus* will be found in Lee, Washington, and Wise counties. Both of the Carroll County specimens were found under deeply embedded stones, one in loose damp soil, the other in dry cinders along an old railroad bed.

25. *Scolopocryptops nigridius* McNeill, 1887

This is a moderate-sized member of the genus, attaining a length of about 50 mm. It has a distinctive greenish brown to mahogany body with somewhat reddish head capsule and a relatively mild disposition: specimens can usually be picked up without risking a bite. The species is widespread over much of Virginia, and frequently taken in damp leaf litter. Curiously, I have never found a female brooding eggs or hatchlings; nursery duty is apparently conducted in deep soil in contrast to the situation in *sexspinosus*. Records are at hand for Albemarle, Alleghany, Botetourt, Buchanan, Dickenson, Floyd, Franklin, Giles, Grayson, Greensville, Henry, Isle of Wight, Lunenburg, Mecklenburg, Montgomery, Nelson, Patrick, Pittsylvania, Prince William, Rockbridge, Rockingham and Washington counties, suggesting a statewide distribution except for the Eastern Shore and possibly the outer coastal plain.

26. *Scolopocryptops peregrinator* (Crabill, 1952)

This taxon was first described as a subspecies of the western *S. gracilis* (Wood), from two specimens taken in Maryland and Virginia (the type locality is Charlottesville, Albemarle Co.). Recently it was elevated to full species status by Shelley (1987), who reviewed the mid-Appalachian distribution on the basis of all specimens known to him. It is certainly a more secretive animal than its local relatives, and collections have relatively few specimens. Perhaps *peregrinator* is more fossorial, as suggested by its pallid coloration: a pale yellowish in the few specimens I have found. The known Virginia locali-

ties are within the area already defined by Shelley, a few of them being additions based on material not accessible to him: Albemarle, Alleghany, Botetourt, Frederick, Montgomery, Patrick, Pulaski, Rappahannock, and Tazewell counties. A specimen in Crabill's personal collection (1655) extends the known range of the species somewhat further to the northeast in Pennsylvania: Monroe Co.: Delaware Water Gap at Shawnee, G. E. Ball 11 September 1953. Possibly *peregrinator* will eventually be found in adjacent parts of New Jersey and New York as well.

27. *Scolopocryptops sexspinosus* (Say, 1821)

A species of superlatives: Virginia's largest centiped, the most widespread, and perhaps the one most often seen. Old adults may attain a length of nearly 65 mm (2.6 inches) when alive and running. The color is somewhat variable, but typically orange to orange-red, rarely reddish-brown. It is a species of leaf litter and rotting logs, very rarely found under bark or embedded stones. During the summer months, females are often discovered in rotting wood, coiled about their eggs or recently hatched young, which they protect from potential predators (and, possibly, from fungal growth). *S. sexspinosus* is the centiped most often caught in pitfalls, suggesting pervasive nocturnal activity although I have never seen one on the surface, despite years of night collecting. So far as I know *sexspinosus* does not enter dwellings. It occurs with equal abundance at Seashore State Park at sea level and at the top of Mount Rogers, around 5700 ft. (and to 6600 feet at Mount Mitchell, N.C.). It is far more common than the following records imply, perhaps because collectors not equipped with forceps are reluctant to attempt hand-capture of the swift-moving, formidable animals. The following county records are available: Alleghany, Augusta, Botetourt, Buchanan, Dickenson, Franklin, Giles, Grayson, Greensville, Henrico, Lee, Mecklenburg, Madison, Montgomery, Nelson, Page, Patrick, Pittsylvania, Rockingham, Tazewell, Wise, and York counties, and the City of Virginia Beach. Perhaps the species does not occur on the two Eastern Shore counties.

Order LITHOBIOMORPHA

Species of this order are relatively short-bodied animals with 15 pairs of legs. Many are minuscule (less

than 10 mm long) residents of leaf litter habitats and tend to be overlooked by all but the most patient and knowledgeable collectors. Extraction of litter samples with a Berlese apparatus is often much more effective than hand-picking and yields specimens in far better condition.

Essentially all of our knowledge of this order in North America came from the hand of R. V. Chamberlin who treated it in a series of generic revisions published from 1912 to 1925. Despite such imperfections as the lack of a key to genera, his pioneering work on a large, diverse, and little-known fauna has to be considered a tour-de-force, of a quality never approached in Chamberlin's later work. However, he placed inordinate emphasis on plectrotaxy of the legs, to the extent that even single differences in spur placement were used to distinguish species. Almost certainly, many of the nominal species established by Chamberlin in these and later papers will be reduced to the rank of subspecies or abolished entirely, especially those based on single specimens. The following list of lithobiomorphs known from Virginia will surely be greatly altered as our knowledge increases; even in its present incomplete form these animals comprise half of the state's chilopod fauna.

Family Henicopidae

Henicopids seem to be the surviving members of an old generalized lineage, widely dispersed over the earth in distinctly disjunct, fragmented ranges. Lacking the regular and elaborate plectrotactic characters of lithobiids, and without modification of male legs, these centipeds are not easy to distinguish and our knowledge of the group in North America is especially deficient.

28. *Zygethobius pontis* Chamberlin, 1911

The type material of this Appalachian endemic was taken at Natural Bridge in 1910 by Chamberlin himself; he had found specimens also at Johnson City, Tennessee. The species is not rare in western Virginia, and often is taken in pitfall traps as well as by hand-collecting in leaf litter (usually in the cooler months of the year). VMNH has material from Augusta, Dickenson, Floyd, Giles, Grayson, Highland, Nelson, Rockingham, Smyth, Washington, and Wise counties, suggesting a general distribution in the mountainous part of the state (and by implication, in adjoining parts of Kentucky, West

Virginia, and North Carolina, for which states there appear to be no published records).

29. *Lamyctes pius* Chamberlin, 1911

The range of this nominal species extends from the mountains of North Carolina northeastward as far as Philadelphia. So far the only Virginia record known to me is a single collection (USNM, Crabill det.) from Blacksburg, Montgomery Co., but the species must be generally distributed in the western half of the state.

[*Lamyctes fulvicornis* Meinert, 1868]

This introduced European species is widespread across most of North America in urbanized habitats, and surely will be found in most of Virginia's cities.

Family Lithobiidae

With about 80 nominal genera and over 1400 "species" worldwide, the Lithobiidae is by far the largest family of Chilopoda, and almost exclusively distributed over the Northern Hemisphere. In the past, both genera and species were defined on the basis of trivial differences in the distribution of spurs on the podomeres, with additional appeal to number of prosternal teeth and antennomeres, and to whether various terga were caudo-laterally produced or not. The taxonomic significance of such variables remains unresolved and at present, it is very difficult to assess the validity and status of most American lithobiids.

In our fauna, lithobiids range from about 6 to 30 mm in length; larger species often occur under loose bark and ground shelter in dry places; smaller forms are to be found chiefly in leaf litter and are readily captured by extraction of litter samples in Berlese apparatus.

Nearly a score of lithobiids have been described from, or reported from, the Duke University Forest, a number of isolated woodlands located west of Durham in Durham and Orange counties, North Carolina. These species were described more or less contemporaneously in the early 1940s by Nell B. Causey and R. V. Chamberlin, and it is not known to what extent their respective names may be redundant and synonymous. It does not, however, seem likely that 25 species of Lithobiidae actually occur in that local faunule. Causey's type material appears to be lost; at least some of Chamberlin's is at the National Museum of Natural History. Until

extensive sampling of the Duke Forest has been conducted, and a reasonable concept of the actual diversity gained, these various lithobiid names will remain a source of confusion and uncertainty. Since Durham is only 33 mi/53 km south of the state line, it is almost certain that any centipeds native there will also occur in Virginia's "Southside" counties. To some extent, this has been established, by the collection here of such nominal taxa as *Nampabius mycophor*, *Sozibius carolinus*, and *Serrobius pulchellus*. For the present, all of these nominal taxa are registered without prejudice as possible members of the Virginia fauna.

30. *Bothropolys multidentatus* (Wood, 1863)

The largest native lithobiid, this corticolous species is also one of the most abundant and frequently collected. Counties of record include Alleghany, Augusta, Botetourt, Floyd, Franklin, Giles, Grayson, Henrico, Henry, King George, Madison, Montgomery, Nelson, Pittsylvania, Rockbridge, Rockingham, Scott, Wythe, and York, and the cities of Suffolk and Virginia Beach.

[*Zygethopolys atrox* Crabill, 1953]

This species was described from Cumberland Falls, Whitley Co., Kentucky. As this locality is only 42 mi/67 km west of Cumberland Gap, the natural occurrence of *atrox* in the Virginia fauna must be considered as likely.

31. *Lithobius forficatus* (Linnaeus, 1758)

The status of this species as native to North America or a widespread and successful immigrant remains uncertain. The latter possibility seems supported by the origin of most records from developed regions. In Virginia, it is common under stones in gardens.

[*Lithobius atkinsoni* Bollman, 1887]

This apparently native Appalachian *Lithobius* was found by Chamberlin as far north as Hot Springs, NC, 50 mi/80 km below the state line and is thus a likely candidate for inclusion in the Virginia fauna.

32. *Neolithobius latzei* (Meinert, 1885)

This rarely collected centipede is known with certainty only from Piedmont North Carolina and southwestern Virginia: Mecklenburg, Montgomery, and Washington counties. A detailed historical account of

the species and its initial collection will appear in a subsequent issue of *Banisteria*.

33. *Arenobius manegitus* (Chamberlin, 1911)

Arenobius is the northeasternmost representative of a group of related genera centered in the southwest and Gulf Coast regions, and *A. manegitus* is fairly widespread in the southern and central Appalachians. Virginia records are for Floyd, Montgomery, Smyth, and Washington counties. The species is not uncommon at Blacksburg, its easternmost locality.

[*Garibius branneri* (Bollman, 1888)]

Described from Jefferson Co., TN, and subsequently collected by Chamberlin at Brown's Summit, Guilford Co., NC. As the latter locality is only 27 mi/43 km south of the state line, *branneri* may reasonably be expected to occur in Virginia.

[*Garibius georgiae* Chamberlin, 1913]

Reported from the Duke Forest, although whether correctly identified is unknown.

[*Garibius monticolens* Chamberlin, 1913]

Like *G. branneri*, also recorded from Brown's Summit and equally likely to extend north into Virginia.

34. *Garibius opicolens* Chamberlin, 1913

Described from New Jersey and adjacent Pennsylvania, this species appears to be nearly statewide in Virginia, recorded from Alleghany, Mecklenburg, Rockingham, and Tazewell counties, and the city of Virginia Beach. It seems to occur preferentially under the loose bark of downed trees.

35. *Garibius pagoketes* Chamberlin, 1913

The type locality is in western Massachusetts. The two Virginia counties of record appear to be the southernmost known for the species: Alleghany (Crabill det.) and Grayson (Weaver det.). Crabill (1957) considered *pagoketes* to be a junior synonym of *opicolens*; Weaver (unpublished) believes that the two can be kept apart. Pending a more systematic treatment of the problem, I continue to list *pagoketes* in a probationary status.

36. *Garibius psychrophilus* Crabill, 1957

This species is known only from western Virginia. The type locality is in Blacksburg, Montgomery Co., and unreported material in the Crabill collection is from adjacent Giles County: Mountain Lake, 3 May 1959, Crabill and Hoffman.

[*Llanobius chamberlini* Causey, 1942]

Duke Forest, the type locality.

[*Llanobius dux* Chamberlin, 1940]

Described from Duke Forest, and possibly a senior synonym for the preceding species?

37. *Nadabius aristeus* Chamberlin, 1922

Apparently an Appalachian species, *aristeus* has been recorded from New York, New Jersey, and Massachusetts, and all of the known Virginia localities are on or west of the Blue Ridge. Albemarle, Bath, Highland, Montgomery, Page, and Rockingham counties.

38. *Nadabius pullus* (Bollman, 1887)

This is one of the commonest lithobiids in eastern United States, and is statewide in Virginia: Albemarle, Alleghany, Buchanan, Campbell, Floyd, Grayson, Henry, Highland, Lunenburg, Montgomery, Patrick, Pittsylvania, Roanoke, Rockbridge, Rockingham, Smyth, and Wythe counties, and the city of Virginia Beach.

[*Nadabius saphes* Chamberlin, 1940]

Described from Duke Forest, Orange-Durham counties, NC, and possibly occurs in southside Virginia.

[*Nampabius carolinensis* Chamberlin, 1913]

Recorded from Duke Forest, NC, thus a possibility for Virginia.

[*Nampabius inimicus* Chamberlin, 1913]

Described from Russellville, Hamblen Co., TN, 24 mi/38 km south of the state line, this nominal species seems likely to occur in Lee and Scott counties, VA.

39. *Nampabius mycophar* Chamberlin, 1940

Described from the Duke Forest. A small series from 6 mi/10 km SE of Martinsville, Henry Co., 30 October 1990 (VMNH) agrees closely with the original description. Material from Lowmoor, Alleghany Co., Va., 21 March 1951 (REC 1237), was tentatively identified by Dr. Crabill as this species.

40. *Nampabius parienus* Chamberlin, 1913

Described from Hot Springs, N.C., and reported by Holsinger & Culver (1988) from Atwell's Tunnel Cave, Smyth Co., Va. (Crabill det.).

[*Nampabius pinus* Causey, 1942]

Described from Duke Forest. It is perhaps not actually referable to this genus.

[*Nampabius tennesseensis* Chamberlin, 1913]

Described from Russellville, TN, therefore likely to occur in Lee, Scott, and Washington counties, VA.

41. *Nampabius turbator* Crabill, 1952

This localized endemic is so far known only from Lowmoor Quarry Cave (the type locality) and Island Ford Cave, both in Alleghany Co., VA.

42. *Nampabius virginensis* Chamberlin, 1913

The type locality is Natural Bridge, Rockbridge Co., VA. As material was also found by Chamberlin at Unaka Springs, TN, the species presumably occurs in all of southwestern Virginia between these two localities. Males considered to be *virginensis* were collected 5 mi/8 km north of Oronoco, Amherst Co., VA, on 29 July 1990 (VMNH). This locality is about 16 mi/26 km northeast of Natural Bridge.

[*Paitobius ariensus* (Chamberlin, 1911)]

Described from Hot Springs, NC, 50 mi/80 km south of the state line, *ariensus* is thus likely to occur in southwestern Virginia.

[*Paitobius carolinae* (Chamberlin, 1911)]

Reported by Chamberlin from Asheville and Hot Springs, NC, and Russellville, TN, this species will probably be found in southwestern Virginia.

[*Paitobius eutyplus* Chamberlin, 1940]

Described from Linville, NC, only 30 mi/48 km south of the Virginia state line.

43. *Paitobius exceptus* Chamberlin, 1922

This nominal species was described from Jackson, Alabama. Material from Tazewell Co., VA (probably Burkes Garden) was identified as *exceptus* by Dr. A. A. Weaver. The large geographic distance between these localities would seem, however, to argue against this identification.

44. *Paitobius naiwatus* (Chamberlin, 1911)

Material from Smyth County, VA, was determined as this species by Dr. A. A. Weaver, who did not return the complete collection data. As *naiwatus* has been recorded by Chamberlin from the Blue Ridge at Linville Falls, NC, presumably it occurs generally in the intervening Mount Rogers area.

45. *Paitobius tabius* (Chamberlin, 1911)

Described from Johnson City, Tennessee. Material from Cave Springs Recreation Area, near Dryden, Lee Co., VA, 20 June 1972, was identified as this species by Dr. A. A. Weaver.

46. *Paitobius zinnus* (Chamberlin, 1911)

This species is unique within the genus because of the enlarged prehensors of the male sex, first described by Crabill in 1960. *P. zinnus* appears to be statewide in Virginia, with records from Albemarle, Alleghany, Campbell, Floyd, Henrico, Pittsylvania, Rockbridge, York, and Wythe counties. It is sometimes taken in large numbers in pitfall traps. Although Chamberlin recorded *zinnus* from a number of localities as far south as Alabama, his description is based only on a female and it seems likely that he did not collect males as the greatly enlarged prehensors could hardly have been overlooked.

47. *Pampibius paitus* Chamberlin, 1922

This localized endemic was described from Unaka Springs, Unicoi Co., TN, and recorded also from Catawba, NC, east of the Blue Ridge. The sole Virginia locality is the third known for the species: Giles Co.: Salt Pond Mountain beyond Mountain Lake, 3800 ft., 3 May

1959, Crabill and Hoffman (USNM).

48. *Serrobium pulchellus* Causey, 1942

Described from Duke Forest near Durham, NC, and recently reported (Hoffman, 1993) from Floyd, Mecklenburg, and Prince Edward counties, Virginia.

49. *Sigibius nidicolens* Chamberlin, 1938

This species was described from a specimen taken in a bird's nest at Harrisonburg, Rockingham Co., Virginia, and has not been subsequently reported.

[*Sigibius starlingi* Causey, 1942]

Described from a single specimen from the Duke Forest, NC.

50. *Sozibius carolinus* (Causey, 1942)

Originally described in the new genus *Pearsobius* from Duke Forest material, this species in the opinion of both Dr. Crabill and Dr. Weaver seems referable to *Sozibius*. Virginia specimens identified by these two specialists have been collected in Floyd and Montgomery counties.

51. *Sozibius pennsylvanicus* Chamberlin, 1922

Specimens from Blacksburg, Montgomery Co., VA. 11 October 1956 (REC 2145) have been identified as this species by Dr. Crabill.

52. *Sozibius providens* (Bollman, 1887)

This species has been recorded from an extensive range in the Central Plains states, and from as close to Virginia as Russellville, TN. Dr. Crabill identified several samples (USNM) from the vicinity of Blacksburg, Montgomery Co., Virginia, as referable to *providens*.

53. *Sozibius tuobukus* (Chamberlin, 1911)

Described from Hot Springs, NC, this species has a wide range in the southern Appalachians: NC, TN, SC, KY, WV, and VA. Virginia counties of record are Bland, Giles, and Roanoke.

[*Tidabius suitus* (Chamberlin, 1911)]

Recorded from New Jersey, North Carolina, and

Alabama, this species should be expected to occur likewise in Virginia.

54. *Tidabius tivius* (Chamberlin, 1911)

Collected by Chamberlin at Lynchburg, Campbell Co., and Balcony Falls, Rockbridge Co., VA. The very wide distribution of this nominal species suggests that it may be synanthropically dispersed.

55. *Typhlobius caecus* (Bollman, 1888)

Originally described from a single female found in Jefferson Co., Tennessee, this pallid and eyeless species has been recorded also from single sites in North Carolina and Alabama. These records are probably based on other, undescribed species, however. A male that probably is *caecus* was found in Rimer Cave, about 5 mi/8 km west of Ewing, Lee Co., Virginia, 19 May 1993, D. A. Hubbard (VMNH). Whether *caecus* is congeneric with the Californian type species of *Typhlobius* is currently under investigation.

Order Scutigermorpha

In many ways, scutigermorphs are the most disjunct of chilopods, set off by the middorsal location of the spiracles, multiple subdivision of the tarsi, and large compound eyes. The very long rear legs are used in prey capture.

Family Scutigerae

A family of mostly tropical centipeds. Native species occur in southwestern United States; one introduced European species represents the family in most of the country. Scutigerae are never welcomed in the basements of residences, but their presence is a guarantee that cockroaches will not occupy the same premises. Specimens may be captured with all legs intact by the simple device of placing a large water glass against a basement wall — water need not be added.

56. *Scutigera coleoptrata* (Linnaeus, 1758)

A West Palearctic species long ago introduced by commerce into North America and now almost continent-wide in urban situations. It is now acclimatized in Virginia and found well away from dwellings through-

out the year. It is statewide in Virginia although represented by only a few actual museum specimens from Alleghany, Henry, Pulaski, Rockingham, and Wythe counties.

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