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Distribution of the milliped genus *Narceus* Rafinesque, 1820 (Spirobolida: Spirobolidae): occurrences in New England and west of the Mississippi River; a summary of peripheral localities; and first records from Connecticut, Delaware, Maine, and Minnesota

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DISTRIBUTION OF THE MILLIPED GENUS *NARCEUS*
RAFINESQUE, 1820 (SPIROBOLIDA: SPIROBOLIDAE):
OCCURRENCES IN NEW ENGLAND AND WEST OF THE
MISSISSIPPI RIVER; A SUMMARY OF PERIPHERAL LOCALITIES;
AND FIRST RECORDS FROM CONNECTICUT, DELAWARE,
MAINE, AND MINNESOTA

Rowland M. Shelley¹, Chris T. McAllister², Michael F. Medrano³

ABSTRACT.—The milliped genus *Narceus* Rafinesque, 1820 (Spirobolida: Spirobolidae) occupies parts or all of 2 Canadian provinces, Québec and Ontario; every U.S. state east of the Mississippi River; and 9 states to the west including Minnesota, Iowa, Missouri, Arkansas, Louisiana, Nebraska, Kansas, Oklahoma, and Texas. Records are detailed for the “western” states and New England and include the first from Minnesota, Connecticut, Delaware, and Maine; occurrence is projected for southeastern Minnesota and the Delmarva Peninsula. The genus presently comprises 2 valid species that are endemic to Florida—*N. gordanus* (Chamberlin, 1943) and *N. woodruffi* Causey, 1959—and 2 of uncertain status that occur throughout the generic range and are referenced as the “*N. americanus/annularis* complex”; geographic evidence suggests greater diversity, particularly in the south, and a 2nd generic revision is in order to update the existing one by Keeton (1960). Records cluster within a large, semicontinuous area whose northern, southern, and western range extremes, respectively, are Saint-Nicolas, Lévis Census Division, Québec; Key West, Monroe County, Florida, and northeastern Duval County and Rockport, Aransas County, Texas; and Garner State Park, Uvalde County, Texas. The eastern limit is the Atlantic Ocean, and records are available from Cape Cod and Tuckernuck Island, Massachusetts; Long Island, New York; Cape Hatteras, North Carolina; and James Island, South Carolina. The projected western boundary, based on peripheral localities, angles southwestward from Omaha, Nebraska, to Uvalde County; and the northern boundary passes through central Iowa and Wisconsin (encompassing the Door Peninsula) and the southern periphery of the Upper Peninsula of Michigan. The lone Minnesota locality, from Lyon County in the southwest, lies substantially north of the projected border in Iowa and well west of the expected area of occurrence in southeastern Minnesota. The northernmost record west of the Mississippi River, it may represent an allopatric population that extends westward into eastern South Dakota.

Key words: *Narceus*, “*Narceus americanus/annularis* complex,” *Mississippi River*, *New England*, *Québec*, *Texas*, *Florida*, *Michigan*, *Delmarva*.

Nearly a half-century has elapsed since Keeton (1960) revised the milliped genus *Narceus* Rafinesque, 1820, as part of a larger work on the family Spirobolidae (Spirobolida). Because of the time the publication was in press, the literature citations only extend through 1958; so our present concept of *Narceus*, based largely on the taxonomy in Keeton’s monograph, dates back some 48 years. The large, cylindrical millipeds, up to 4 inches long as adults, are commonly encountered in the Atlantic Coastal and east central United States (U.S.); they are abundant at all elevations in both urban and native biotopes, and collectors working east of the Mississippi River

will encounter numerous individuals on every field expedition. Locality records cluster within a large, semicontinuous area extending generally from southern Québec, Canada, to the Florida Keys, and from the Atlantic Ocean to the eastern and central Plains (Chamberlin and Hoffman 1958, Keeton 1960, Hoffman 1999, Shelley 2002a); and the lone Minnesota locality lies substantially outside this general area. *Narceus* is the 2nd most widely distributed chilogath genus in North America after *Oriulus* Chamberlin (Julida: Parajulidae), which ranges from the Atlantic Coast to central Utah, the Rocky Mountains of Wyoming, Idaho, and Montana, and the Plains of Alberta (Shelley 2002b).

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Keeton (1960) recognized 3 species in *Narceus*—*N. americanus* (Beauvois, 1817), *N. annularis* (Rafinesque, 1820), and *N. gordanus* (Chamberlin, 1943)—and provided distribution maps and gonopod and cyphopod illustrations for each. The only other published figures of *N. gordanus* are by Chamberlin (1943a), in the original description, and Loomis (1944), in the proposal of the synonym, *Arctobolus keyesi*. Additional illustrations of *N. americanus* and *N. annularis*, some under synonyms (see Keeton 1960, Hoffman 1999), are available in Wood (1865), Brölemann (1914), Loomis (1933, 1943), Chamberlin (1931, 1943a, 1943b), Causey (1955a), Hoffman (1957), Shelley (1978, 1988), and Filka and Shelley (1980). Shelley (1988: 1643, fig. 8) mapped occurrences in Canada (Ontario and Québec) and Watermolen (1995: 226, fig. 1) depicted those in Wisconsin, though placing dots centrally in the counties instead of precisely plotting the sites.

Narceus gordanus is endemic to peninsular Florida from Alachua and St. Johns to Collier and Broward counties (Keeton 1960, Shelley 2001, plus unpublished samples examined by RMS). Keeton (1960) also reported females of *N. gordanus* from Charleston County, South Carolina, and Carter County, Tennessee, but Shelley and Bauer (1997) deleted the species from these states. *Narceus annularis* and *N. americanus* occur widely across the generic range with the former, according to Keeton, being more northern and the only representative in Canada, New England, New York, New Jersey, Pennsylvania, Wisconsin, Iowa, Missouri, and Kansas. *Narceus americanus* occupies South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Oklahoma, and Texas; and both species inhabit Illinois, Indiana, Ohio, West Virginia, Virginia, Kentucky, Tennessee, and North Carolina. Keeton placed 23 species-group names in synonymies under these species, 11 apiece with 9 and 5 new synonymies under *N. americanus* and *N. annularis*, respectively, and 1 under *N. gordanus*. Based on examinations of random samples throughout the ranges, Shelley (1988) concluded that the area of overlap is one of intergradation conforming to geographic races and reduced *N. annularis* to subspecific status under *N. americanus*; however, this interpretation was not adopted by Hoffman (1999) and Shelley (2001). Keeton (1960:65, footnote 4) could not evaluate the small-bodied Floridian species, *N. woodruffi*

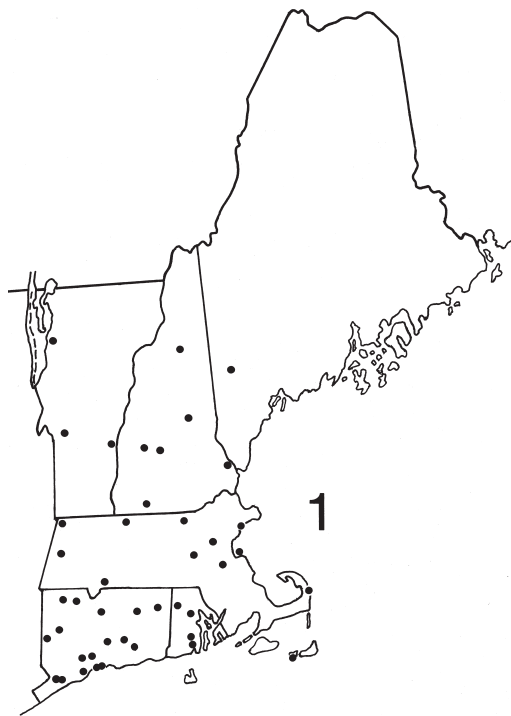


Fig. 1. Occurrences of *Narceus* and the “*N. americanus/annularis* complex” in New England.

Causey, 1959, described while his monograph was in press, but Shelley (2002a) did and found it to be a valid species; the subsequent discovery of the “lost” holotype (Shelley 2005) confirmed this conclusion. Shelley (2002a) also observed that substantial size differences between ostensibly conspecific males in parts of the ranges of *N. americanus* and *N. annularis* raise questions about Keeton’s species concepts. With a larger collum, different gonopods, sandy yellow rather than brownish red coloration, and much larger body size, *N. gordanus* is clearly a valid species; some of the names that Keeton placed under *N. americanus* and *N. annularis* may also be species instead of synonyms. A modern treatment incorporating molecular techniques is needed to resolve this situation, and until such is conducted we recommend the term “*N. americanus/annularis* complex.” In advance of this “re-revision,” we update the generic distribution emphasizing peripheral records and fully document and map all published and new localities from New England (Fig. 1) and west of the Mississippi River (the “western” states; Fig. 2), as Keeton

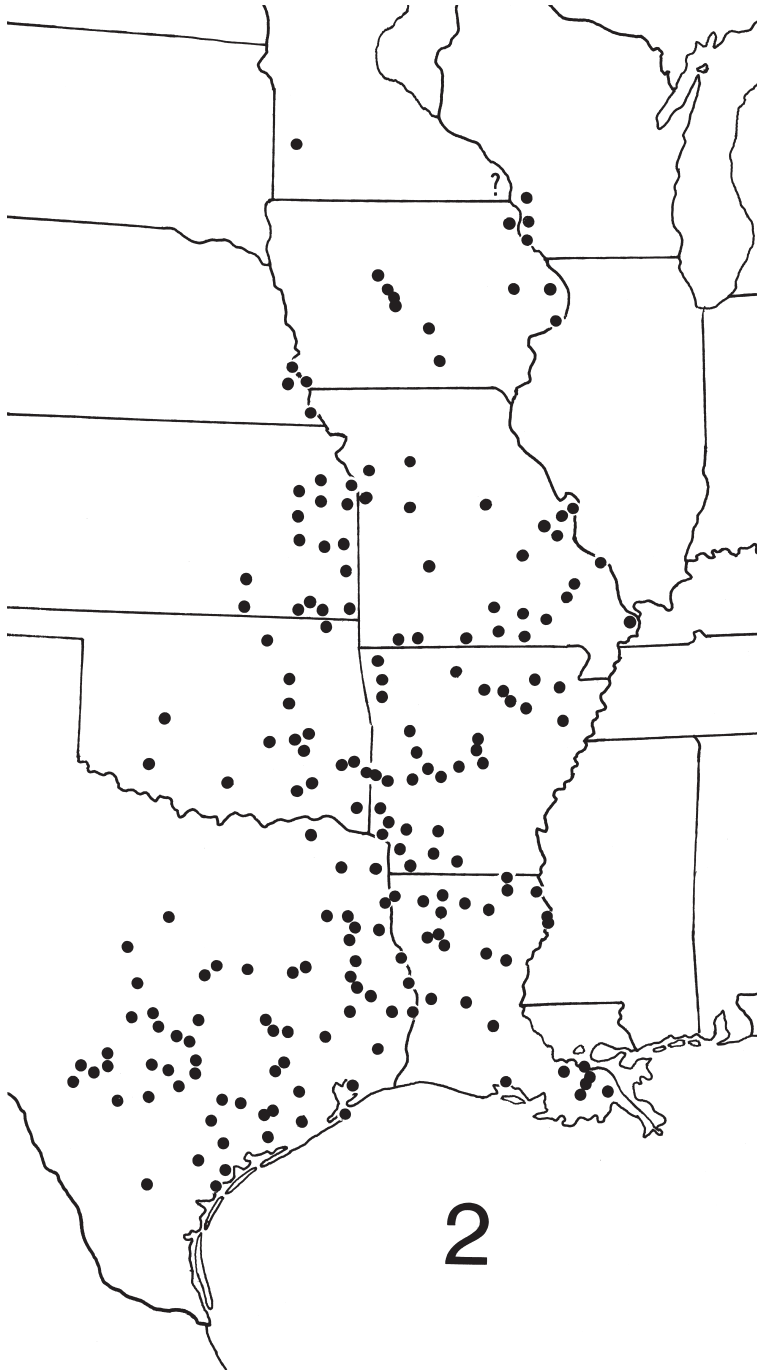


Fig. 2. Occurrences of *Narceus* and the "*N. americanus/annularis* complex" west of the Mississippi River and in southwestern Wisconsin. Some dots represent records from closely proximate localities; the question mark indicates projected occurrence in southeastern Minnesota.



Fig. 3. Projected overall distributions of *Narceus* and the "*N. americanus/annularis* complex" showing selected peripheral records. A smooth curve is drawn around range extremes in all directions excepting the Lyon County, Minnesota, record which we treat as representing an allopatric population. The dashed lines across peninsular Florida denote the approximate range of *N. gordanus*, and the stars show the distribution of *N. woodruffi*. The question marks indicate projected occurrences in southeastern Minnesota and the Delmarva Peninsula.

only reported 12 and 22 localities, respectively, from these areas. We also provide the 1st records from Minnesota, Maine, Connecticut, and Delaware, to our knowledge only the 2nd milliped reported from the last. As both *N. gordanus* and *N. woodruffi* occur wholly within peninsular Florida (Fig. 3), the generic distribution and that of the "*N. americanus/annularis* complex" are the same.

While a few North American milliped species occupy extremely large ranges—*Scytonotus granulatus* (Say, 1821) (Polydesmida: Polydesmidae); *Pleurolooma flavipes* Rafinesque, 1820, and *Apheloria virginiensis* (Drury, 1770) (Polydesmida: Xystodesmidae); and especially *O. venustus* (Wood, 1864), the lone component of

Oriulus (Shelley 1980, 1993, 2002b, Hoffman 1999, Shelley et al. 2003, 2005)—it is difficult to accept Keeton's concept that there are at most only 2 species, other than the Florida endemics, in the vast distribution of *Narceus*. The area encompasses a great array of biotopes in different climates and suggests a diverse taxon, and some additional species may have available names that Keeton placed in synonymies. Minimally, the existence of at least 3 species in Florida (Fig. 3), at the southeastern range extremity, suggests greater diversity for Texas, at the southwestern extremity; and since milliped genera are typically more diverse in the south than the north, the states from Arkansas, Tennessee, and North Carolina southward

plausibly harbor additional species. Consequently, geographical considerations alone call Keeton's concept into question. Suffice it to say that we have probably only begun to decipher *Narceus*, and a long-term reinvestigation is eminently desirable.

This is the 4th contribution detailing occurrences west of the Mississippi of millipeds that are abundant east of the watercourse (Shelley et al. 2003, 2005, Shelley and McAllister 2005). The 2nd author and students have encountered *Narceus* repeatedly in the "Ark-La-Tex" region, and the 1st and 3rd authors have recorded samples in major repositories, representing the great majority of preserved specimens. Additional material undoubtedly exists from all parts of the distribution, but other than the adjoining border areas of Iowa and Minnesota, and possibly the eastern fringe of South Dakota, we believe this will only marginally expand the generic range shown in Fig. 3. In reviewing the literature, we noted that Keeton missed the records in a number of early papers, so the ensuing summary of published localities in peripheral New England and the "western" states focuses on the works by Cragin (1885), Bollman (1888a, 1888b), Kenyon (1893a, 1893b), Gunthorp (1913, 1921), Bailey (1928), Chamberlin (1918, 1942, 1946, 1953), Blake (1931), Loomis (1939, 1944), and Hoffman (1950). Missing data in the new records was not provided on the vial labels, and the numbers of individuals of each sex are provided when known; when unknown, the total number of specimens is cited after the institutional acronym, the word "several" indicating too many specimens to count. Repository acronyms are as follows: AC—Biology Department, Alma College, Alma, Michigan; AMNH—American Museum of Natural History, New York, New York; BYU—Monte L. Bean Life Science Museum, Brigham Young University, Provo, Utah; CNC—Canadian National Collection, Centre for Lands and Biological Resources Research, Agriculture and Agri-Food Canada, Ottawa, Ontario, Canada; CSC—Natural Sciences Department, Castleton State College, Castleton, Vermont; FMNH—Field Museum of Natural History, Chicago, Illinois; FSCA—Florida State Collection of Arthropods, Gainesville; INHS—Illinois Natural History Survey, Champaign (records from website listing); NCSM—North Carolina State Museum of Natural Sciences, Raleigh; MCZ—Museum

of Comparative Zoology, Harvard University, Cambridge, Massachusetts; MEM—Mississippi Entomological Museum, Mississippi State University, Starkville; MHNG—Muséum d'Histoire Naturelle, Geneva, Switzerland; MNHN—Muséum National d'Histoire Naturelle, Paris, France; MSU—Biology Department, Midwestern State University, Wichita Falls, Texas; NCSM—North Carolina State Museum of Natural Sciences, Raleigh; NMNH—National Museum of Natural History, Smithsonian Institution, Washington, DC; PMNH—Peabody Museum of Natural History, Yale University, New Haven, Connecticut; SEM—Snow Entomological Museum, University of Kansas, Lawrence; TAMUT—Biology Department, Texas A&M University, Texarkana, Texas; TMM—Texas Memorial Museum, University of Texas, Austin; UCO—University of Colorado Museum, Boulder; UCT—Department of Ecology and Environmental Biology, University of Connecticut, Storrs; UGA—University of Georgia Museum of Natural History, Athens; UMMZ—University of Michigan Museum of Zoology, Ann Arbor; UMO—Enns Entomological Museum, University of Missouri, Columbia; VMNH—Virginia Museum of Natural History, Martinsville.

PUBLISHED RANGE STATEMENTS
AND RECORDS (SOME BASED ON
PRESUMED SYNONYMS
[SEE KEETON 1960, HOFFMAN 1999]).

United States east of the Rocky Mountains (McNeill 1888). North America east of the Great Plains (Chamberlin and Hoffman 1958). Key West north into the New England states and west as far as 97°W longitude (Causey 1959). Southern Ontario and Québec south through Florida; west to eastern Nebraska, Kansas, Oklahoma, and Texas (Keeton 1960). Eastern United States in general (Hoffman 1969). The Atlantic Ocean to the Central Plains and from southern Québec, Canada, to the south Florida Keys, the Gulf of Mexico, and Kerr and Goliad Counties, Texas (Shelley and Hoffman 1995). Eastern North America (Québec to Florida, Nebraska to eastern Texas; Hoffman 1999), approximating our documented distribution (Fig. 3).

Canada

QUÉBEC: Québec in general (Hoffman 1979, 1999, Kevan 1983, Shelley 2002c). Lévis Census

Division (CD), Saint-Nicolas (Chamberlin 1920, Keeton 1960). **Gatineau CD**, 7 miles (11.2 km) SW Low; **Rouville CD**, Mont-Sainte-Hilaire; and **Vaudreuil CD**, Île Claude (Shelley 1988).

ONTARIO: Ontario in general (Causey 1955a, Hoffman 1979, Kevan 1983, Shelley 2002c). **Renfrew Co.**, Renfrew (Chamberlin 1920, Keeton 1960), White Lake (Keeton 1960). **Grey Co.**, Durham; **Haliburton Co.**, Gull Lake; **Lanark Co.**, Ford Island, between Long Bay and the main part of Bob's Lake, S of Maberly (Keeton 1960). **Simcoe Co.**, Craighurst (Percy and Weatherston 1971). **Brant, Durham, Frontenac, Haldimand-Norfolk, Hamilton-Wentworth, Hastings, Kent, Lanark, Leeds and Grenville, Lennox and Addington, Muskoka, Niagara, Renfrew, Simcoe, and York Cos.**; and the **Regional Municipality of Ottawa-Carleton** (Shelley 1988).

United States
of America

NEW HAMPSHIRE: **Strafford Co.**, Durham (Blake 1931). ?**Belknap Co.**, Three Mile Island, L. Winnepesaukee; **Merrimack Co.**, Sutton (Keeton 1960).

VERMONT: **Chittenden Co.**, Burlington (Keeton 1960).

MASSACHUSETTS: **Berkshire Co.**; **Barnstable Co.**, Tuckernuck I. (nr. Nantucket); **Essex Co.**, Salem Neck; **Franklin Co.**, Warwick; **Middlesex Co.**, Concord, Winchester; **Norfolk Co.**, Blue Hills; **Worcester Co.**, Southborough (Keeton 1960).

RHODE ISLAND: **Washington Co.**, Exeter (Keeton 1960).

NEW YORK: New York in general (Bailey 1928). **Allegany, Cortland, Essex, Onondaga, Saint Lawrence, Tompkins, Wayne, Westchester, and Wyoming Cos.** (Keeton 1960).

NEW JERSEY: **Warren Co.**, nr. Blairstown (Keeton 1960).

VIRGINIA: **Giles Co.**, Mountain Lake (Loomis 1944). **Augusta, Bath, Bedford, Bland, Fairfax, Fauquier, Floyd, Giles, Montgomery, Nelson, Page, Pittsylvania, Rockbridge, Russell, Surry, Tazewell, and Washington Cos.**; the city of Norfolk; and Plummers Island (in the Potomac River between Virginia and the District of Columbia; Keeton 1960).

NORTH CAROLINA: **Macon Co.**, Highlands (Hoffman 1950, also missed by Shelley 2000). **Ashe, Avery, Buncombe, Carteret, Clay, Macon, Richmond, and Wake Cos.** (Keeton

1960). **Chatham, Durham, Franklin, Granville, Halifax, Harnett, Johnston, Lee, Moore, Nash, Northampton, Orange, Richmond, and Vance Cos.** (Shelley 1978). **Kings Mountain region (Cleveland and Gaston Cos.**; Filka and Shelley 1980). **Alamance, Alexander, Alleghany, Bladen, Brunswick, Burke, Cabarrus, Caldwell, Camden, Caswell, Catawba, Cherokee, Currituck, Dare, Davidson, Edgecombe, Gates, Graham, Guilford, Henderson, Hertford, Hoke, Iredell, Jackson, Lincoln, Madison, McDowell, Mitchell, New Hanover, Pender, Person, Pitt, Polk, Randolph, Robeson, Rockingham, Rutherford, Stanly, Stokes, Surry, Swain, Transylvania, Union, Wilkes, and Yancey Cos.** (Shelley 2000).

GEORGIA: **Bibb Co.**, Macon; **Rabun Co.**, Tallulah (Bollman 1888a). **DeKalb Co.**, Stone Mountain; **Thomas Co.**, Boston (Chamberlin 1946). **County unknown**, Spring Creek (Chamberlin 1918). **Bibb, Camden, Floyd, and Rabun Cos.** (Keeton 1960).

FLORIDA: **Alachua, Charlotte, Duval, Escambia, Hernando, Highlands, Hillsborough, Indian River, Lake, Monroe (Key West), and Volusia Cos.** (Keeton 1960). **Jackson, Lee, Liberty, Orange, Putnam, Santa Rosa, and Sarasota Cos.** (Shelley 2001).

ALABAMA: Alabama in general (Hoffman 1950). **Baldwin, Cullman and Mobile Cos.** (Keeton 1960).

MISSISSIPPI: Mississippi in general (Hoffman 1950). **Lee, Oktibbeha, and Tishomingo Cos.** (Keeton 1960).

TENNESSEE: **Marion Co.**, Nickajack Cave (Cv.; Loomis 1939). **Carter, Cocke, Davidson, Greene, Knox, Morgan, and Sevier Cos.** (Keeton 1960).

ILLINOIS: **Johnson Co.**, Will Thomas Spring Cv. (Peck and Lewis 1977). **Champaign, Cook, Knox, LaSalle, McLean, and Richland Cos.** (Keeton 1960).

MICHIGAN: Michigan in general (Johnson 1954). **Cheboygan Co.**, Douglas Lake (Chamberlin 1914, Snider 1991). **Leelanau Co.**, Leland (Chamberlin 1953). **Berrien Co.** (Snider 1991), Lakeside, Warren Woods (Keeton 1960). **Alcona, Allegan, Barry, Benzie, Calhoun, Emmet, Iosco, Kalkaska, Lapeer, Mackinac, Midland, Newaygo, Oceana, Presque Isle, and Wash-tenaw Cos.**; **Grand Traverse Co.**, Fife Lake (Snider 1991).

WISCONSIN: Wisconsin in general (Kevan 1983), probably statewide (Watermolen 1995).

Dane Co., Wingra Springs (Cahn 1915, Watermolen 1995). **Grant Co.** (Causey 1955a), Wyalusing St. Pk. (Watermolen 1995). **Clark Co.**, Worden Twp.; **Sauk Co.**, Devils Lake St. Pk., Wisconsin Dells (Keeton 1960, Watermolen 1995). **Crawford and Milwaukee Cos.**; **Brown Co.**, Green Bay; **Door Co.**, Peninsula St. Pk.; **Ozaukee Co.**, Cedarburg Bog; **Vernon Co.**, Viroqua (Watermolen 1995).

IOWA: **Boone Co.**, Ledges St. Pk. ("The Ledges"; Chamberlin 1942), Boone (i.e., Boonesboro; Keeton 1960). **Monroe Co.** (Causey 1955a). **Scott Co.**, Davenport (Keeton 1960).

MISSOURI: Missouri in general (Bollman 1893, Hoffman 1999). **Jefferson Co.** (Causey 1955a). **Stone Co.** (Causey 1955a), Notch (Chamberlin 1953). **St. Louis Co.**, St. Louis (Causey 1955a, Keeton 1960), "wagon rd. to Bridger's Pass, R. Mts.," exact location unknown (Keeton 1960). **Wayne Co.**, Sam A. Baker St. Pk. (Keeton 1960). **Crawford Co.**, Bear and Jagged Canyon Cvs. (Craig 1977, Gardner 1986). Caves in **Barry, Carter, Howell, Madison, Oregon, Ozark, Shannon, and Texas Cos.** (Gardner 1986).

ARKANSAS: Statewide (Bollman 1888b). **Polk Co.**, Rich Mtn.; **Sevier Co.**, Ben Lomond (Chamberlin 1953). **Faulkner, Hempstead, Lawrence, Logan, Montgomery, Pulaski, Saline, and Yell Cos.** (Keeton 1960, McAllister et al. 2003). **Montgomery Co.**, 3.5 miles (5.6 km) NE Norman, Crystal Springs Rec. Area, (Keeton 1960). **Independence Co.**, Cushman Cv. (McDaniel and Smith 1976). **Ouachita Co.**, Poison Springs (McAllister et al. 2002a, 2003; Shelley 2002). **Garland Co.**, Brady Mtn. Cpgd. on L. Ouachita, and 3 miles (4.8 km) W Crystal Springs; **Little River Co.**, Wilton; **Pope Co.**, 6.1 miles (9.7 km) N Hector (McAllister et al. 2003).

LOUISIANA: **Morehouse Par.** (Causey 1963), Mer Rouge (Girard 1853, Keeton 1960). **Natchitoches Par.** (Causey 1963), Creston and vicinity (Chamberlin 1918, Keeton 1960), Chastine, 2 miles (3.2 km) N Creston (Keeton 1960). **La Salle Par.**, Urania (Loomis 1944, Causey 1963). **Red River and East Carroll Pars.**; **Rapides Par.**, Forest Hill; and **St. Charles Par.**, Norco (Keeton 1960). **Caddo, Catahoula, Claiborne, Iberia, Lafourche, Lincoln, Madison, St. James, Vernon, and Webster Pars.** (Causey 1963). Records from the following parishes lie east of the Mississippi River: **East Baton**

Rouge, Jefferson, Livingston, Orleans, St. Helena, St. Tammany, Tangipahoa, and Washington Pars. (Keeton 1960, Causey 1963).

NEBRASKA: Nebraska in general (Kenyon 1893a, Causey 1955b). **Cass Co.**, Weeping Water; **Sarpy Co.**, Bellevue (Kenyon 1893b). **Richardson Co.** (Causey 1955a), 4 miles (6.4 km) E Barada (Keeton 1960).

KANSAS: **Shawnee Co.**, Topeka (Cragin 1885, Gunthorp 1913, 1921). **Anderson, Bourbon, Butler, Cherokee, Coffey, Cowley, Jefferson, Labette, Linn, Montgomery, and Wyandotte Cos.** (Gunthorp 1913). **Douglas Co.** (Gunthorp 1913, Causey 1955a). **Osage Co.**, Osage River (Keeton 1960).

OKLAHOMA: **Comanche Co.**, Buffalo Lodge, Wichita Mountains Nat. Wildlife Ref. (Chamberlin 1931), Camp Boulder (Keeton 1960). **Pushmataha Co.** (Chamberlin 1931, Causey 1955a). **Murray Co.** (Chamberlin 1931, Causey 1955a, Keeton 1960). **Hughes and Pittsburg Cos.** (Causey 1955a). **McCurtain Co.**, Beaver's Bend St. Pk. (McAllister et al. 2002b, McAllister and Shelley 2003). **LeFlore Co.**, Choctaw Nation Hist. Site (McAllister and Shelley 2003).

TEXAS: Texas in general (Causey 1955b, Hoffman 1999). **Austin Co.**, Stephen F Austin St. Pk. (Chamberlin 1953, Causey 1955a, Keeton 1960). **Brazoria Co.** (Causey 1955a). **Brazos Co.**, College Station; **Galveston Co.**, Galveston; **Leon Co.**, 5 miles (8 km) W Marquez; **Williamson Co.**, Georgetown (Keeton 1960). **Burnet Co.**, Crossing and Snelling's Cvs., 8 miles (12.8 km) ESE Marble Falls; **Medina Co.**, Koch Cv.; **San Saba Co.**, Namrod and Turtle Shell Cvs.; **Uvalde Co.**, Burial and Indian Creek Cvs. (Reddell 1965, 1970). **Gregg Co.**, 3 miles (4.8 km) S Longview; **Lamar Co.**, 11 miles (17.1 km) N Paris; **Nacogdoches Co.**, 3 miles (4.8 km) N Nacogdoches; **Rusk Co.**, 3 miles (4.8 km) S New Salem; **Smith Co.**, Tyler (Stewart 1969). **Angelina Co.**, Lufkin airport (Stewart 1969), Angelina Nat. For. (Shelley 2002a). **Counties unknown**, "Birkville"; between Lufkin and Houston (Keeton 1960).

Reddell (1965) stated that the Medina County record constituted a range extension of about 200 miles (320 km) westward, but it is really only around 60 miles (96 km) west of the longitude of Georgetown, Williamson County, the westernmost locality reported by Keeton (1960). He (Reddell 1965) identified the Uvalde County specimens, taken at the entrance of Indian Creek Cv. (exact location unknown), as

immature atopetholids, but later (Reddell 1970) assigned them to the spirobolid genus *Tylobolus* Cook. However, *Tylobolus* occurs from southwestern Utah and northwestern Arizona westward (Keeton 1966, Shelley and Bauer 1997, Hoffman 1999, Shelley and Stevens 2003), and *Narceus* is the only spirobolid genus that plausibly inhabits Uvalde County. As noted by Hoffman (1982, 1999), the Texas myriapod species described and reported by Chamberlin (1943b), individuals of which were collected by Russell Scott in 1941 in, ostensibly, Houston, Harris County, are patently mislabeled and did not come from anywhere near Texas. They were taken well to the east, and he suggested Houston County, Tennessee, west of Nashville, as a plausible site; however, Shelley and Whitehead (1986) discovered that one of these millipeds, *Sigmoria (Falloria) houstoni* Chamberlin, occurs in Grundy, Franklin, and Marion counties near Chattanooga. Harris County is well within the range depicted in Figs. 2 and 3, and *Narceus* should be expected in metropolitan Houston; but the literature record from there, based on the type of *Spirobolus scotti* (Chamberlin 1943b, Causey 1955a, Chamberlin and Hoffman 1958, Keeton 1960), is undoubtedly erroneous.

NEW RECORDS AND
PROJECTED OCCURRENCES

Canada

QUÉBEC: Expected from southern Temiscamingue CD and Québec City southward. Westernmost record: **Lotbinière CD**, Ste. Croix, Réserve écologique du Moulin (30°38'46"N, 71°53'30"W), ♂, 27 August 2005, J.-D. Brisson (Brisson personal communication to RMS). **Terrebonne CD**, Saint-Hippolyte, 22 August 1963, L. LeSage (CNC 1). Northernmost site in both Québec and the overall range: **Lévis CD**, Saint-Nicolas (Chamberlin 1920, Keeton 1960), on the eastern shore of the St. Lawrence River across from Québec City and just north of the Lotbinière CD locality.

ONTARIO: Expected from Sudbury County and the Ottawa River southward. **Haldimand-Norfolk Co.**, Turkey Pt., 20 May 1983, L. LeSage (CNC 1). **Kent Co.**, Rondeau Prov. Pk., 6 June 1985, L. LeSage (CNC 1). **Lanark Co.**, Murphys Prov. Pk., 17 June 1982, L. LeSage (CNC 1). **Muskoka Co.**, L. Muldrew

nr. Gravenhurst, 6 August 1959, C.B. Knowlton (MHNG 3). **Pontenac Co.**, 62.5 miles (100 km) SSW Ottawa, Sharbot L., ♂, 1968, M. Adamson (MNHN). **Simcoe Co.**, Strawberry I., L. Simcoe, August 1890 (NMNH juv.). Westernmost record: **Muskoka Co.**, Muldrew L., 4 August 1959, R. Huff (VMNH 1).

United States
of America

MAINE: Expected in the west and south, but only 1 record. **Cumberland Co.**, Harrison, ♂, ♀, C.D. Haskel (NMNH). **New State Record.**

NEW HAMPSHIRE: Statewide. **Cheshire Co.**, Jaffrey, ♂, ♀, juv., September 1896, ♂, ♀, August 1897, S. Henshaw (MCZ). **Coos Co.**, NW of Crawford Notch, Zealand Tr., juv., 10 September 1989, H.W. Levi (MCZ). **Merrimack Co.**, Sutton, ♂, September 1911, W.Q. Zaffey (MCZ).

VERMONT: Statewide. **Rutland Co.**, Castleton, 29 May 1982, W. Freeman (CSC 1). **Windsor Co.**, Mt. Ascutney, Ascutney St. Pk., ♂, 3 ♀, 2 juvs. (MCZ).

MASSACHUSETTS: Statewide. **Berkshire Co.**, Williamstown, juv., S.H. Scudder, and ♂, ♀, 2 juvs., 1870, Plager (MCZ). **Hampden Co.**, Holyoke, Holly's Ledge, 17 August 1914 (PMNH 1). **Middlesex Co.**, Pepperell, ♂, 20 August 1962, ♀, September 1964, H.W. Levi (MCZ). **Norfolk Co.**, Slate Island, Hingham Bay, 5 ♀, 14 July 1978, J. Lazell (MCZ). Easternmost record: **Barnstable Co.**, Cape Cod, ♀, 1872, O. Harger (PMNH).

RHODE ISLAND: Statewide. **Providence Co.**, nr. Foster and Gloucester town borders, juv., and Jackson School House Rd., juv., 2 June 2003, J.E. O'Donnell, R.J. Pupedis (PMNH). **Washington Co.**, Kingston, 20 July 1969, A. Lavallee (UGA 1).

CONNECTICUT: Statewide. **Fairfield Co.**, Weston, ♀, juvs., 14 May 1968, E. Rommel (PMNH); Sherman, juv., 1969 (PMNH); and Wilton, 22 May 1980, L.E. Sorkin, M.W. Klemens (AMNH 1) and Wier Preserve nr. Ridgefield, ♀, 12 July 1981, M.W. Klemens (AMNH). **Hartford Co.**, Talcott Mtn. St. Pk., ♂, 5 ♀, 17 May 1992, R.J. Pupedis (PMNH). **Litchfield Co.**, Colebrook, ♀, W.M. Mann (MCZ); Washington, 31 July 1966, C.L. Remington (PMNH 1); and Norfolk, Haystack Mtn., ♀, 25 September 1995, L.R. Levi (MCZ). **Middlesex Co.**, North Plain, 11 June 1933, J.C. Ball (PMNH 1);

and Meriden Hills, Williams (PMNH 1). **New Haven Co.**, New Haven, 1860, A.E. Verrill (PMNH); Mt. Carmel, 27 May 1867, D.C. Eaton (PMNH 1); Oxford, 1871, O. Harger (PMNH 1); Orange, June 1935, D.W. McQuire (PMNH 1); West Rock, 28 April 1983, A.F. Schweitzer (PMNH 1); and Horse Island, Stony Creek, 9 June 1992, R.J. Pupedis (PMNH 1). **Tolland Co.**, Storrs, juvs., 10 April 1967, R.W. Frehm (UCT). **Windham Co.**, Eastham, Yale Univ. Forest, 29 September 1979, N. Atkins (PMNH 1). **New State Record.**

NEW YORK: Statewide with the possible exception of eastern Long Island. Easternmost record: **Suffolk Co.** (Long Island), Cold Spring Harbor, juv., 1 June 1906, F.C. Lutz (NMNH).

NEW JERSEY: Statewide. **Ocean Co.**, Manahawkin, 15 October 1970, M. Kassardy (VMNH 1). **Essex Co.**, Short Hills, 13 June 1908 (NMNH several).

DELAWARE: Statewide. **New Castle Co.**, Wooddale, ca. 3.8 miles (6.1 km) W Wilmington, nr. Ashland Covered Bridge off DE Hwy. 48, juvs., 21 April 1998, R.M. Shelley (NCSM). **New State Record.** This is only the 2nd millipede reported from Delaware, the other being *Virgoiulus* (= *Nopoiulus*) *minutus* (Brandt 1841) (Julida: Blaniulidae) (Chamberlin 1921, Chamberlin and Hoffman 1958, McAllister et al. 2005).

MARYLAND: Statewide but no records available from the "eastern shore."

VIRGINIA: Statewide but no records available from the "eastern shore," at the southern end of the Delmarva Peninsula, where surveys have been conducted in both counties.

NORTH CAROLINA: Statewide. **Brunswick Co.**, 4.8 miles (7.7 km) NNW Maco, ♀, 17 July 1978, D.L. Stephan (NCSM); and 10 miles (16 km) N Supply, ♀, 3 November 1979, J. Perry (NCSM). **Currituck Co.**, 2 miles (3.2 km) NW Poplar Branch, 18 October 1979, R.M. Shelley, P.T. Hertl (NCSM 1). **Dare Co.**, 4.8 miles (7.7 km) SE Red Lake, Alligator River Nat. Wildlife Ref., walking on road, 10 May 2003, J.C. Beane (Sight Rec.); and Roanoke Island, 3.1 miles (5.0 km) WNW Manteo, 24 September 1996, J.C. Beane (NCSM 1). Easternmost record: **Dare County**, Hatteras Island, Buxton, ♂, 3 ♀, 29 October 1981, D.L. Stephan (NCSM).

SOUTH CAROLINA: Statewide. **Charleston Co.**, James I., 3 ♂, 5 September 1928 (NMNH).

GEORGIA: Statewide. **Chatham Co.**, N of

Savannah, ♀, 5 April 1943, W. Ivie (NMNH). **McIntosh Co.**, Darien, juv., 24 July 1931, O.F. Cook (NMNH).

FLORIDA: Statewide. **Dade Co.**, Miami, Coconut Grove, ♀, 23 May 1887, E.A. Schwarz (NMNH); Coral Gables, 20 January 1957, R.W. Swanson (NMNH 1) and 20 February 1957, C.F. Dowling (NMNH 1); and Everglades Nat. Pk., Paradise Key, ♀, H.S. Barber (NMNH) and Mahogany Hammock, 2 ♀, 2 December 1961, Glenn (CNC). **Monroe Co.**, Lower Matecumbe Key, ♀, O.F. Cook (NMNH); Upper Matecumbe Key, Islamorada, ♀, 3 March 1920, W.L. Brooks (NMNH); Plantation Key, ♂, 3 May 1957, H.V. Weems, Jr. (NMNH); and Big Pine Key, ♀, 11 April 1966, W.R. Ennis (UMO) and 15–20 May 1990, S.B. Peck (NCSM several). Southernmost record in both Florida and the overall range: **Monroe County**, Key West (Keeton 1960).

ALABAMA, MISSISSIPPI, TENNESSEE, KENTUCKY, WEST VIRGINIA, PENNSYLVANIA, OHIO, INDIANA, AND ILLINOIS: Occurrences are statewide.

MICHIGAN: Occurring throughout the Lower Peninsula (LP); projected for the southern periphery of the Upper Peninsula (UP) but only 1 record, from Mackinac County in general. **Cheboygan Co.**, Douglas L., ♂, B. Glading (NMNH), ♀, 13 July 1931, E.L. Miner (NMNH), and ♂, 3 ♀, 28 June 1948, G. Edmunds (NMNH); and Grapevine Pt., ♂, ♀, 24 July 1950, A.L. Edgar (AC). **Huron Co.**, July and 26 August 1908 (AMNH 13). **Isabella Co.**, ♂, R.R. Dreisbach (NMNH). **Kalkaska Co.**, 5 miles (8 km) NNE Kalkaska, 30 August 1958, L. Hubricht (MHNG 4). **Lapeer Co.**, ♂, 3 November 1945 (NMNH). **Midland Co.**, ♂, 3 May 1943 (NMNH). **Newago Co.**, Newago, 2 ♂, 13 May 1956, R.R. Dreisbach (NMNH). **Washtenaw Co.**, Ann Arbor, ♂, ♀, 29 October 1929, P.O. Kelley (NMNH) and July 1931, G.A. Swanson (NMNH several). Northernmost record: **Mackinac County** (Snider 1991).

WISCONSIN: Central and eastern Wisconsin, not statewide as projected by Watermolen (1995). **Crawford Co.**, north central sec 20, T7N, R6W, 2 ♂, 2 ♀, 5 October 1975, J. Richter, K. Wick (TMM). **Grant Co.**, Wyalusing St. Pk., juv., 23 June 1949, H.W. Levi (MCZ), and ♂, 14 September 1953 (TMM); and east central sec 6, T5N, R6W, ♀, 27 September 1975, M. Mittelstadt (TMM). Northernmost record:

Door Co., Washington Island, ♀, 14 June 1971, J.A. Payne (VMNH). Northwesternmost record: **Clark County**, Worden Township (Keeton 1960, Watermolen 1995).

MINNESOTA: Projected for the area southeast of Rochester, in the corner adjoining Iowa and Wisconsin, with the following record in the southwest that may represent an allopatric population: **Lyon Co.**, ♂, R. Meyer, October 1953 (MCZ). **New State Record**.

IOWA: Northeastern and central Iowa southward. **Allamakee Co.**, 10 miles (16 km) N McGregor, Yellow River St. For., May 1963, V.K. Howe (MHNG 1). **Boone Co.**, Ledges St. Pk., 19 May 1941 (NMNH 2), ♀, 6 May 1963, R.A. Grabbe (VMNH), 6 July 1963 (MHNG 4), August 1963, D. Castaner (MHNG 1), and ♂♂, ♀♀, 26 April–4 June 1984, R.E. Lewis (NCSM); and Matigwa, 6 miles (9.6 km) S Boone, August 1963, V.K. Howe (MHNG 1). **Fremont Co.**, Waubonsie St. Pk., 24 June 1967, F.A. Coyle (FMNH 4), ♀, 4 May 1979, W.F. Rapp (MCZ), and 2♀, 19 June 1985, D.J. Perschau (VMNH). **Jackson Co.**, Howell Tract, 7 August 1953, V.K. Howe (MHNG 1). **Jasper Co.**, Monroe, ♀, 5 July 1950, R.W. Frederickson (SEM). **Linn Co.**, 3 miles (4.8 km) N Viola, 13 August 1976, E.L. Sleeper (FSCA 5). **Webster Co.**, 10 miles (16 km) S Ft. Dodge, Woodman's Hollow St. Pk., July 1963, D. Castaner (MHNG 1). Northernmost records: those from Allamakee and Webster Cos.

MISSOURI: Statewide. **Callaway Co.**, ♀, 4 May 1969, W.W. Dowdy (FSCA). **Clay Co.**, Coolie L., ♀, 20 July 1967, J.R. Heitzman (FSCA). **Crawford Co.**, Steelville, ♀, 7 June 1955, P.J. Spangler (FSCA). **Franklin Co.**, Gray Summit, 7 August 1955, R.E. Crabill, Jr. (MHNG 1). **Jackson Co.**, Kansas City, Swope Park, 26 April 1968, J.R. Heitzman (FSCA 13). **Johnson Co.**, Knob Noster, ♀, 27 March 1962, E. Peterman (FSCA). **Miller Co.**, Osage Beach, 22 June 1948 (INHS). **Mississippi Co.**, near Cairo, IL, 19 September 1942 (INHS). **Oregon Co.**, Greer Springs, 26 August 1965, R. LaVal (FSCA 2). **St. Louis Co.**, Kirkwood, ♀, P. Rose (NMNH); and Chesterfield, 17 April 1954, R.E. Crabill, Jr. (MHNG 1). **Perry Co.**, Tower Island Chute, N end, 30 May 2003, J. Louderman (FMNH 2).

ARKANSAS: Statewide. **Benton Co.**, Vaughn, 3♂, 1–10 October 1959, N.B. Causey (FSCA). **Columbia Co.**, Logoly St. Pk., ♂, 4 October 2004, R.M. Shelley, Z.D. Ramsey (NCSM).

Craighead Co., 3 juvs., 18 April 1955, M. Adje-man (FSCA). **Cross Co.**, 12 miles (30.7 km) N Levesque, E. slope Crowley's Ridge, ♀, juv., 18–20 April 1957 (FSCA). **Garland Co.**, Hot Springs, ♂, 28 April 1962, P. Holmes (FSCA); Ouachita Nat. For., ♂, juv., 7 September 1979, J.C. and J.E. Cokendolpher (FSCA). **Independence Co.**, 1.3 miles (3.3 km) W Cushman, nr. Blowing Cv., ♀, 5 March 1973, R.M. Blaney, P.J. Kimmich (FSCA). **Jackson Co.**, 1.5 miles (2.4 km) NW Olyphant, 10 April 1936, L. Hubricht (NMNH 5). **Lafayette Co.** (NMNH 1). **Logan Co.**, NE corner of Mt. Magazine, ♂, ♀, 24 March 1938 (NMNH); Mt. Magazine, 15 July 1949 (INHS); and Mt. Magazine St. Pk., ♂, 17 April 2004, C.T. McAllister (TAMUT). **Marion Co.**, Buffalo Nat. River, juv., 15 July 1977, W.C. Welbourn (FSCA). **Miller Co.**, 28 miles (44.8 km) E Mandeville, ♀, juv., 30 August 1940, S. and D. Mulaik (NMNH). **Montgomery Co.**, 7.5 miles (12 km) NE Norman, 14 August 1955, L. Hubricht (NMNH 1). **Polk Co.**, Queen Wilhelmina St. Pk., Rich Mtn., ♂, 14 August 1972, D.E. Rossman, E.A. Liner (FSCA); and Ouachita Mountains Biol. Sta., ♂, ♀, 9 June 2004, C.T. McAllister (TAMUT). **Pulaski Co.**, Little Rock, ♂ (NMNH) and Pulaski Heights, 2 juvs., 1968, N.B. Causey (FSCA); North Little Rock, ♀, juv., 28 April 1962 (FSCA). **Stone Co.**, N. Sylamore Cr. nr. Allison, ♀, 29 June 2004, C.T. McAllister (TAMUT). **Union Co.**, ♂, 8 January 1958, L.O. Warren (FSCA). **Washington Co.**, Corkscrew Cv., 12 January 1938 (NMNH 1); Fayetteville, October 1963, N.B. Causey (MCZ 2); and Devil's Den St. Pk., 2 June–12 July 1966 (NMNH 2).

LOUISIANA: Statewide. **Bienville Par.**, Arcadia, ♂, 24 August 1940, S. and D. Mulaik (NMNH). **Caddo Par.**, 5 miles (8 km) NW Shreveport, 13 April 1936, L. Hubricht (NMNH 5). **Claiborne Par.**, roadside park 3 miles (4.8 km) from Homer, 4 June 1952 (FSCA 3). **East Carroll Par.**, September 1926 (NMNH 1). **Jefferson Par.**, Lafitte, ♂, 19 August 1940 (NMNH). **Lincoln Par.**, 6 miles (9.6 km) S Ruston, 4 juvs., 2 April 1955, D. Harman (FSCA); and 9 miles (14.4 km) S Ruston, 2 juvs., 24 August 1940 (NMNH). **Madison Par.**, Milliken's Bend, 2♂, 3♀, C.H. Shurtieff (MCZ); and Mound, 6 October 1920 (NMNH 2). **Morehouse Par.**, Chemin-A-Haut St. Pk., ♂, ♀, juv., 25 April 1971, D.A. Rossman (FSCA). **Ouachita Par.**, Monroe, 2♀, 1 June 1965, J.

Gallagher (FSCA). **St. Landry Par.**, W of Eunice, 2 juvs., 31 August 1940, S. and D. Mulaik (NMNH). **Webster Par.**, ♂, December 1958, W.E. Evans (FSCA).

NEBRASKA: Along the Missouri River and perhaps slightly westward from Omaha southward. Northernmost records: **Sarpy Co.**, Bellevue (Kenyon 1893b) and Fontanelle For., ♀, 11 May 1986, R.M. Shelley (NCSM). Westernmost record: **Cass Co.**, Weeping Water (Kenyon 1893b).

KANSAS: Eastern and southcentral Kansas. **Anderson Co.**, ♀, 15 September 1932, M. Griffith (SEM). **Douglas Co.**, Lawrence, juv., 20 September 1974, C.K. Starr (UGA); Univ. of Kansas Nat. Hist. Res., ♀♀, 1 May 1953, R.W. Frederickson (SEM) and 29 June 1967, F.A. Coyle (FMNH 5); and Baldwin City, juv., 1900 (NMNH) and ♀, 1905, J.C. Bridwell (NMNH). **Johnson Co.**, Shawnee Mission Park, 21 April 1968, J.R. Heitzman (FSCA 3). **Montgomery Co.**, Montgomery State Fishing Lake, July 1959, P.C. Holt (MHNG 2). Westernmost records: **Butler and Cowley Counties.** (Gunthorpe 1913).

OKLAHOMA: Central and south central Oklahoma eastward. **Caddo Co.**, Red Rock Canyon St. Pk., ♂, 2♀, 8 November 2003, C.T. McAllister (NCSM). **Craig Co.**, 1 mile (1.6 km) S Kansas border, 7 April 1973, J.H. Black (FSCA 6). **LeFlore Co.**, 7 miles (11.2 km) NE Talihina, nr. Bear Den Cv., ♂, 29 April 1971, J.H. Black (FSCA); along U.S. Hwy. 270, 5.5 miles (8.8 km) E jct. U.S. Hwy. 259, ♂, 27 June 1972, F.A. Coyle (NCSM); and Ouachita Nat. For., Cedar Lake Cpgd., 2♀, 12 June 1973, J.H. Black (FSCA). **McCurtain Co.**, Beaver's Bend St. Pk., ♀, 25 March 1977, P. and A. Black (FSCA) and 2♂, 27 October 1979, S. Morris (NCSM). **Okmulgee Co.**, Dripping Springs St. Pk., ♂, ♀, 10 September 2004, C.T. McAllister (TAMUT). **Osage Co.**, 16.6 miles (35.8 km) W Bartlesville, along U.S. Hwy. 60 at Cedar Cr., ♂, 2 juvs., 3 October 1979, S.-K. Wu (UCO). **Pittsburg Co.**, Krebs, ♂, ♀, juv., 8 November 1952 (FSCA); McAlester, 8 November 1952 (INHS); 14 miles (22.4 km) NNW McAlester, roadside park at South Canadian R. on Nations Turnpike, juv., 16 July 1962 (FSCA); and Arrowhead St. Pk., ♂, 11 September 2004, C.T. McAllister (TAMUT). **Pushmataha Co.**, along Indian Nations Tpk., ♀, 9 September 2004, C.T. McAllister (TAMUT). **Tulsa Co.**, Bixby, ♀, 4–10 November 1973, J.M. Nelson (NCSM).

Westernmost records: **Comanche Co.**, Wichita Mountains National Wildlife Refuge (Chamberlin 1931, Keeton 1960), ♀, 16 October 1971 (MSU), and 2 juvs., 11 May 1977, J.H. Black (FSCA).

TEXAS: **Anderson Co.**, 6 miles (9.6 km) S Elkhart, ♀, 7 April 1958, O. Sanders (FSCA). **Angelina Co.**, 8 miles (12.8 km) N Lufkin, ♀, 22 August 1940 (NMNH); and Angelina Nat. For., crossing rd. to Boykin Spring, ♂, 5 October 2001, R.M. Shelley (Sight Rec.). **Bandera Co.**, Lost Maples St. Nat. Area, Canyon Creek Cvs. 2 and 3, 20 July–30 October 2000, J.R. Reddell, M. Reyes (TMM 3). **Bastrop Co.**, E. of Bastrop, juvs., 20 August 1940, S. and D. Mulaik (NMNH); and Bastrop St. Pk., juv., 30 September 1973, J.R. Reddell, M.H. McKenzie (FSCA). **Bexar Co.**, San Antonio, cotton fields, 27 September 1915 (NMNH 2). **Brazoria Co.**, 2.4 miles (6.1 km) S Old Ocean, ♀, 23 December 1961, R.O. Albert (FSCA). **Brazos Co.**, Bryan, ♂, June 1964, W. Russell (FSCA). **Brown Co.**, Brownwood, 9 May 1909 (NMNH 3). **Burnet Co.**, 5 miles (8 km) W Spicewood, Whitfield Cv. and Mossy Fissure, juvs., 27–30 March 1993, A. Grubbs (TMM); 4.2 miles (7 km) NW Spicewood, Waldman Cv., ♀, 24 April 1993, P. Sprouse (TMM). **Cass Co.**, Atlanta St. Pk., ♂, 16 June 2004, C.T. McAllister (TAMUT). **Chambers Co.**, Anahuac, ♀, 8 November 1918 (NMNH). **Comal Co.**, San Marcos, 24 May 1928 (NMNH 1); N of San Marcos, 24 May 1928, B.C. Marshall (NMNH 1); and NE of Bergheim, ♂♂, ♀♀, 2 October 1965, J.R. Reddell (FSCA). **Coryell Co.**, Mother Neff St. Pk., 3♂, 2♀, 6 June 1955, W. Moody (UMMZ) and ♀♀, 4 July 1955, L. Hubricht (NMNH). **DeWitt Co.**, Cuero, ♀, December 1907 (NMNH). **Fort Bend Co.**, Richmond, ♀, 4 June 1956 (FSCA). **Goliad Co.**, Goliad, ♀, 14 August 1963, N.L.H. Kraus (NMNH). **Grimes Co.**, Navasota, juv., 2 December 1961, W. Watkins (FSCA). **Guadalupe Co.**, 10 miles (16 km) N Stockdale, 3♀, 17 November 1995, J.R. Reddell (TMM). **Hardin Co.**, Village Creek St. Pk., ♂, 14 June 2004, C.T. McAllister (TAMUT). **Harrison Co.**, Caddo Lake St. Pk., 19–31 May 1940, S. and D. Mulaik (NMNH 7) and ♀, 14 June 2004, C.T. McAllister (NCSM). **Jasper Co.**, Jasper, 3♀, 4 November 1962, Jasper High School Science Club (FSCA). **Kerr Co.**, Kerrville, ♂, ♀, 1 April 1959, J.F. McAlpine (CNC); 8 miles (12.8 km) N Kerrville, ♀, juv., 13 July 1940, S. and D. Mulaik (NMNH); ca. 12 miles

(19.2 km) S Kerrville, Raven Ranch off TX Hwy. 173, August 1939 and 1940, S. and D. Mulaik (NMNH 8), juvs., June 1941 (NMNH), and 4 ♀, July 1941, J. Rowe, S. and D. Mulaik (NMNH); 15 miles (38.4 km) S Kerrville, 5 juvs., 30 June 1941, S. and D. Mulaik (FSCA). **Lavaca Co.**, Hallettsville, 23 May 1908, E.S. Tucker (NMNH 1); and 10 miles (16 km) E of Hallettsville, along U.S. Hwy. 90A, ♂, 2 ♀, 13 May 1960, H.F. Loomis (VMNH). **Leon Co.**, 12 miles (19.2 km) E Buffalo, 2 ♀, juv., 19 January 1951 (NMNH) and 3 ♀, September 1951, O.L. Cartwright (NMNH). **Limestone Co.**, between Thornton and Oletha, 16 April 1945, K.P. Schmidt (FMNH 3). **Llano Co.**, Enchanted Rock St. Pk., 28 September 1940 (NMNH 2). **McLennan Co.**, S. of Waco, 12 April 1941, R.H. Stewart (FMNH 1). **Nacogdoches Co.**, Nacogdoches, 2 juvs., January 1931 (NMNH) and 14 June 1938, R.H.A. (NMNH 1); NE of Nacogdoches, nr. Harmonia Church, 2 ♀, 17 February 1991, K.J. McWest (NCSM). **Newton Co.**, 12 miles (19.2 km) NE Newton, Wild Azalea Trail, juv., 7 October 2004, R.M. Shelley (NCSM). **Panola Co.**, Carthage, 2 ♀, 10 March 1962, L. Hull (FSCA). **Polk Co.**, 7 miles (11.2 km) E Livingston, ♂, juv., 21 August 1940, S. and D. Mulaik (NMNH). **Real Co.**, "The Cave at 14," ♀, 30 May 1993, G. Veni (TMM). **Refugio Co.**, 25 miles (40 km) S Victoria, 3 juvs., 28 December 1947 (NMNH). **Rusk Co.**, 4 miles (6.4 km) NE Henderson, along Texas Hwy. 43, ♀, 3 juvs., 12 May 1957, O. Sanders (FSCA). **Sabine Co.**, Sabine Nat. For., juv., 4 October 2001, R.M. Shelley (Sight Rec.). **San Jacinto Co.**, Sam Houston Nat. For., Double Lake Rec. Area, ♂, 8 October 2001, R.M. Shelley (Sight Rec.). **Shelby Co.**, Sabine Nat. For., nr. Boles Field along headwaters of Grannies Cr., ♂, 23 April 1990, R.W. Baumann, C.R. Nelson (BYU). **Titus Co.**, Lake Bob Sandlin St. Pk. (zone 15S, 0304245E, 365928N), ♂, juv., 2 October 2004, R.M. Shelley, C.T. McAllister, H. Robison (NCSM). **Travis Co.**, Austin (NMNH 10); Cave X, October 1988, E. and W. Grimm (TMM); Hamilton Pool Natural Area, ♀, 2 May 2004, R.M. Shelley (FSCA). **Victoria Co.**, Victoria, ♂, 3 juvs., December 1905 (NMNH), August 1906, D.J. Mitchell (NMNH 2), and ♀, juvs., 10 March 1917, J.D.M. (NMNH). **Waller Co.**, Hempstead, 5 ♀, 26 February 1962 (FSCA). **Wharton Co.**, Wharton, bank of Colorado R., ♀, December 1905 (NMNH); Pierce, ♀ (NMNH); and Mackay, 3

juvs., 12 September 1906 (NMNH). Real and Uvalde counties are at essentially the same longitude, and the precise locations of the caves cited by Reddell (1965, 1970) and the one above from Real County are unknown. Westernmost definite, locatable record in both Texas and the overall range: **Uvalde Co.**, Garner St. Pk., ♀, 16 March 1983, W.H. Cross (MEM). Southernmost records in both Texas and the overall range outside of Florida, which are at essentially the same latitude and just north of that of Corpus Christi: **Aransas Co.**, Rockport, 26 May 1961, J.D. Gray (FSCA 10); **Duval Co.**, NE corner of county, juv., 4 April 1962, R.O. Albert (FSCA).

DISCUSSION

The overall distributions of *Narceus* and the "*N. americanus/annularis* complex" encompass a large, semicontinuous area and a single site in southwestern Minnesota that lies some 150 miles (240 km) north of the projected border in Iowa and around 180 mi (288 km) west-northwest of Rochester and the southeastern corner of Minnesota, where the genus is expected. This site, the northernmost one west of the Mississippi River, is so disjunct that we interpret it as representing an allopatric population that plausibly extends 35 mi (56 km) westward into the eastern fringe of South Dakota.

The projected range of the main area extends, latitudinally, from 24°33'17.71"N, at Key West, Florida, to 46°49'12.07"N, at Saint-Nicolas/Québec City, Québec; longitudinally it ranges from 69°55'31.16"W, at Cape Cod, Massachusetts, to 99°44'10.71"W, at Garner State Park, Uvalde County, Texas. Causey (1959) was therefore remarkably accurate in reporting 97°W longitude as the western limit. Maximal north-south dimensions are ca. 1650 mi (2640 km) in the east, from Québec City to Key West, and 940 mi (1504 km) in the west, from Omaha to Rockport/Duval County, Texas. East-west, the area covers some 1120 mi (1792 km) in both the north and south, from Atlantic City, New Jersey, to Omaha, and from Jacksonville Beach, Florida, to Garner State Park. The east-west distance in Texas is around 360 mi (576 km), and that in Canada, from the points where the projected border crosses into the U.S., is 600 mi (960 km); the northernmost locality, Saint-Nicolas, is some 160 mi (256 km) north of the closest border with New York.

Other northern limits are in Mackinac County, Michigan; Door and Clark counties, Wisconsin; Webster County, Iowa; and Sarpy County, Nebraska; other western limits are in Brown County, Texas; Comanche and Caddo counties, Oklahoma; Butler and Cowley counties, Kansas; and Cass County, Nebraska. The eastern limit is the Atlantic Ocean itself, and records are available from Cape Cod and Tucker-nuck Island (near Nantucket), Massachusetts; Suffolk County, Long Island, New York; Ocean County, New Jersey; Norfolk, Virginia; Cape Hatteras, Dare County, North Carolina; James Island, Charleston County, South Carolina; Chatham and McIntosh Counties, Georgia; and numerous sites along the east coast of Florida. The lone Maine record, Harrison, Cumberland County, also forms the eastern limit, but collecting in this poorly sampled state may extend it farther east. While we report the first locality from Delaware, from the north near Pennsylvania, no samples are available from Delmarva per se, and while field surveys have taken place in the "eastern shore" of Virginia, few if any have occurred to the north in Delaware and eastern Maryland. The millipeds inhabit the same environments elsewhere, and because they have spread over the rest of the eastern states, it is unreasonable to exclude them from at least the Delaware and Maryland part of Delmarva. *Narceus* is also projected for southeastern Minnesota because this area is encompassed by extrapolating between known sites in Iowa and Wisconsin and because records exist from bordering counties in southwestern Wisconsin, east of the Mississippi River.

The projected range includes the southern periphery of the UP of Michigan. Mackinac County, the lone UP record, is plausibly the northern limit in this part of the range because no individuals have been taken in several years of pitfall trapping near the Great Lakes Forestry Research Station, Sault Ste. Marie, Ontario, only around 60 mi (96 km) to the north (Shelley 1988). *Narceus* potentially occurs in Menominee County, the southernmost in the UP, as the genus occurs only 50 mi (80 km) to the south in Green Bay, Brown County, Wisconsin. We believe that Clark County is at or near the range limit in Wisconsin and that *Narceus* may truly be absent from western and northwestern Iowa. Farther west, Omaha, just 5 mi (8 km) north of Bellevue, is the likely

northern limit in Nebraska, and from there the western boundary angles progressively south-westward through Kansas and Oklahoma to Uvalde County, Texas (Figs. 2, 3).

To the south, numerous records are available from near the Gulf Coast in Florida, Alabama, Louisiana, and Texas; and the southernmost Texas localities are another likely range limit. *Narceus* apparently has not spread into the southernmost part of Texas, the Rio Grande Valley of Starr, Hidalgo, Cameron, and Willacy counties, approximately 120 mi (192 km) to the south, because Stanley Mulaik, who lived and taught high school in Edinburg, Hidalgo County, for many years, and was a protégé of R.V. Chamberlin, never found it despite intensive collecting in "the Valley." Consequently, we do not anticipate significant southward range expansion in Texas and curve the border north-westward through McMullen, LaSalle, Frio, and Zavalla Counties to the western extremity in Uvalde. Thus, the line lies about 60 mi (96 km) north of the Rio Grande at Laredo, and it seems safe to say that *Narceus* does not cross into Tamaulipas and Nuevo León, Mexico, which are occupied by another spirobolid genus, *Aztecocolus* Chamberlin (Chamberlin 1943c, Keeton 1960, Loomis 1968, Hoffman 1999).

Future sampling may expand the boundary westward, particularly in Nebraska and northern Kansas where little field work has been done, but we think this extension will be minimal. The 2nd author has collected extensively around San Angelo, Tom Green County, Texas, about 60 mi (96 km) west of the projected boundary, without encountering *Narceus*, so we think it truly does not occur there. Spirobolids also have not been encountered in Thayer County, Nebraska, adjacent to Kansas and approximately 40 mi (64 km) west of the projected border, where a modest amount of sampling has occurred. The projected overall distribution therefore encompasses parts of 2 Canadian provinces and 36 U.S. states, including all or essentially all of 26 states: New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North and South Carolina, Georgia, Florida, Alabama, Mississippi, Tennessee, Kentucky, West Virginia, Pennsylvania, Ohio, Indiana, Illinois, Missouri, Arkansas, and Louisiana. It spans 13 physiographic provinces and the following major rivers: the St. Lawrence, Connecticut, Hudson,

Delaware, Susquehanna, Potomac, York, James, Roanoke, Cape Fear, Santee, Savannah, St. Johns, Chattahoochee/Apalachicola, Alabama, Tennessee, New/Kanawha, Ohio, Illinois, Mississippi, Missouri, Arkansas, Canadian, Red, Sabine, and Colorado (of Texas). Surveys are needed in Québec, to document occurrence between Terrebonne and Temiscamingue Census Divisions, and along the Ottawa River and between Sudbury and Muskoka Counties, Ontario; in the U.S., they are needed in southern Minnesota, northwestern Iowa, eastern South Dakota, and Delmarva. As it harbors the northernmost record in the Midwest, the UP of Michigan warrants special attention; we need to confirm occurrence in Mackinac County, search for *Narceus* in Menominee County, and determine the extent of its distribution in the northern part of this state.

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