DISTRIBUTIONS OF THE SCORPIONS CENTRUROIDES VITTATUS (SAY) AND CENTRUROIDES HENTZI (BANKS) IN THE UNITED STATES AND MEXICO (SCORPIONES, BUTHIDAE)

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ABSTRACT. Specific locality records are presented to define the distributions of the scorpions Centruroides vittatus (Say) and C. hentzi (Banks) in North America. The former occurs in the Central Plains as far north as Thayer County, Nebraska; the Rio Grande and Sangre de Cristo Mountains form the western distributional boundary, and the Missouri and Mississippi Rivers essentially do likewise on the east. Centruroides vittatus occurs just across the latter watercourses in Holt County, Missouri, and Monroe and Randolph counties, Illinois, range extensions that probably can be attributed to rafting or natural alterations in the rivers’ courses. Other occurrences east of the Mississippi River, in northern Illinois, Kentucky, Tennessee, Louisiana, Mississippi and North Carolina, are associated with cities and are mostly far outside what we consider the natural range; such records are regarded as human introductions. One of these apparently represents a viable reproducing population in Rutherford County, Tennessee. Likewise, records far west of the Rio Grande, in Arizona and California, are interpreted as introductions. Centruroides vittatus traverses the Rio Grande south of Texas and occurs in Chihuahua, Coahuila, Nuevo Leon, and Tamaulipas, Mexico. Centruroides hentzi, previously known only from Florida in the United States, occurs in Mobile and Baldwin counties, Alabama, and in the southern tier of counties in Georgia. Occurrences of C. hentzi in Durham, Carteret, and Brunswick counties, North Carolina, Charleston County, South Carolina, and Harris and Muscogee counties, Georgia, are considered to represent accidental human importations, although it is also possible that the more proximal ones are peripheral isolates.

The scorpion fauna of the United States east of the Mississippi River is depauperate in comparison to that of the southwest. According to Muma (1967), five species — Tityus floridanus Banks, Isometrus maculatus (DeGeer), Centruroides gracilis (Latreille), C. hentzi (Banks), and C. keysi Muma — occur in Florida. Presently, T. floridanus is a synonym of T. dasyurus Pocock, from Puerto Rico and the Virgin Islands (Lourêncio & Franke 1984), and C. keysi is considered a synonym of C. guanensis Frangillo, from Cuba, Hispaniola, and the Bahamas (de Armas 1981). The first two species are known in Florida only from single individuals ostensibly collected at Key West. These records are questionable, and C. gracilis, hentzi and guanensis are the only scorpions that will be encountered frequently in the state, if not the only ones actually occurring there. Elsewhere in the East, the only known native scorpion is Vaejovis carolinianus (Beauvois), an upland species occurring primarily north and west of the Fall Zone as far north as the Ohio River in central Kentucky (Shelley 1994a).

Say (1821) described “Buthus vittatus” from the “sea islands” of Georgia, but his type specimen(s) are lost, and this name, long associated with the common midwestern species of Centruroides, was formally assigned to it (Opinion 1680, 1992) in response to the petition by Stockwell & Levi (1989), as subsequently modified by respondent comments (Gentry et al. 1991). As part of this opinion, a neotype of B. vittatus was designated from Kinney County, Texas, instead of Georgia. Say’s locality record plausibly refers to C. hentzi, which occurs statewide in Florida (Muma 1967), but up to now is not supported by preserved specimens. Centruroides hentzi and vittatus have been introduced into North Carolina (Shelley 1994b), and newspaper articles have reported scorpions from Kiawah Island and Isle of Palms, near Charleston, South Carolina (Langley 1991, 1994). These two scorpions are
readily distinguished at any life stage by the characters in Table 1, which also serve to distinguish \textit{C. vittatus} from \textit{C. guianensis} (= \textit{C. keysi}). Differences in the pigmements of the chelicerae and carapaces, and in the configurations of the telsons, are shown in Figs. 1–5.

While recently examining museum specimens, we encountered samples of \textit{C. hentzi} from southern Alabama and Georgia, thus establishing its occurrence north and west of Florida. The museum holdings also included numerous new records of \textit{C. vittatus} that enable a detailed description of its distribution. This distribution has been generally described as Louisiana west of the Mississippi River to New Mexico east of the Rio Grande, and from the Central Plains of the United States to northern Mexico (Stahnke & Calos 1977; Stockwell & Levi 1989; Shelley 1994b). However, it is striking to note that, aside from Las Vegas, San Miguel County, New Mexico (Banks 1901); Cleveland, Garvin, and Seminole counties, Oklahoma (cited as \textit{Centurus carolinianus} by Banks et al. 1932); the Wichita Mountains, Comanche County, Oklahoma (Coken-dolpher & Bryce 1980); and Thayer County, Nebraska (Rapp 1987), few definite United States records exist outside of Texas, where \textit{C. vittatus} can be anticipated statewide with perhaps the exception of several southeastern coastal counties. Published Mexican records (Hoffmann 1932; Diaz Najera 1975) are as follows: Cd. Juarez in Chihuahua; Cd. Acuna, Allende, Cuatro Cienegas, Lamadrid, and Sacramento in Coahuila; Hidalgo in Nuevo Leon; and Barrotaí, Cd. Aleman, Guerrero, Matamoros, and San Fernando in Tamaulipas.

It is our purpose here to place the new samples on record, update the known distributions of these scorpions in the United States and Mexico, and provide additional habitat information based on notations on vial labels. Acronyms for sources of preserved material are as follows: AMNH - American Museum of Natural History, New York, New York; ANSP - Academy of Natural Sciences, Philadelphia, Pennsylvania; CAS - California Academy of Sciences, San Francisco; CC - Biology Department, Columbus College, Columbus, Georgia; CIM - Cumberland Island Museum, St. Marys, Georgia; FMNH - Field Museum of Natural History, Chicago, Illinois; FSCA - Florida State Collection of Arthropods, Gainesville; INHS - Illinois Natural History Survey, Champaign; LSU - Entomology Department, Louisiana State University, Baton Rouge; MCZ - Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts; MEM - Mississippi Entomological Museum, Mississippi State University, Starkville; MMNS - Mississippi Museum of Natural Science, Jackson; MPM - Milwaukee Public Museum, Milwaukee, Wisconsin; MWSU - Midwestern State Univ., Wichita Falls, TX; NCSE - North Carolina State Museum of Natural Sciences, Raleigh; NCSU - Entomology Department, North Carolina State University, Raleigh; NMNH - National Museum of Natural History, Smithsonian Institution, Washington, DC; OKSU - Emerson Entomological Museum, Oklahoma State University, Still-
Figures 4–5.—Differences in telson morphology between *Centruroides vittatus* and *C. hentzi*. 4, Lateral view of telson of *C. vittatus*; 5, Same for *C. hentzi*.

water; OMNH - Oklahoma Museum of Natural History, University of Oklahoma, Norman; PMNH - Peabody Museum of Natural History, Yale University, New Haven, Connecticut; RNH - Private collection of R. N. Henson, Boone, North Carolina; SEM - Snow Entomological Museum, University of Kansas, Lawrence; SFASU - Biology Department, Stephen F. Austin University, Nacogdoches, Texas; TAMU - Texas A & M University, College Station; TMM - Texas Memorial Museum, University of Texas at Austin; TY - private collection of T. Yamashita; UCO - University of Colorado Museum, Boulder; UGA - University of Georgia Museum of Natural History, Athens; UMN - Entomology Department, University of Minnesota, St. Paul; UMO - Enns Entomological Museum, University of Missouri, Columbia; UTEP - Biology Department, University of Texas at El Paso; WDS - Private collection of W. D. Sissom, Canyon, Texas; WFR - Private collection of W. F. Rapp, Crete, Nebraska; WTAMU - Department of Biology and Geosciences, West Texas A&M University, Canyon, Texas.

### Centruroides vittatus

#### Habitat.

As reported by Shelley (1994b) and recorded through personal observations, *C. vittatus* occupies a variety of microhabitats in deserts, deciduous and pine forests, and grasslands, inhabiting crevices of rocky outcrops, canyon walls, and volcanic hills, climbing into vegetation, seeking refuge beneath yuccas and in trash dumps, and commonly entering houses. It has been collected from sea level to elevations of over 1800 m in the Guadalupe and Chisos Mountains, Texas and 2340 m in mountains of Coahuila, Mexico. Additional microhabitats cited on labels with the present samples include under palm branches, rocks, bark and logs in a pine forest, cow dung, and old rags and debris at an abandoned campsite; in a sabal palmetto grove; in the nest of a cactus rat; and in a molasses trap left overnight. Specimens were found in homes, motels, dormitories, and office buildings in Cole, St. Louis, and Taney counties, Missouri; Orleans Parish, Louisiana; Alfalfa, Kay, Marshall, Muskogee, Pawnee, Payne, and Stephens counties, Oklahoma; and DeBaca and Eddy counties, New Mexico. An individual from San Miguel County, New Mexico, was encountered inside the Las Vegas hospital.

### Distribution.

*Centruroides vittatus* has officially been recorded from only 16 Texas counties — Andrews, Brewster, DeWitt, Edwards, Erath, Garza, Hall, Kinney, Lubbock, Mason, Parker, Travis, Uvalde, Val Verde, Williamson, and Wise (Reddell 1965, 1970; Rowland & Reddell 1976; Stockwell & Levi 1989; Formanowicz & Shaffer 1993). Although overlooking a number of significant collections, Stockwell (1986) reported it from 50 additional counties in an unpublished Master's Thesis: Archer, Bexar, Blanco, Cameron, Clay, Coke, Crockett, Crosby, Culberson, Dallas, Foard, Gillespie, Gonzales, Grayson, Hidalgo, Jeff Davis, Johnson, Kaufman, Kent, Kerr, Kimble, King, Knox, LaSalle, Maverick, McMullen, Medina, Menard, Motley, Navarro, Oldham, Pecos, Presidio, Real, Reeves, San Patricio, San Saba, Schleicher, Starr, Sutton, Taylor, Terrell, Tom Green, Victoria, Ward, Webb, Wichita, Winkler, Zapata, and Zavala. These records are scattered across the state, and the scorpion is now known from bordering states in the United States and Mexico in all directions. We therefore believe that *C. vittatus* can be anticipated in every Texas county except perhaps Orange, Jefferson and Chambers, along the Gulf Coast east of Galveston Bay. Present records from Louisiana do not support its occurrence in this corner of Texas, and field collecting is needed in these counties and in Calcasieu and Cameron Parishes, Louisiana, to confirm or refute this
Distributions of *C. vittatus* (closed circles) and *C. hentzi* (open circles) in the United States and Mexico. Florida records for *C. hentzi* are for counties only and are partially based on Muma (1967). The approximate courses of the Missouri River and the Rio Grande are indicated in Missouri and New Mexico/Colorado, respectively. The "?" in Iowa and Louisiana denotes the records from unknown counties along the Missouri and Mississippi Rivers, respectively. The "?" in Chihuahua, Mexico reflects our lack of knowledge on the extent of the distribution of *C. vittatus* in this region, which has been so poorly sampled.

Finding. Large numbers of samples from Texas exist in many museum collections, too many to be shipped for examination. We therefore list only additional Texas county records that were intermingled with material from other states, but plot all known localities accurately on Fig. 6.

Determining the natural distribution of *C. vittatus*, and to a lesser extent *C. hentzi*, is hampered by the number of specimens that man has accidentally transported into new areas, which tend to mask the indigenous range. Samples from distant states like California and North Carolina clearly represent human introductions, but ones from proximate sites like Memphis, Tennessee and Baton Rouge, Louisiana could plausibly reflect peripheral native populations. Mapping of all the samples, however, reveals clusters of records that we believe represent natural occurrence; we use them as the basis for determining indigenous distributions, particularly when detached records are from urban environments and are consistent with human activities. Thus, as shown in Fig. 7, the eastern border formed by clustered records angles southwestward through southeastern Missouri into Arkansas, and then runs through central Arkansas and Louisiana before turning westward into Texas, omitting the adjoining coastal corners of Louisiana and Texas. The only outlying records along this boundary are from the urban environments of Baton Rouge and Memphis, and are therefore treated as human introductions.

The overall distribution of *C. vittatus* (Fig. 6) extends southward from Thayer County, Nebraska, and expands longitudinally to encompass all of Oklahoma, Arkansas, and Missouri south of the Missouri River. The Rio Grande in southern New Mexico and the Sangre de Cristo Mountains in northern New Mexico and south central Colorado form the western geographical boundary, and present Colorado records suggest westward expansion through the Arkansas River Valley. The only available records from the western half of Kansas are sight records from Clark and Trego counties, so collecting is needed to determine the distribution in this part of the state. The Missouri and Mississippi Rivers essentially form distributional boundaries, as the only natural occurrences to the north/east of the former, in Holt County, Missouri, and to the east of the
latter, in Monroe and Randolph counties, Illinois, are in bordering counties that could have resulted from rafting or natural alterations of the rivers’ courses; the Illinois records are directly across the Mississippi from an area where the scorpion is common in Missouri. However, other sites east of the Mississippi, mostly urban areas, represent obvious adventives. The range traverses the Rio Grande south of Texas, and C. vittatus is known from over half the lengths of Tamaulipas, Nuevo Leon, and Coahuila, and the northern periphery of Chihuahua.

NEW RECORDS
Specimens that are considered to represent the native distribution were examined from the following localities. Missing data (exact locality, date of collection, and collector(s)) are not reported. Sight records deemed reliable from additional counties are presented separately for each state after the locality listings but are plotted in Fig. 6.


<table>
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<th>Table 1.—Morphological differences between C. vittatus and C. hentzi and C. guanensis (=C. keysi).</th>
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<tr>
<td>C. vittatus</td>
</tr>
<tr>
<td>1. Carapace with black inverted triangle covering ocular tubercle (Figs. 1–2)</td>
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<tr>
<td>2. Dorsal surface of chelicerae usually uniformly yellowish (Fig. 1), occasionally with trace of reticulation (Fig. 2)</td>
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<td>3. Pedipalp chela fingers and manus uniformly yellowish; all pedipalpal segments uniformly yellowish</td>
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<tr>
<td>4. Median yellow stripe of dorsum as wide or wider than black stripes (when stripes are present)</td>
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<td>5. Higher pectinal tooth counts</td>
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<td>Male: 21–30</td>
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<td>Female: 20–27</td>
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<tr>
<td>6. Metasomal segments with a single solid dusky midventral stripe lying between ventral submedian carinae</td>
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<td>7. Legs usually immaculate yellow, rarely faintly infuscate</td>
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<tr>
<td>8. Telson suboval when viewed from ventral aspect</td>
</tr>
<tr>
<td>9. Telson midventrally with very weak smooth, longitudinal carina leading into subacetabular tubercle (Fig. 4)</td>
</tr>
<tr>
<td>10. Subacetabular tooth small, spinoid (Fig. 4)</td>
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Figure 7.—Comparisons of native distributions of scorpions in the United States and northern Mexico, emphasizing those species occurring in eastern and southcentral United States. 1, *C. vittatus*; 2, *C. hentzi*; 3, *C. gracilis*; 4, *C. guanensis* (= *C. keysi*); 5, *Vaejovis carolinianus*. The dotted line in western New Mexico and Arizona indicates the eastern boundary of the range of *C. exilicauda* (Wood); the boundary in New Mexico is based on the unpublished data of the junior author.

Yamashita (TY); Fayetteville, 4 October 1938, L. G. Hembest (NMNH) and 19 July 1953, N. B. Causey (MCZ); and 40 km W Fayetteville, 20 July 1969, A. Graves (FSCA). Sight records (T. Yamashita, in litt. to second author): Lake Ouachita (several sites, all rocky areas) in Hot Springs Co. **COLORADO**: Baca County, Regnier, ca. 36.8 km S Pritchett, Comanchee Nat. Grassland (AMNH). Fremont County, 0.8 km W Canon City, 5 September 1958, A. W. Spencer (CAS); and Canon City, June 1968, R. L. Kaebler (SEM), and outside Fly Cv., 28 August 1961, W. J. Gertisch, W. Ivie (AMNH). *Las Animas County*, along CO hwy. 109, 21 June–11 July 1966 (AMNH). Otero County, along CO hwy. 109, 6 July 1967 (AMNH). Prowers County, Two Buttes Reservoir, 3–19 July 1966 (AMNH). **Pueblo County**, Boone, 6–7 July 1967 (AMNH); along CO hwy. 78, 16 March 1963–15 August 1964 (AMNH); and Lime, ca. 16 km S, 3.2 km E Pueblo, 12 May year unknown, Brookhart (AMNH). **ILLINOIS**: Monroe County, 6.4 km N Fults, 9 April 1949, D. M. Smith (INHS); 4 km N Fults, 13 July 1949, A. G. Wright (INHS); Fults, 9 October 1948 and 16 June 1949, P. W. Smith (CAS, INHS), 15 July 1953, Hensley & Smith (INHS), and spring 1971, D. Daleske (FMNH); and 6.4 km S Valmeyer, 1 May 1956, P. W. Smith (INHS). Randolph County, 3.2–4.8 km N Prairie du Rocher, October 1980, R. W. Sites (UMO); and Prairie du Rocher, 28 June 1949, Smith & Stannard (INHS) and 29 September 1982, J. H. Gerrard (AMNH). **KANSAS**: Allen County, Humboldt, 24 August 1944 (CAS). Chase County, 2.4 and 4.8 km S Saffordville, 24 June 1964 and 10 May 1965, R. F. Clarke (CAS), and 11.2 km S Saffordville, 20 June 1965, R. Zwiefel (AMNH); 8 km S Strong City, 4 June 1957, C. E. Goulden (CAS); and east edge L. Kahola, 17 June 1965, R. F. Clarke (CAS). Chautauqua County, 4.8 km W Peru, 3 April 1933, C. E. Burt (NMNH). Cowley County, Winfield vic., 1933, C. E. Burt, B. Anderson (NMNH). **Douglas County**, Lawrence, B. C. Marshall (ANSP), 10 October 1947 (CAS), 28 April 1948 (INHS), and 22 September 1962 (SEM); Lawrence, no date, T. Yamashita (TY); prairie outside Lawrence, 3 May 1964, S. Roth (CAS); 4.8 km W Lawrence, Clinton Lake Rec. Area, 9 May 1993, B. Cutler (UMN); and Rock Cr., 3 May 1899 (AMNH). Lyon County, Emporia, 14 May and 21 September 1966 (CAS). Osage County, 17 April 1966, R. F. Clarke (CAS). Reno County, Hutchinson, 27 July 1951 (CAS). Riley County, Manhattan, 10–19 September 1904 (MCZ) and 1927, C. E. Burt (NMNH). Wilson County, Altoona, Neodesha Region, 11 August 1977, Gordon (FMNH). Woodson County, Toronto (CAS). Wyandotte County, Kansas City (NMNH). Sight records (B. Cutler, in litt. to first author): Butler, Cherokee, Clark, Elk, Trego, and Wabaunsee counties. **LOUISIANA**: Allen Parish, 16 February 1963, D. A. Rossman (LSU). Beauregard Parish, DeRidder, 1943, E. L. Bell (AMNH); and 41.6 km N Lake Charles, 10–17 August 1941, E. L. Bell (AMNH). Caddo Parish, Ida, 11 June 1972, F. H. Eubanks (CAS); Blanchard, 14 February 1967, K. Howard (CAS); and Shreveport,
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It is also noteworthy that C. vittatus may have been introduced abroad as well. At least, there are some specimens in museum collections bearing labels from locations in South America. Sissom & Lourenço (1987) discovered that the species C. dasypus Mello-Leitão described from Andahuaylas, Peru was in fact C. vittatus. These specimens were probably mislabeled, as the locality is deep in the mountainous interior of the country. There are also several specimens of C. vittatus from Caracas, Venezuela in the Field Museum of Natural History, Chicago.

Centruroides hentzi (Banks)

Habitat.—According to Muma (1967), C. hentzi usually occurs under litter, logs, and stones in Florida; it can also be found under bark of dead trees and often enters houses. North of Florida, specimens were encountered under pine and oak bark in Camden and Charlton counties, Georgia, respectively, and inside houses, condominiums, or dormitories in Charleston County, Georgia; Charleston County, South Carolina; and Durham, Carteret, and Brunswick counties, North Carolina. Of the six specimens seen at the South Carolina site, two have been preserved, one of which was in a sleeve of a robe and stung the collector when she tried to put on the robe (Langley 1994).

Distribution.—In the United States, C. hentzi was previously known only from Florida, where it occurs statewide (Muma 1967); it can now be reported from adjacent parts of Alabama and Georgia, where it would logically be anticipated (Figs. 6, 7). In Georgia, the scorpion appears to be common in the southern tier of counties adjacent to Florida; it occurs offshore on Cumberland Island, and these specimens constitute topotypes of Buthus vittatus Say. The westernmost locality, Mobile, Alabama, establishes C. hentzi west of the Alabama River and suggests eventual discovery in southeastern Mississippi. Specimens from outside of Florida that are believed to represent natural occurrences were examined from the following localities:


Human importation to other areas.—Specimens that are believed to represent accidental human introductions were examined from the following localities. The samples from Georgia could conceivably represent natural occurrence because these two counties, in the Fall Zone and outer periphery of the Piedmont Plateau, ca. 160 km from the most proximate locality, are not so remote as to be implausible indigenous records, par-
particularly if *C. hentzi* occurs northward in the Gulf Coastal Plains. However, they are detached from the clustered and unquestionably native records in southern Georgia and are therefore treated as introductions. The specimens from South Carolina and Brunswick County, North Carolina, were possibly imported with Florida palm trees that have been planted along the coast of the Carolinas (J. Morse, pers. comm.). Reproducing populations have not been verified at any of the following sites.

**GEORGIA:** Harris County, 10 May 1970 (CC). Muscogee County, Columbus, 17 May 1959 (CC). **NORTH CAROLINA:** Brunswick County, Bald Head Island, February 1993 (NCSM) and 1.6 km E of Marina, July 1992 (RHN). Carteret County, Bogue Banks, Emerald Isle, September 1993, D. McLuskey (NCSM). **SOUTH CAROLINA:** Charleston County, Isle of Palms, 20 February 1994, S. Mims (NCSM).

**COMPARISON OF SCORPION DISTRIBUTIONS IN THE EASTERN UNITED STATES**

The known indigenous distributions of the scorpions in the United States east of the Central Plains are compared in Fig. 7; the ranges of *C. gracilis* and *C. guanensis* (= *C. keysi*), and *V. carolinianus* are adapted from maps published by Muma (1967) and Shelley (1994a), respectively. There is no known overlap between *V. carolinianus* and any of the buthids, although its range is only about 112 km north of that of *C. hentzi* in southern Alabama. According to Muma (1967), *C. guanensis* is restricted to Collier, Dade, and Monroe counties, Florida. *Centruroides gracilis* is indigenous to the peninsula from Alabama southward. To our knowledge, these distributions are still current, but we did discover the following two samples of *C. gracilis*, representing accidental human importations, from well outside this area.

**MISSISSIPPI:** Rankin County, in concrete debris at truck stop on US hwy. 49 just S 1-20, nr. Jackson, 27 October 1983, E. S. Olson (MMNS). **TEXAS:** Galveston County, Galveston, 1935 (NMNH).

Additionally, there is an invididual of *C. gracilis* from Dallas, Texas (NMNH), that was taken in 1956 "in produce from Central America," and another collected in 1930 on a ship berthed at New Orleans (NMNH).

**ACKNOWLEDGMENTS**

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**LITERATURE CITED**


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