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New distribution records for *Stenoponia americana* (Baker) and *Stenoponia ponera* Traub and Johnson (Siphonaptera: Ctenophthalmidae) with a review of records from the Southwestern United States

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Abstract

The genus *Stenoponia* is represented in the United States by *S. americana* (Baker) and *S. ponera* Traub and Johnson. *Stenoponia americana* is widely distributed from the eastern seaboard of the United States to the eastern slopes of the Rocky Mountains. The western extreme of *S. americana* is reported for the first time in Utah, a new state record is given for South Dakota, and additional unpublished records are provided for Arkansas, Colorado, Florida, Georgia, Indiana, Iowa, Kentucky, Montana, New Mexico, and North Carolina. The presence of *S. ponera* was confirmed in SW Colorado, extending the distribution north by 480 km, additional records are provided for Arizona, and the first record of this species is documented for Texas. A distribution map for *Stenoponia* in the southwestern United States and a discussion of their ecology is included.

Key words: geographical distribution, Siphonaptera, *Stenoponia americana*, *Stenoponia ponera*

Introduction

Dr. Charles H. Calisher, Arthropod-Borne Infectious Disease Laboratory, College of Veterinary Medicine and Biomedical Science, Colorado State University, Fort Collins, recently submitted two males of *Stenoponia americana* (Baker, 1899) from southwestern Colorado. These new montane records occurring so far to the west stimulated further inquiries. Additional material was examined from the collections of Brigham Young University (BYU), Carnegie Museum of Natural History (CMNH), Glenn E. Haas (GEH), National Museum of Natural History (NMNH), Nixon Wilson (NW), Purdue University

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Insect Collection (PUIC), Robert E. Lewis (REL), and University of Minnesota Insect Collection (UMIC). Larvae were identified by Professor R.L.C. Pilgrim, University of Canterbury, Christchurch, New Zealand and are retained in his collection (RLCP). Records that have not previously been reported are included for several states east of the Rocky Mountains and those records from the southwestern United States are illustrated in Figure 1.

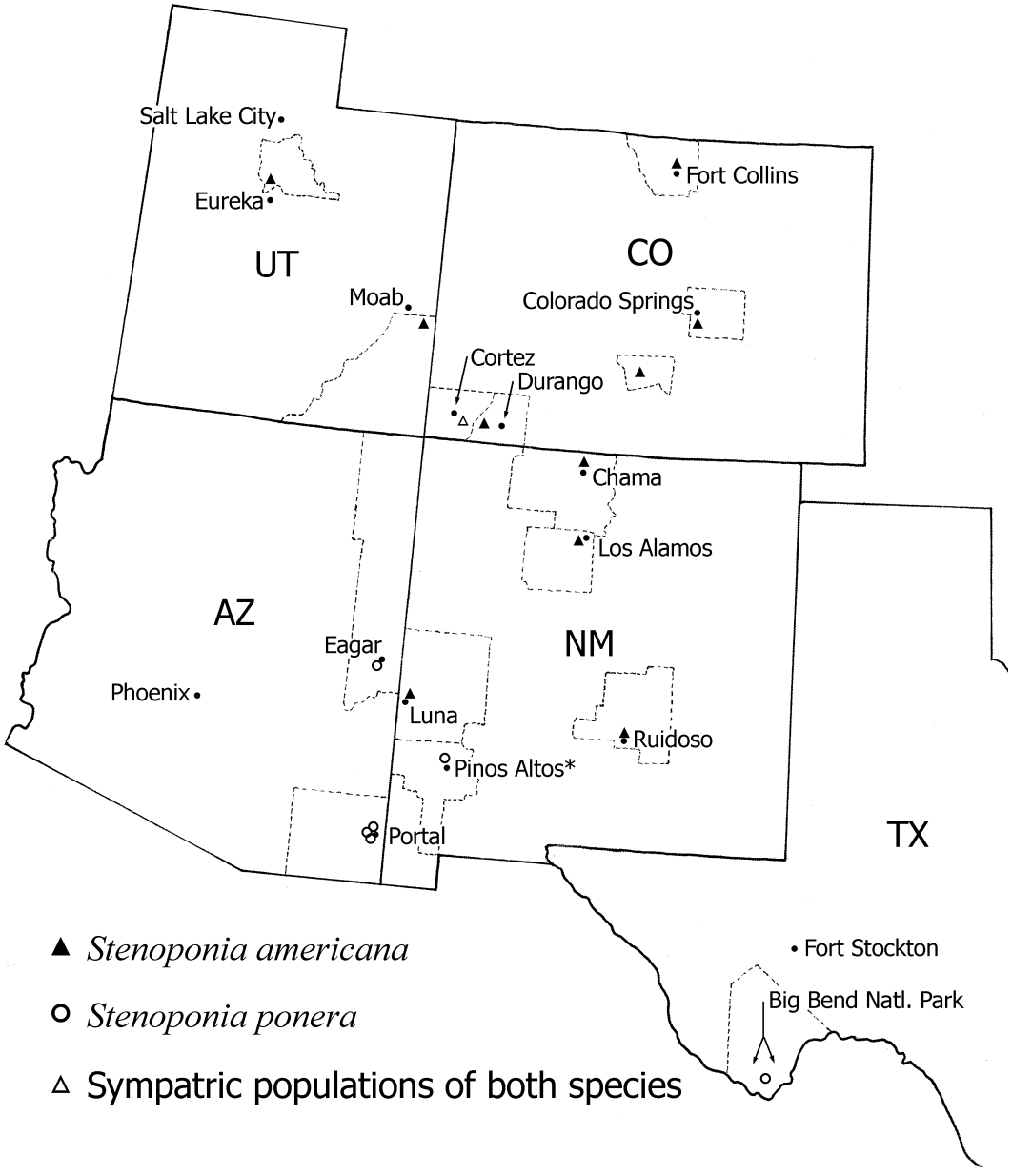

FIGURE 1. Map illustrating the distribution of *Stenoponia americana* and *Stenoponia ponera* in the southwestern United States (* designates type locality of *S. ponera*).

Results and discussion

Stenoponia americana (Baker, 1899)

Occurring primarily on peromyscine and microtine rodents, *S. americana* is generally found at low elevations from the eastern slopes of the Rocky Mountains to the Atlantic seaboard. Benton (1980) mapped records in all states east of the Mississippi River, except Mississippi and Wisconsin. Haas and Wilson (1973) reported collections from Wisconsin and it undoubtedly occurs in Mississippi as well. In the plains states east of the Rocky Mountains, it has been reported from Arkansas, Missouri, Kansas, and eastern Montana. The northern limit of *S. americana* occurs below 52 degrees latitude in the plains regions from Alberta to Nova Scotia (Holland, 1985). *Stenoponia americana* has not been documented in the montane Rocky Mountain regions of Alberta, Canada, Montana, or Wyoming and known records from Colorado are restricted to Custer and Larimer Counties on the eastern slope of the Rocky Mountains (Eads, *et al.* 1979) and in Mesa Verde National Park, Montezuma County (Beck 1966, Douglas 1969). In New Mexico, montane records have been reported in Rio Arriba County (Stark 1958, Williams and Hoff 1951, specific locality, number and sex not stated) and in Catron and Sandoval Counties (Haas *et al.* 1973, 2004). To better integrate the ecology and zoogeography of the latter two records, collection data not included in the original reports are given below. Coincidental to this current report, Salceda and Hastriter (in press) reported two populations of a large series of *S. americana* disjunct and remotely located in montane regions of the States of Hidalgo and Puebla, Mexico.

Materials examined

ARKANSAS. Jefferson County: *Peromyscus maniculatus* Wagner, 16.III.1954, J.P. Redman (BZ-95 lot 54-4222), 1 female; *Peromyscus leucopus* (Rafinesque), 20.I.1955 (BZ-626), C.E. Hoffman, 1 female; same data except 20.I.1955 (BZ-626), 1 female; 24.II.1955 (BZ-679), 1 female; 16.II.1955 (BZ-686), 1 male, 1 female (NMNH). **COLORADO. El Paso County:** Fort Carson Military Reservation, *P. maniculatus*, 7.X.1977, Klein Team, 2 males, 1 female; same data except *Neotoma mexicana* Baird, 8.X.1977, 1 female (MWH). **La Plata County:** Fort Lewis, nr Hesperus, 21 km W Durango (37°13'30.9"N, 108°10'51.1"W), *P. maniculatus*, 23.IX.2001, J.J. Root, 2 males; same data except 11–13.X.2005, C.H. Calisher, 3 males, 1 female; *Microtus montanus* (Peale) 11, 13.X.2005, C.H. Calisher, 2 females (MWH). **Larimer County:** dog, 25.II.1975, G. Smith, 1 male (NMNH). **Montezuma County:** Chapin Mesa, SW of Far View Ruins, Mesa Verde National Park, 2271–2317 m, *Peromyscus truei* (Shufeldt) and *Peromyscus* sp., 26.X.1961, C.L. Douglas (BYU Project X. Field #5890), 1 male, 2 females; same as #5890 except 25.X.1961 (#5909), 2 females; same as #5890 except *P. truei* and *P. maniculatus*, 13.X.1961 (#5906), 1 female; same as #5890 except 4.8 km S garbage dump on Ute Indian land, 21.XI.1961 (#5912), 1 male (BYU). **FLORIDA. Leon**

County: Imonia (Tall Timbers Research Station), *Peromyscus gossypinus* (Le Conte), 21.II.1967, W.W. Baker, 1 male, 3 females; same data except, *Sigmodon hispidus* Say and Ord, 22.II.1967, 3 females; *P. gossypinus*, 24.II.1967, 1 male; 8.III.1968, 1 male; *S. hispidus*, 9.III.1968, 1 female; *Microtus pinetorum* (Le Conte), 12.IV.1968, 2 males; *P. gossypinus*, 7.III.1969, 1 female; *S. hispidus*, 7.III.1969, 1 male; *P. gossypinus*, 7.III.1970, 2 males, 1 female; 5.III.1971, 1 female; 5.II.1972, 2 females; 19.XII.1972, 2 males, 1 female; 22.XII.1972, 2 females; *P. gossypinus* (2), 17.I.1973, 1 male, 1 female; *P. gossypinus* (4) or *Neotoma floridana* (Ord), 17.I.1973, 2 males, 2 females; *P. gossypinus*, 22.II.1973, 1 male; 23.II.1973, 1 male; 16.XI.1976, 1 female; 2.XII.1976, 1 male, 1 female (all NW). **GEORGIA. Jackson County:** Attica, *S. hispidus*, 19.II.1965, W.W. Baker, 1 male, 1 female (NW). **Richmond County:** Augusta, *S. hispidus*, XII.1945, L. Kartman (A.P. #22192), 1 male; same data except I.1946, 1 male, 1 female; II.1946, 3 males, 3 females(NMNH). **Towns County:** Presley (Tray Gap), *Peromyscus* sp., 27.IV.1967, V.B. Baker, 1 male, 1 female (NW). **Wilkes County**: Rayle, *S. hispidus*, 3.II.1965, W.W. Baker, 1 female (NW). **INDIANA. Clarke County:** Henryville (Clarke State Forest), *P. leucopus* (2), 26.III.1962, R.E. Mumford, 2 males, 1 female (NW). **Harrison County:** 2 km S Laconia (Tobacco Landing), *P. leucopus* nest, 8.III.1958, N. Wilson, 1 female, 3 larvae (PUIC, RLCP). **Montgomery County:** 6 km NNW Waveland (Shades State Park), *P. leucopus*, 3.II.1957, N. Wilson, 1 female (PUIC); 8 km N (Pine Hills Nature Preserve), *Blarina brevicauda* (Say), 23.I.1958, N. Wilson, 1 female (PUIC); same data except *P. leucopus*, 24.I.1958, 2 males (PUIC). **Parke County:** 5 km N Byron (Shades State Park), *P. leucopus* (3), 10.II.1957, N. Wilson, 4 males, 9 females (PUIC). **Ripley County:** 8 km N Friendship, *Scalopus aquaticus* (Linnaeus), 8.XI.1957, N. Wilson, 1 male (PUIC). **IOWA. Dubuque County:** Dubuque (Mines of Spain State Recreation Area), *P. leucopus* (13), 14.X.1984, N. Wilson, 1 male, 1 female, 2 eggs; Sagerville, *P. leucopus*, 23.IX.1977, N. Wilson, 1 female; subsequent Iowa records same data except 24.IX.1977, 1 male, 2 females; 7.IX.1977, 1 female, 2 eggs; 8.X.1977, 1 male; 13 hosts, 11.XI.1977, 6 males, 12 females (2 eggs); 3 hosts, 12.XI.1977, 1 male, 6 females, 6 eggs; 16.XI.1977, 1 female; 4 hosts, 16.XII.1977, 3 males, 3 females, 2 eggs; 17.XII.1977, 1 male; *B. brevicauda*, 11.XI.1977, 1 male (all NW). **KENTUCKY. Edmonson County:** Mammoth Cave National Park, *P. leucopus* active nest, 3.IV.1958. N. Wilson, 4 larvae (RLCP). **Ohio County:** 6.4 km N Deanefield, *P. leucopus*, 31.XII.1981, 1 female; 27.XII.1992, 1 female (NW). **MONTANA. Rosebud County:** 12.9 km E Forsyth, *P. maniculatus*, 6.IV.1940 [C-2622, (CDC Plague Laboratory, San Francisco, California (CDCPL, SF, CA)], 1 male (NMNH). **NEW MEXICO**. **Catron County:** Mogollon Volcanic Plateau, Hellroaring Mesa, Apache National Forest, ~2.8 km NNE Luna Post Office (33°51'N, 108°56'W), 2195 m, *Peromyscus gratus* Merriam, rocky hillside with junipers (*Juniperus* sp.) and piñon pines (*Pinus edulis* Engelmann), 18.III.1990 (TAS 323), T.A. Spradling, 1 male (GE H) (see Haas *et al.* 2004:516). **Lincoln County:** 11.3 km N Ruidoso, *Peromyscus boylii* (Baird), 4.XII.1951 (316 NM 1029, (CDCPL, SF, CA), 1 female (NMNH). **Rio Arriba**

County: 1.6 km NE Chama, 2377 m, *P. maniculatus*, 31.VIII.1951 [NM 790 261d RT B-8604, (CDCPL, SF, CA)], 1 male (NMNH) (see Stark 1958: 70). **Sandoval County:** Jemez Mts., Bandelier National Monument, north side NM Hwy 4, mixed conifer forest (35°50'58"N, 106°24'55"W), 2716 m, *P. maniculatus*, 7.V.1970, G.E. Haas & R.P. Martin, 1 female (GEH) (see Haas *et al.* 1973:28). **NORTH CAROLINA. Cumberland County:** McFayden Pond, Fort Bragg Military Reservation, *S. hispidus*, 21.I.1971, G. Dancisak & H. Fleming, 1 female (NMNH). **Forsyth County:** Winston-Salem, found on skinning table where *B. brevicauda*, *P. maniculatus*, *Ochrotomys nuttalli* (Harlan) and *Mus musculus* Linnaeus had been handled, 19.III.1970, J.B. Cope, 1 female (NW). **OHIO. Athens County:** Athens, *P. leucopus*, (no date), H.T. Gier (A.P. #16527), 1 female (NMNH). **SOUTH DAKOTA. Fall River County:** *Microtus* sp., 10.IX.1946 [46F181 (CDCPL, SF, CA)], 1 female (NMNH). **Jackson County:** *Microtus pennsylvanicus* (Ord), 3.X.1942 [42F203 (CDCPL, SF, CA)], 1 male (NMNH). **UTAH. San Juan County:** Brumley Creek (T27S, R23E, SE 1/4), *P. truei*, 27.X.1988, T. Tibbets, 1 male, 1 female (REL). **Utah County:** Chimney Rock Pass, *Reithrodontomys* sp., 17.IV.1947, L.S. Miller (Museum no. 6026), 1 male (BYU).

Remarks

Records reported by Beck (1966) and Douglas (1969) were the first records for Colorado; however, both authors considered the species as either *S. americana* or *S. ponera* and were uncertain of their specific identities. Interestingly, both species were present in their material (see Material Examined herein for each species). The presence of *S. americana* in San Juan and Utah Counties, Utah are new state records and the western most for the species. It is surprising to find the Utah records scattered on isolated mountain ranges relative to the SW Colorado records, especially when the Utah County record is ~435 km northwest of the previously reported Colorado material. The species is also recorded herein for the first time in La Plata County, Colorado and in two counties in South Dakota. Data were listed for specimens from Richmond County, Georgia and Athens County, Ohio, which were only illustrated on the map in Benton (1980). Eads, *et al.* (1979) recorded 8 males and 13 females from Custer County, Colorado but we were unable to locate these specimens. Several specimens noted by Jellison and Senger (1973) from Petroleum and Rosebud Counties, Montana were collected in habitats suggestive of those on the eastern slopes of the Colorado Rockies. *Stenoponia americana* located in the Rocky Mountain region of Utah, Colorado, Arizona, and New Mexico are found within the limits of the Colorado Plateau with exception of those from El Paso, Larimer, and Lincoln Counties, Colorado. Future collecting in Wyoming, northwestern Colorado and western Montana is needed to determine if the species extends beyond the Colorado Plateau in the western United States.

Seven females collected in Iowa in September through December deposited large eggs, in pairs, when placed in 70% ethanol. Larvae were collected from *P. leucopus* nest

material from Indiana and Kentucky in March and April, respectively. In the material at hand, adults were collected as early as 31 August (Rio Arriba County, NM, 2377 m), 7 September (Dubuque County, IA, <400 m) and 10 September (Fall River County, SD, unknown elevation) and as late as 7 May (Sandoval County, NM, 1716 m), 27 April (Towns County, GA, 1185 m) and 17 April (Utah County, UT, ~1600 m). These large fleas are collected primarily during cooler months with only one or two per host animal. Warm weather seems to have a deleterious effect on adult longevity, since they emerge earlier and survive later at cool higher elevations. The Towns County, Georgia record collected at Tray Gap along the Appalachian Trail represents one of the highest points in the state and might have similar physiographic characteristics to the high elevations of western states.

Stenoponia ponera Traub and Johnson, 1952

During examination of *S. americana* material from the BYU collection, three *S. ponera* females were discovered that were incorrectly assigned to *S. americana*. Their distribution was extralimital to known records. Only two records of *S. ponera* Traub and Johnson have been documented in the United States. These include 12 specimens described by Traub and Johnson (1952) 11.3 km north of Pinos Altos, 2104 m (Pinos Altos Range), Grant County, New Mexico and six specimens reported by Beer, *et al.* (1959) from the Chiricahua Mountains, between Onion Gap and Rustlers Park, 2968 m, Cochise County, Arizona.

Material examined

ARIZONA. Apache County: foothills of White Mountains (Apache National Forest), Eagar, 5.2 km S, 11.3 km W (South Fork Campground), Ponderosa pines (*Pinus ponderosa* Laws.), 2310 m, *P. maniculatus*, 21.IX.1989, N. Wilson, 1 female (GEH). **Cochise County:** Chiricahua Mountains, Portal, *Peromyscus boylii* (Baird, 1855), 24.XII.1961, J.L. Mumford, 1 female (NW); same data except 4.7 km SW Portal, Cave Creek Canyon (north facing slope), 1590 m, 22.III.1992, N. Wilson, 1 female (NW); same data except 12.8 km W Portal, Barfoot Peak rockslide (south facing slope), mixed conifers, quaking aspen (*Populus tremuloides* Michx.), Gambel oak (*Quercus gambelii* Nutt.), and New Mexican locust (*Robinia neomexicana* A. Gray), 2560 m, *P. maniculatus*, 25.XI.1989, G.E. Haas, 1 female, (GEH); same data except 2525 m, *P. boylii* (2), 21, 22.X.1994, 1 female on one host and 4 males, 1 female on the other (GEH); 13 km W Portal, Rustler Park, 2597 m, *P. maniculatus*, 24.XI.1989, G.E. Haas, 3 males, 1 female (GEH). San Simon Valley, San Simon, 31 km N Portal, ~1128 m, *P. maniculatus*, 21.X.1977 (ACS 183), A.C. Simon, 1 male (NW); Portal, *P. boylii*, XIII.1957, J. Beer, 1 male (UMINN), Portal, 2440 m, *P. maniculatus*, XIII.1957, J. Beer, 2 females (UMINN). The only data on two slides was “Ariz” and a collection code: 13-3 and 13-16 (2 females) (BYU). **COLORADO. Montezuma County:** Chapin Mesa, SW of Far View Ruins, Mesa

Verde National Park, 2271–2317 m, *P. truei* and *P. maniculatus*, 13, 14.X.1961, C.L. Douglas (field #5906, #5907), 2 females (BYU); same data as #5906 except area between East Ruins Loop Road and Soda Can, 2096–2111 m, 10.I.1962 (#5915), 1 female (BYU). **TEXAS. Brewster County:** Big Bend National Park, 1738–2140m, *Peromyscus pectoralis* Osgood, 2.XI.1963, V.J. Tipton *et al.*, 4 males, 2 females (BYU).

Remarks

We confirmed several specimens cited by Beck (1966) and Douglas (1969) from Mesa Verde National Park as *S. ponera*, thus validating a northern extension of the species range from the type locality by 480 km. It should be noted that not only were the Mesa Verde National Park specimens of *S. ponera* taken from the same locality as *S. americana*, but one female (field #5906) of each species was collected from the same host animal. Texas records also constitute a new state record for *S. ponera*. This would suggest that the associated habitats for these two species in montane environments are similar. Beer *et al.* (1959) noted that their specimens were collected in a Douglas fir-yellow pine habitat, while there was no discussion of habitat characteristics in the original description.

Ecology of *Stenoponia* in the Southwestern United States

The need for more collecting in the Southwest is evident from the widely scattered records (Fig. 1). From the limited and often incomplete collection data available, adults of both species are collected primarily from species of *Peromyscus* during the cooler months from September through April in a wide range of habitats from grasslands and shrubs to Piñon-Juniper woodlands, Ponderosa pine forests and mixed Conifer-Aspen forests. There are no records from the low deserts such as the Sonora and Mojave where summers are probably too hot for development of immature stages, nor are there records from the high montane Spruce-Fir forests and Alpine tundra where extreme cold could be a limiting factor, or collecting efforts have been insufficient.

Data for nests are unavailable except for descriptions of nests and sites of *P. maniculatus* and *P. truei* on Mesa Verde (Douglas 1969). Large fleas with broad host ranges are likely to have a lower fecundity than small fleas, as the growth and development of the immature stages in the nests are prolonged. Larvae of species of *Stenoponia* are likely the longest lived stadium extending from Spring to Fall. Some might have been present in nests collected by Douglas (1969), but they were not preserved. Presumably the nest microclimate is one with moderate relative humidity and temperature based on data taken by Douglas (1969) on Mesa Verde. Finding and collecting nests where adult fleas were found on mice can be impractical as in the rock slide on Barfoot Peak, Chiricahua Mountains. At most, it can be concluded that the subterranean nests found in rockslides would have a more stable moderate microclimate than recorded on the surface of Mesa Verde. Regarding the sympatry of the two species of *Stenoponia* on Mesa Verde

(Fig. 1) and therefore presumably in other parts of New Mexico as well; hypothetically the two species were allopatric during the Pleistocene. After that epoch ended, *S. ponera* extended its range north from Mexico into Texas, New Mexico, Arizona, and Colorado, while *S. americana* radiated west into uplands of Colorado, New Mexico and Utah. We contend that these extensions of range are continuing.

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