

selves and determine whether you are original or not. If you can detect the quality, remember that it is the most precious commodity which may come from the college or university.

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OBSERVATIONS OF SOME MEMBERS OF THE GENUS *PHEIDOLE* IN THE SOUTHWESTERN UNITED STATES WITH SYNONYMY (HYMENOPTERA: FORMICIDAE)¹

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I have awaited publication of the recent important contribution by my colleagues, Drs. Creighton and Gregg (1956), concerning certain species of *Pheidole* from the southwestern United States before preparing for publication a number of my observations of southwestern *Pheidole*. The present paper lists previously unrecorded localities from which I have collected a number of the forms discussed in the paper by Drs. Creighton and Gregg. It also presents information on some other forms, my opinion concerning three complexes in the genus, and some suggested synonymy.

Pheidole cerebrosi Wheeler

Arizona: Madera Canyon, Santa Rita Mts. (1 nest). Under a stone on a dry, grassy, gravelly, lightly timbered slope.

New Mexico: 4 mi. N. of Las Cruces (1 nest). At base of dead acacia root in sandy semidesert. This record extends the known range into southern New Mexico.

Pheidole pinealis Wheeler

Texas: Fisher Hill, Davis Mts. (type locality, 1 nest). Small colony beneath a stone on a moist shaded slope.

Pheidole titanis Wheeler

Texas: Fisher Hill, Davis Mts. (6 nests). Beneath large stones on a moist, lightly timbered slope. Both majors and minors were foraging in long trails.

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Pheidole lepicana Pergande

Texas: Amarillo (3 nests). Under stones on a dry grassy roadside.

Pheidole vallicola Wheeler

Arizona: Cochise Stronghold, Dragoon Mts. (2 nests). Beneath stones on a dry wooded slope.

Pheidole virago Wheeler

Texas: 5 mi. W. of Laredo (1 nest). The nest was in dry sandy desert and a single unadorned opening marked its entrance. My series is definitely referable to *virago* although there are some differences. It may quite possibly represent a new species population, but until more collections and critical comparisons have been made, it should be considered as *virago*. *P. virago* is apparently known only from type material coming from Tucson, Arizona. My collection extends the range a great distance eastward. The distance involved strengthens the possibility of the series representing an undescribed species.

Pheidole gilvescens Wheeler

I am in hearty accord with the well-founded opinion of Creighton and Gregg (1956, p. 39) that *gilvescens* is a discrete specific population and that its name should be properly restored. In sandy desert, 15 miles west of Tucson, Arizona, *gilvescens* occurs sympatrically with *xerophila tucsonica*. At that station, I collected series from nine nests of *gilvescens*. The species apparently does not occur in the extensive desert area surrounding the base of Madera Canyon, Santa Rita Mountains, not far south of Tucson, where *tucsonica* abounds in the coarse sand.

Pheidole senex Gregg

Colorado: Pueblo (1 nest). Small soil crater on a dry shaded roadside.

Texas: 10 mi. N. E. of Amarillo (4 nests). Small sand craters on a dry grassy roadside. This species has hitherto been recorded only from Colorado and New Mexico.

Pheidole pilifera artemisia Cole

Arizona: The Gap, 30 mi. N. of Cameron (1 nest); Kaibab National Forest, 25 mi. N. of Marble Canyon (1 nest); Oak Creek Canyon, 20 mi. S. of Flagstaff (1 nest.) The nests were beneath stones. The range of this form is now known to extend from northern Utah to central Arizona. The Arizona series compare very well with the Provo, Utah types.

Pheidole pilifera pacifica Wheeler

Nevada: Kyle Canyon, Charleston Mts., near Las Vegas. Two nests of this interesting form which has heretofore been reported only from coastal California were found at a sandy semidesert shrub—juniper station at an elevation of 6,650 feet. Each colony was in the dry soil under a large stone and a small amount of chaff-covered mounded sand marked the entrance. Brood and seed chambers were at a depth of approximately 18 inches.

Pheidole bicarinata complex

In the western United States, there appear to be at most two forms in this complex, namely, *bicarinata bicarinata* Mayr and *longula* Wheeler which has long been regarded as a subspecies of *bicarinata*.

Pheidole bicarinata bicarinata has a wide range extending from Arizona and Nevada eastward and from central New Mexico northward into Colorado and southeastern Utah. There is much variation in sculpture of the major and in epinotal

armature of the minor. *P. bicarinata buccalis* Wheeler seems to be nothing more than a synonym of *bicarinata bicarinata*. Certainly it cannot be a geographic race. At its type locality (Prescott, Arizona) the "typical" form nests together with *bicarinata* at identical stations. A population comparable to the "typical" *buccalis* occurs in Cimarron Canyon, New Mexico (Ute Park, 7,400 ft.). Again this population is interspersed with *bicarinata* and completely surrounded by it. At Oak Creek Canyon, near Flagstaff, Arizona, *bicarinata* is well represented and variable as it is also at Madera Canyon, near Tucson. I believe that the degree of morphologic difference observed in the population named *buccalis* is well within the limits of normal variation of *bicarinata* and that consequently the two forms are conspecific. I propose therefore that *buccalis* be relegated to the synonymy of *bicarinata* Mayr.

The population named *longula* has a comparatively very limited range which lies between that of *bicarinata* (to the north and west) and that of *bicarinata vinelandica* Forel (to the south and east.) I have taken several colonies of *longula* in the Texas panhandle and adjoining Oklahoma. Inasmuch as there is apparently no known evidence of intergradation between *longula* and *bicarinata*, the two populations behaving as discrete species rather than as geographic races, I propose that the *longula* population be elevated to full specific rank. I realize that such a status cannot be other than provisional for, as Dr. Creighton (1950, pp. 171-2) has clearly pointed out, differences which characterize *longula* are very slight. The species is likely to fall into synonymy eventually unless considerably more information can be obtained in support of its integrity.

Western localities from which I have taken *bicarinata bicarinata* include the following ones:

Arizona: Madera Canyon, Santa Rita Mts. (3 nests); Oak Creek Canyon, 20 mi. S. of Flagstaff (2 nests); Prescott (5 nests); Navajo Springs (1 nest); Rustler Park, Chiricahua Mts. (5 nests).

Colorado: La Junta (2 nests); Colorado-New Mexico Line, on U. S. 550 (4 nests).

Nebraska: North Platte (1 nest).

New Mexico: 12 mi. S. of Santa Fe (3 nests); Embudo (2 nests); Raton (9 nests); 20 mi. W. of Raton (14 nests); Espanola (3 nests); 16 mi. W. of Socorro (1 nest); Tucumcari (1 nest); Glenrio (3 nests); 9 mi. W. of Glenrio (1 nest); San Juan Pueblo (3 nests); 22 mi. N. of Las Vegas (1 nest); 9 mi. W. of Magdalena (1 nest); Black Mt. Canyon, Wilderness Area (5 nests); Ute Park (2 nests).

Nevada: Battle Mountain (1 nest).

Pheidole sitarches complex

Only two valid forms appear to comprise this complex in the western United States, namely, *sitarches campestris* Wheeler,

which is an eastern and a southern race extending westward into Texas, and *sitarches sitarches* Wheeler, a western race. In my opinion, there is no evidence to authenticate the validity of *sitarches soritis* Wheeler as a race or indeed even as a distinctive population of any sort. I have been unable to find reliable differences between the types of *sitarches* and *soritis* which I examined and in adequate nest series the reputed separatory characteristics just will not hold true. The population called *soritis* appears to be a normal variant within the large, wide-spread, and highly variable population of *sitarches sitarches* and it certainly does not behave as a geographic race. Consequently, I propose that *soritis* be synonymized with *sitarches sitarches*.^{2, 3}

In *campestris* the posterior half of the head of the minor is subopaque to opaque and is always densely and rather coarsely punctate. In *sitarches* the posterior half of the head of the minor varies considerably, both intranidally and internidally, from completely smooth to the distinctly striate condition which has been considered to characterize the population called *soritis*.

The range of *sitarches sitarches* extends from the region around Austin, Texas, southward, westward into New Mexico and Arizona, and northward into Utah. The western portion of the range of *campestris* stretches northwestward into the Texas panhandle and adjoining Oklahoma. I have found colonies of "good" *campestris* at Amarillo, west of which there is a blending zone of *campestris* and *sitarches*.

My collections of *sitarches* come from the following localities:

Arizona: Rustler Park, Chiricahua Mts. (2 nests); 7 mi. E. of Bowie (1 nest); 5 mi. W. of Wilcox (2 nests); 5 mi. N. of Cochise Stronghold, Dragoon Mts. (1 nest); Madera Canyon, Santa Rita Mts. (1 nest); desert base of Madera Canyon (7 nests); 20 mi. S. of Marble Canyon (1 nest); 27 mi. N. of Cameron (1 nest); 20 mi. N. of Kanab (2 nests).

New Mexico: 23 E. of jct. U. S. 60 and 85 (on U. S. 60), E. of Bernardo (1 nest); 10 mi. S. of Mountainair, on state rt. 10 (2 nests); 18 mi. S. E. of Bayard (2 nests); San Juan Pueblo (2 nests); 10 mi. S. of Santa Fe (1 nest); Galesteo (1 nest); 7 mi. W. of Magdalena (1 nest); 12 mi. W. of Hope (1 nest); White Sands National Mon. (4 nests); 15 mi. E. of Silver City (1 nest); 8 mi. W. of Alamogordo (1 nest); Cimarron Canyon (1 nest); Lordsburg (1 nest).

Texas: 10 mi. W. of Laredo (1 nest); Ozona (7 nests); 17 m. S. of Ozona (3 nests); Limpia Canyon, Davis Mts. (4 nests); 5 mi.

²It may be of interest to note that there seems to be a tendency for central and northern Arizona populations of *sitarches* to possess better developed postpetiolar connules in the major. The series from near Marble Canyon as well as that from Oak Creek Canyon have these connules comparatively pronounced although the pronotal humeri are not strongly developed and the cephalic sculpture is definitely that of *sitarches*.

³This invalidates my previous conclusion, made in 1953, that *campestris* and *soritis* are synonymous (*Jour. Tenn. Acad. Sci.*, 28: 298).

S. of Alpine (1 nest); 20 mi. S. of Alpine (2 nests); Uvalde (1 nest).

Utah: Skull Valley (1 nest); Provo (1 nest).

Pheidole cockerelli - *sciara* complex

I am now convinced that *sciara* Cole is more closely related to *cockerelli* Wheeler than to the *crassicornis* complex proper. From *crassicornis* Emery and its subspecies *tetra* Wheeler both *cockerelli* and *sciara* may be readily separated. The latter two species lack completely the smooth and shining posterior portion of the head of the major, which is a consistent feature of the major of *crassicornis* and *tetra*, and the gastric hair pattern is notably different.

P. cockerelli and *sciara*, although clearly of close relationship, appear to represent distinctive populations. The *cockerelli* major has thoracic and gastric hairs noticeably shorter, more numerous, more slender, and more pointed than does the *sciara* major. None of the short gastric hairs (pubescence?) is appressed in *cockerelli*; most of them are completely appressed in *sciara* and contrast sharply with the long gastric pilosity.

I have been unable to find distinctive sculptural differences between the Prescott types of *cockerelli* and the types of *sciara*. The cephalic sculpture of both species undergoes a considerable amount of normal variation.

My collections of *cockerelli* and *sciara*, as well as the *cockerelli* types from Prescott, fall into three rather well defined groups on the basis of scape index (scape length x 100/head width) of the major plotted against head length. Within each of these groups there is a good intertwining of plots with no mingling with adjoining group plots. The populations so defined are, namely: 1) *cockerelli*, 2) *sciara* (*sensu stricto*), and 3) a population which consists of the Madera Canyon and Cochise Stronghold, Arizona series. The scape index of *cockerelli* ranges from 66.6 to 75.4, that of *sciara* (*sensu stricto*) from 62.7 to 65.3, and that of the Madera Canyon and Cochise Stronghold collections from 58.9 to 61.8. There is a decided break between the *sciara* and *cockerelli* plots and a less obvious one between the *sciara* and Madera Canyon-Cochise Stronghold plots. Although the latter population is with little doubt a portion of the *sciara* (*sensu lato*) population, it possesses certain structural distinctions. These features, which chiefly involve cephalic sculpture, seem not to be particularly diagnostic ones, and until more collections have been made from the southern Arizona mountains which may possibly characterize this population as a discrete unit, the present series should be considered as a part of the overall *sciara* population.¹

P. cockerelli appears to be a more northern species, with a southeastern extension of range into southwestern Texas, where-

as *sciara* is very largely a southern form. The Wheeler types of *cockerelli* from Prescott only rather vaguely fit the original description of *cockerelli* Wheeler; they more readily agree with the original description of *sciara*. I have not examined the types of *cockerelli* from Tempe, Arizona, but I strongly suspect that they may represent the *sciara* population, coming as they do from a southern desert station. Creighton (1950, p. 175) restricted the type locality of *cockerelli* to Las Vegas, in northern New Mexico. Inasmuch as I have series which definitely represent this species from nearby San Jose and from Cimarron Canyon, which is a relatively short distance north of Las Vegas, it follows, I believe, that the Las Vegas types are not likely to have the characteristics which define *sciara*.

Although Dr. Creighton has designated Las Vegas as the type locality of *cockerelli*, he gives the range of this species as "deserts of Southern New Mexico and Arizona" (Creighton, 1950, p. 175). Certainly it is scarcely conceivable that one would restrict, without a justifiable reason, the type locality of a species to a northern station when at least the greater part of the range of that species occurs in a considerably more southern and quite different region. It is conceivable then, I believe, that the Las Vegas types best agree with the original description of *cockerelli* and moreover that Dr. Wheeler probably drew his published description from the Las Vegas series. My collections of this species from Cimarron Canyon and San Jose agree with Dr. Wheeler's description rather well. In his original description of *cockerelli*, Wheeler (1908, p. 464) makes no reference to any very short, appressed, gastric hairs (pubescence) which in *sciara* contrast so obviously with the suberect and much longer remaining gastric pilosity and are one of the chief differences between the two species. It is very likely, I think, that the southern records which Dr. Creighton has attributed to *cockerelli* may actually represent the *sciara* population. If this should not be so, then the southwestern portion of the range of *cockerelli* is considerably more extensive than I believe it to be.

In spite of the fact that *sciara* is apparently largely a southern species, I have a perplexing northern collection, which distinctly represents *sciara*, from Glenrio, New Mexico, near the Texas border. It would appear then, in justification of this record, that the range of *sciara* swings northward from southwestern Texas up into the panhandle and across the New Mexico semi-desert. I am unable to explain the gap between stations in southern and northern New Mexico. In spite of intensive collecting, I have never taken *sciara* or *cockerelli* in this intervening region.

Matters are somewhat further complicated by my having collected series of what undoubtedly represent the northern population (*cockerelli*) from Fisher Hill, in the Davis Mountains of southwestern Texas and from Ozona, Texas, some distance eastward. These discontinuous distributional records

tend to signify that the *cockerelli* population swings south-eastward into southwestern Texas.

A considerable amount of further collecting and study will have to be accomplished before the *cockerelli*-*sciara* matter can be thoroughly interpreted and completely resolved. There remains the possibility that these two closely related forms may be proved ultimately to be conspecific. At the present time, however, on the basis of available data, I believe that they are discrete populations and should be so categorized.

I have taken *cockerelli* at the following stations:

New Mexico: Cimarron Canyon (2 nests); San Jose (1 nest).

Texas: Fisher Hill, Davis Mts. (1 nest); Ozona (4 nests).

My records of *sciara* are as follows:

Arizona: Cochise Stronghold, Dragoon Mts. (1 nest); Madera Canyon, Santa Rita Mts. (1 nest).

New Mexico: Glenrio (1 nest); Deming (1 nest); Lordsburg (type locality, 1 nest).

Texas: 9 mi. E. of Alpine (1 nest); 20 mi. W. of Ft. Stockton (3 nests); 41 mi. W. of Ft. Stockton (2 nests).

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