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STUDIES ON THE DISTRIBUTION OF THE GENUS NOVOMESSOR (HYMENOPTERA: FORMICIDAE)

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During recent years the writer has taken specimens of *Novomessor albisetosus* or *N. cockerelli* at seventy-three stations[1]. As more than half of these were in northern Mexico it seems advisable to review the distribution of both species. When W. M. Wheeler and the writer monographed the genus *Novomessor* in 1934 (1) there were no Mexican records for *albisetosus* and only four for *cockerelli.* In the intervening twenty years this situation has changed scarcely at all. There are still no published records for *albisetosus* from Mexico and only one additional one for *cockerelli.* This last is, however, a most interesting record. In 1954 (2) Kannowski, in his important account of the habits of *N. manni,* noted that Cantrall has recently taken specimens of *cockerelli* at Rincon de Romos (6100′) in the state of Aguascalientes. Cantrall's record establishes the fact that the range of *cockerelli* extends into the tropics, but it should be clear that, because of the lack of published data, the distribution of *albisetosus* and *cockerelli* in northern Mexico has remained largely conjectural.

On the following pages I have presented not only records from Mexico but also a number from the United States. This is necessary to demonstrate the significant difference

[1]Field work done on a Guggenheim Fellowship.

in the response of the two species to elevation. Dr. Wheeler and the writer failed to appreciate this difference in 1934 and, in consequence, gave a very unsatisfactory account of the vertical range of the two species. It now appears that response to elevation is what mainly determines the range of each species. The figures for elevation which follow were secured from altimeter readings made at the station and checked then or later against topographic sheets.

Novomessor albisetosus:

TEXAS: Davis Mountains, Limpia Canyon (4800′), 2 miles south of Indian Hill (5300′); Chinati Mountains, Arsarca Canyon (4800′).

ARIZONA: Huachuca Mountains, Garden Canyon (5800′) Carr Canyon (5000′), Ft. Huachuca (5100′); Dragoon Mountains, Cochise Stronghold (5200′); Peloncillo Mountains, Cottonwood Canyon (4800′); Baboquivari Mountains, Forestry Cabin (3500′), Brown Canyon (3900′); Chiricahua Mountains, Nat. Mon. Camp Ground (5200′); Pima County, Total Wreck Mine (4400′), 30 miles east of Sells (2800′); Santa Cruz County, 5 miles north of Nogales, (3900′), Pena Blaca Springs (3700′), Ruby (4600′); Hasayampa River, 5 miles south of Wickenberg (1800′); 5 miles south of Clifton (3200′).

SONORA: Cerro San Jose, 10 miles southwest of Naco (5100′); 5 miles north of Santa Cruz (4700′); Cibula (3600′); La Casita (3400′); 5 miles north of Imuris (3100′).

CHIHUAHUA: Sierra de en Medio, Nogales Ranch (5000′); 9 miles north of El Sauz (4900′); 13 and 18 miles west of Chihuahua City (5100′, 5400′); 16 miles east of Cuauhtemoc (5900′); Bachimba (4200′); 2, 17 and 22 miles south of Parral (5500′).

DURANGO: Villa Ocampo (5700′); 22 miles south of Villa Ocampo (5700′).

Novomessor cockerelli:

NEVADA: 9 miles north of Searchlight (3200′).

TEXAS: Palo Duro Canyon (3000′).

ARIZONA: Whetstone Mountains, Dry Canyon (5000′); Plains west of the Baboquivari Mountains (3000′); Organpipe Cactus National Monument, Headquarters (1600′), Dripping Springs (1700′), Quitobaquito (900′); 25 miles east of Douglas (4000′); 20 miles east of Gila Bend (2700′); 8 miles north of Casa Grande (1300′); 7 miles east of Aguila (2200′); Safford (3000′); 15 miles north of Wilcox (4100′).

SONORA: 3 and 8 miles south of Sasabe (3400′); 2 and 10 miles south of Sonoita (1300′, 1400′); Campamto (1400′); Santa Ana and five miles south of Santa Ana (2500′); 6 miles south of Imuris (3200′); 10 miles south of Hermosillo (700′).

CHIHUAHUA: Plains east of the Sierra de en Medio (4700′); El Pueblito (4900′); 6 miles south of Gallego (5100′); 5 miles north of Ojo Laguna (4800′); 7 miles north of Chihuahua City (4700′); Jiminez (4300′); 2, 34 and 38 miles south of Parral (5500-5800′).

COAHUILA: Nava (1000′); 20 miles north of Saltillo (4000′); Sierra de la Paila (4800′); 22 miles west of Saltillo (5000′).

DURANGO: 12 miles south of Villa Ocampo (5600′); 17 miles south of Rodeo (5500′); 5 and 6 miles east of San Lucas (6100′); 17 miles south of Durango City (6400′).

ZACATECAS: 30 miles east of Sombrerete (6900′).

The table below shows the relationship of latitude to elevational range in the two species. It is based on the records just given plus about thirty older ones for which elevational data was available or could be assigned with

acceptable accuracy. The numbers in parentheses are the totals of the records involved.

Latitude	Elevational Range *N. cockerelli*	Elevational Range *N. albisetosus*
36°-34°	(3) 3000-3300′	no records
34°-32°	(16) 1000-4500′	(8) 1800-5200′
32°-30°	(20) 1300-5000′	(22) 3100-5800′
30°-28°	(10) 700-5100′	(7) 2600-5900′
28°-26°	(5) 4300-5800′	(5) 5500-5700′
26°-24°	(5) 4000-6100′	no records
24°-22°	(5) 6100-7000′	no records

The following points in the above table should be noted:

1. The range of *cockerelli* extends further north and much further south than does that of *albisetosus*. There are no records for the latter species north of Latitude 34° or south of Latitude 26°.

2. The effect of latitude on the upper limit of the elevational range is different in the two species. From Latitude 34° to Latitude 26°, where they occur together, the rise in the upper elevational limit is 700 feet for *albisetosus* against 1300 feet for *cockerelli*. Over the entire range of *cockerelli* the rise is almost 4000 feet.

3. In the northern part of the common range the upper elevational limit of *cockerelli* is approximately 1000 feet below that of *albisetosus*. But because this limit rises more rapidly in the case of *cockerelli*, the two species have the same upper limit about Latitude 26°. South of that latitude the upper limit of the vertical range of *cockerelli* continues to rise, but, since *albisetosus* does not occur south of Latitude 26°, the records for *cockerelli* from stations above 6000 feet cannot properly be compared with those for *albisetosus*.

4. In the common range there is a considerable area of overlap in the vertical ranges of the two species. The two vertical ranges are never identical, however, for although the upper limits may coincide, the lower limit of *cockerelli* always descends below that of *albisetosus*. This difference is at least 800 feet and often much more.

It goes without saying that this response to elevation has a direct connection with the topography of the regions in which the two species occur. In subsequent pages the writer has discussed some of the topographic features which affect the distribution of the two species. The most extensive of these is the Sierra Madre Occidental, which determines the western limit of the range of both species for several hundred miles in northern Mexico. Most cartographers show the Sierra Madre Occidental as a continuous rampart which extends from Zacatecas northwestward to the southern border of Arizona. In the opinion of the writer it may be doubted that the highlands of Zacatecas ought to be considered as a part of the Sierra. At least they are cut off from the rest of the Sierra by the valley of the Rio Mezquital, which rises on the Plateau in southern Durango and flows westward to the Pacific. A similar gap, leading south to Aguascalientes, occurs at the eastern end of the highlands of Zacatecas. But proceeding northward from the valley of the Rio Mezquital to Latitude 30° the main chain of the Sierra presents an unbroken barrier whose crest varies between 8000 and 9500 feet. It should be noted that there are few peaks in this region and none of them are high. Nevertheless the Sierra forms an effective barrier to any species whose vertical range is below the 8000 foot level. Both *albisetosus* and *cockerelli* appear to be held to the eastern side of the Sierra until its topography changes in northwestern Chihuahua. North of Latitude 30° the Sierra breaks up into a number of scattered ranges, few of which show elevations in excess of 7500 feet. Between these ranges are broad valleys which communicate on the east with the Mexican Plateau and on the west with the narrow Sonoran coastal plain. From east to west the elevation of these valleys gradually descends from 5000 to 1000 feet. There is no barrier here comparable to the main chain of the Sierra further south and both *albisetosus* and *cockerelli* occur widely in this region. The range of *cockerelli* is, however, more extensive than that of *albisetosus*. The latter species does not descend below 2500 feet in this region, while *cockerelli* occurs at elevations down to 700 feet. It follows that *cockerelli* occasionally nests on the inner edge of the

coastal plain while *albisetosus* rarely gets within fifty miles of it. The range of *cockerelli* follows the inner border of the Sonoran coastal plain as far as Quitobaquito, where it turns north through the Growler Mountains in Arizona and thence to the Gila Bend Mountains. As far as the writer could determine the insect is not present in the Gran Desierto in northwestern Sonora, nor in the mountains immediately north of it in western Arizona. Records for both species from stations northwest of the Gila Bend Mountains are scarce. The range of *albisetosus* appears to terminate near Wickenberg, that of *cockerelli* procedes into southern Nevada.

The presence of *cockerelli* in southern Nevada leads to the vexing question as to whether or not this insect occurs in California. In the writer's opinion there is no proof at present that *cockerelli* occurs west of Nevada. To date all California records for *cockerelli* are demonstrably incorrect[2] or suspect. In 1934 Cole (3) published the statement that *cockerelli* is "rather common" near Barstow, Ludlow and Tehachapi. The first two stations are on the Mojave Desert, the last one is at the southern end of the San Joaquin Valley. Although the writer doubted the Tehachapi record from the start, there seemed little reason to question the Barstow and Ludlow records until the spring of 1951. In April of that year a series of exceptionally favorable climatic conditions resulted in a magnificent display of ephemeral flowers on the Mojave Desert. This extraordinary burst of bloom (said to have been the best in a period of twenty years) was accompanied by a corresponding burst of foraging activity on the part of the ants in that area. At this time the writer was

[2]In his recent book on California ants T. W. Cook states (p. 115) that he took a colony of *N. cockerelli* on the Mills College campus at Oakland. The explanation for this record is quite simple; what Cook had was a colony of *Veromessor andrei*. There can be no doubt of this, for the three illustrations of the worker that Cook presented as that of *"Novomessor cockerelli"* are drawn from a small worker of *Veromessor andrei*. It is unpleasant to have to add that most of Cook's misguided efforts with the California ants are little better than his fumbling treatment of *cockerelli*.

collecting daily in the area between Barstow and Tehachapi. Yet not a single colony of *cockerelli* was encountered.

There seemed to be only two possibilities here. Either *cockerelli* had notably decreased in abundance in the western Mojave Desert since 1934 or Dr. Cole's records were incorrect. In the hope of clarifying this point I wrote to Dr. Cole for further information on his 1934 records. Dr. Cole replied that there were no specimens of *cockerelli* from California in his collection at present. It seems virtually certain, therefore, that the above records were based on field identification only. The writer believes that they were the result of the misidentification of abandoned nests of *Veromessor pergandei.* This ant is abundant in most parts of the Mojave Desert. It makes nests which might be mistaken for those of *cockerelli* and it often abandons them. Whether this explanation is correct or not, it should be clear that at present there is no reliable evidence to show that *cockerelli* occurs in California. If it does so, it seems certain that its occurrence in that state will be limited to the eastern end of the Mojave Desert. In the writer's opinion it is safe to conclude that none of the range of *cockerelli* lies west of Longitude 115° and only a very small part of it lies west of Longitude 114°.

The northern limit of the range of both *cockerelli* and *albisetosus* seems largely determined by the inability of either species to occupy highland areas in northern and central Arizona and New Mexico. Southeast of Wickenberg, Arizona, the range of both *cockerelli* and *albisetosus* runs along the southern end of the region where the rise to the Mogollon Mesa begins. This area is much broken up by valleys and canyons and it seems certain that the northern limit of the range is much more irregular in this area than our present records indicate. For most of these have come from the easily accessible southern end of the area. The Mogollon Mesa itself forms an effective northern barrier, for its elevation is too great to permit either *cockerelli* or *albisetosus* to reach the top of the plateau. In eastern Arizona and western New Mexico the limit of the range dips even further to the south, passing below the southern end of the Blue Moun-

tains in Arizona and the Black Range in New Mexico. Further east in New Mexico the range swings north again in the Rio Grande Valley and the Tularosa Valley. The range in southeastern New Mexico is at present conjectural, for there are no published records for New Mexico east of Alamogordo. But the presence of *cockerelli* in Palo Duro Canyon in the Texas Panhandle makes it seem likely that the range runs northeastward through the Staked Plain region.

The eastern boundary of the range of *albisetosus* is very little known but it seems safe to say that it does not coincide at all with that of *cockerelli*. The easternmost record for *albisetosus* to date seems to be the colony which the writer took in 1933 at Cernas Ranch in the Chisos Mountains of Texas. This station lies about ten miles west of Longitude 103°. The Chisos Mountains are so close to the Sierra del Carmen and the Serranias del Burro in northern Coahuila, that *albisetosus* can scarcely be absent in the Mexican ranges. But that it extends far south in Coahuila seems very doubtful. We failed to take it in the Sierra Hermosa de Santa Rosa, a small range which lies just south of those previously mentioned. Neither was *albisetosus* secured in the mountains around Saltillo, although *cockerelli* was taken there. Since the collections around Saltillo were carried up to the 7200 foot level, the vertical range of *albisetosus* was more than covered. It is hard to see why the insect should be absent in the mountains of southern Coahuila, but this appears to be the case.

The eastern boundary of the range of *cockerelli* is much better known. There are at present seven records extending from Palo Duro Canyon, Texas (Lat. 35°), almost to Saltillo, Coahuila (Lat. 26°). Six of these records are within twenty-five miles of Longitude 101°, the seventh is only ten miles west of Longitude 102°. This comparatively smooth eastern boundary is certainly not determined by topography. Two of the stations are on the Edwards Plateau, three in the Rio Grande Valley and two in the mountains of southern Coahuila. Since *cockerelli* can occur in the Rio Grande Valley at elevations of 1000 feet (Del

Rio, Texas, and Nava, Coahuila) the writer fails to see why it has not been taken in northern Nuevo Leon. North of Monterrey are a number of mountains which rise from a base plain about 1400 feet high. The valleys between these mountains seem ideal for *cockerelli* and the writer feels sure that it will ultimately be taken there.

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OBITUARY NOTICE

Professor Charles T. Brues, for many years an active member of the Cambridge Entomological Club and Editor of PSYCHE for thirty-seven years, died at his home in Crescent City, Florida, on July 22, 1955. A future issue of PSYCHE will contain a biographical account of Professor Brues and a list of his publications.

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