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Joseph C. Daniel Jr.  
*Adams State College, Alamosa, Colorado*

R. Leonard Blain  
*Adams State College, Alamosa, Colorado*

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## BACKGROUND RADIATION AND ENDEMIC FAUNAL RANGE IN THE SAN LUIS VALLEY OF SOUTHERN COLORADO

Joseph C. Daniel Jr.<sup>1</sup> and R. Leonard Blain

Mutations, one of the main tools of speciation, can be produced by radiations and are produced proportional to the dosage of radiation. Theoretically then, if adequate isolating mechanisms and selective environmental pressures exist, areas of higher background radiations (i.e. soil and cosmic) should exhibit more speciation than areas of lower radiation. It was decided to test this hypothesis in a locality where these conditions seem to exist.

The San Luis Valley of Southern Colorado (Fig. 1) has variable soil radioactivity and is unique in the variety of its isolating mechanisms. Along with the physical limits imposed by the surrounding mountain ranges, it has a cold, dry climate, a very alkaline soil, and sparse vegetation. (See Ramaley, 1929)

Seven terrestrial animals are known either to be endemic to the San Luis Valley or to have ranges that barely exceed the valley boundaries. Of these, three are insects and four are rodents, groups that generally submit readily to speciation. The ranges of these organisms are not known precisely and were calculated by extending the areas around and between points of observation or collection. The ranges listed below and shown on Figures 2 and 3 are, at best, approximations.

*Cicindela theatina* Rotger (Sand Dunes tiger beetle): At edge of Great Sand Dunes in sands with scanty vegetation. (Rotger, 1944)

*Serica bruneri* Dawson (Scarabaeid beetle): In sandy areas around Blanca, Colorado. (Personal communication from Rev. Bernard Rotger)

*Pseudohazis hera mangifica* Rotger (Small moth): In sage brush belt of Costilla County, probably extending south to Taos, New Mexico. (McDunnough, 1948)

*Eutamias minimus caryi* Merriam (Cary chipmunk): Eastern part of Costilla and Saguache Counties. (Merriam, 1908; Warren, 1910)

*Reithrodontomys montanus* (Baird) (Mountain harvest mouse): North-eastern part of the valley. (Baird, 1855; Warren, 1910)

*Perodipus montanus* (Baird) (San Luis kangaroo rat): Sandy areas along eastern side and possibly over whole valley. (Baird, 1855; Warren, 1910)

*Thomomys talooides agrestis* Merriam (San Luis pocket gopher): Northeastern part of valley. (Merriam, 1908; Warren, 1910)

In addition to these there are three fish; namely *Gila nigrescens* (Girard), *Plantosteus plebeius* (Baird & Girard) and *Tinca tinca* L. (introduced from Europe in 1894). All three are found in the northern Rio Grande drainage, much of which lies in the valley. Since they live in water, fish do not lend themselves to this particular study. The eight-eyed leech, *Theromyzon* sp. has also been described from this area. It was found by Wheeler's expedition in 1874, but the type, and only, specimen is lost.

To measure the soil radioactivity, a grid-section map of the San Luis Valley was prepared. Boundaries were set at 8000 to 8500 feet levels, as determined by the surrounding mountains (boundaries and map outlines from Lantis, 1950). Transect studies depending on available roads were made at six to eight mile intervals. Over a

<sup>1</sup> Adams State College, Alamosa, Colorado.

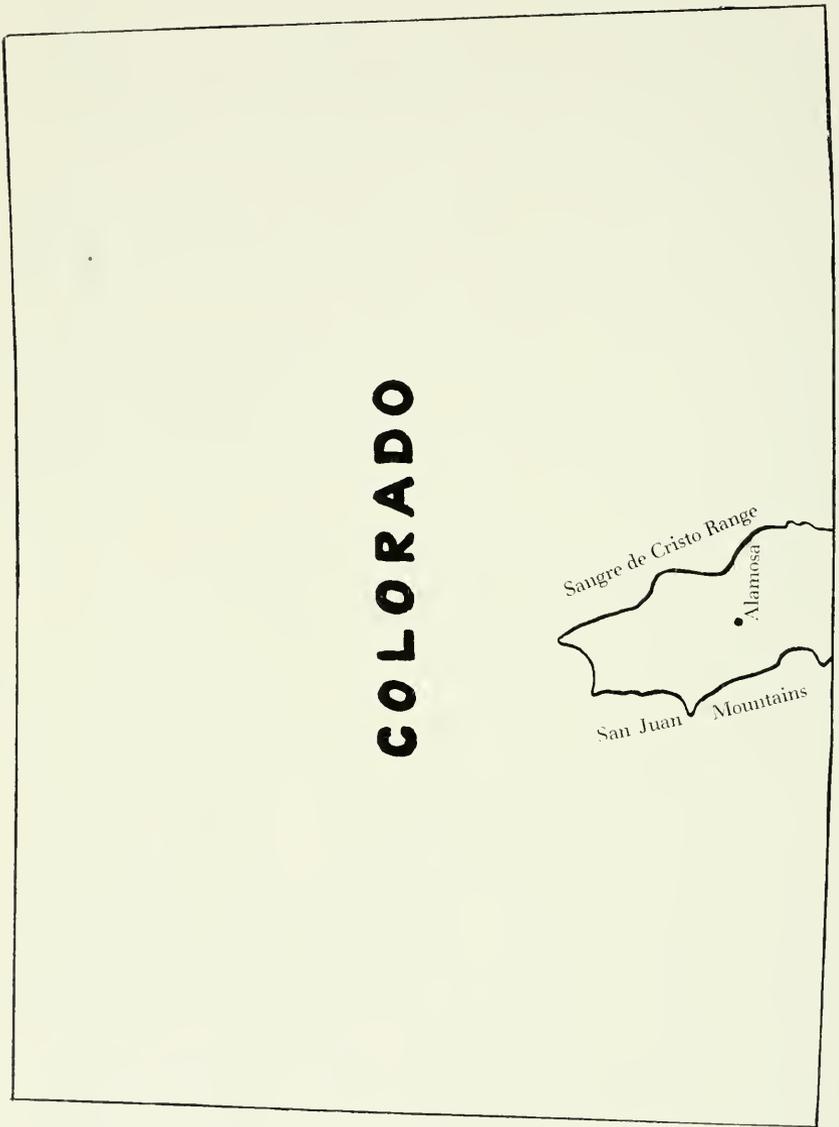


Fig. 1. Location map of the San Luis Valley in Southern Colorado

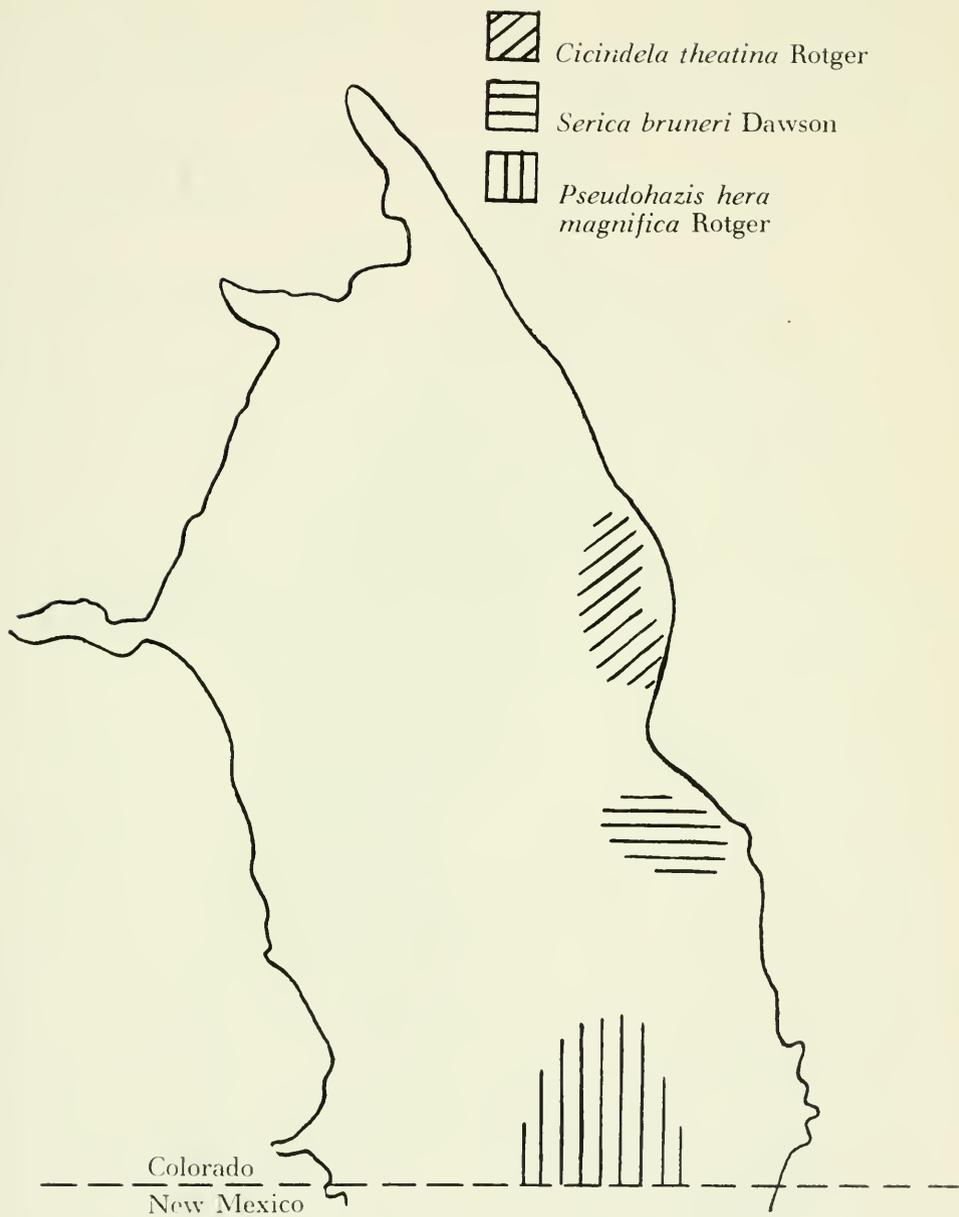


Fig. 2 Approximate ranges of the endemic insects of the San Luis Valley.

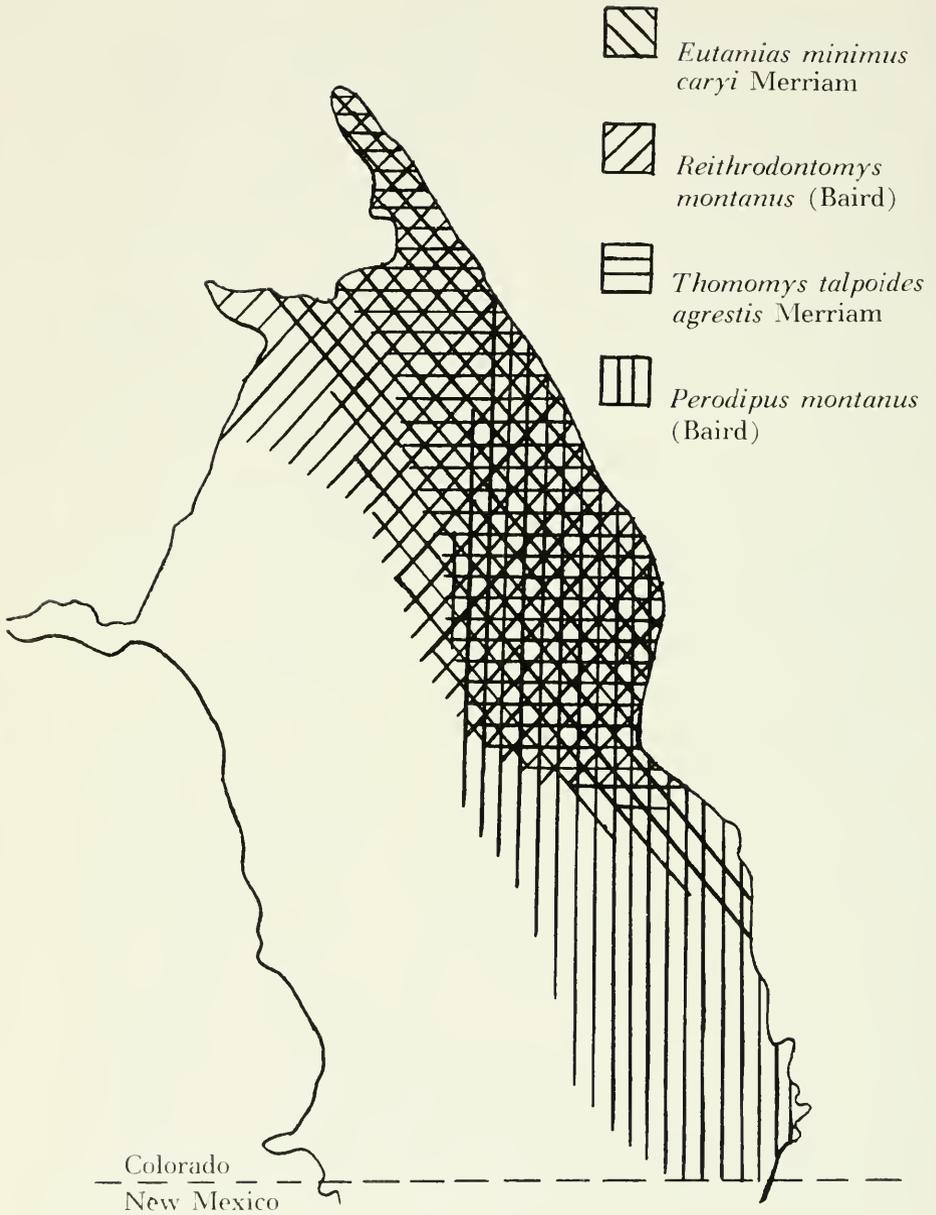


Fig. 3. Approximate ranges of the endemic rodents of the San Luis Valley



Fig. 4. Soil radioactivity of the San Luis Valley

four week period in November and December of 1958, background radiation (mostly Gamma) was measured at each transection corner by the use of a "Precision" field scintillator. The results are plotted on the map (Fig. 4) so that the density of the stippling is proportional to the radiation.

The soil radioactivity varied from .011 milliroentgens per hour (mr./hr.) up to .046 mr./hr. One small strip along the southwestern base of Mount Blanca had a maximum reading of .026 mr./hr. and another very high radiation area at the base of the San Juan Mountains in the Cat Creek drainage had a maximum reading of .046 mr./hr. This high intensity fades out gradually both to the north and south. The lowest radiation areas exist in the north and southeastern portions of the valley. Both areas provide about .014 mr./hr. Generally the highest soil radioactivity exists along the western boundary of the valley.

It appears obvious, from reference to the maps in figures 2, 3, and 4, that no correlation exists here between high background radiation and endemic faunal ranges. If anything, almost the opposite relationship seems to exist. The areas in which these endemic forms live are typically characterized by sand, scanty vegetation and some sage brush, and probably as such, furnish the significant isolation and environmental pressures. The background radiation pattern may have had some influence on speciation if we could assume that it was different at the time the species arose or if the species range had changed since. We have no evidence to support either of these hypotheses. It may be noted that in their ranges most of these endemic animals aren't in the high radiation areas. This may be coincidental or may be evidence of some other relationship that could be uncovered by further study.

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