## CERCOPIDAE OF THE SOCIETY ISLANDS \*

 $\mathbf{B}\mathbf{y}$ 

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In 1924 Miss L. E. Cheesman, who had accompanied the St. George Expedition to the South Seas, left the expedition and spent five months in the Society Islands investigating the insect fauna.1 She visited Tahiti, Raiatea, and Borabora. Thanks to her work, our knowledge of the Cercopidae of the Society Islands is already fairly wall advanced. Her material was worked out by the well-known Belgian Homopterist, Dr. V. Lallemand.<sup>2</sup> who described and recorded four species and one variety which he referred to the genus Clovia Stål. The excellent collection made by E. P. Mumford and A. M. Adamson during the present survey has enabled the exact relationships of these forms to be worked out and has at the same time added a new species to the list.

The genus Clovia was erected by Stål 3 to hold 16 species, none of which was fixed as a genotype. In 1907 Distant 4 fixed the genotype as C. bigoti Signoret, an African species, in which he was followed by Lallemand.5

Now the genus Clovia as at present understood is undoubtedly generically composite. The typical genus as restricted by the African C. bigoti Signoret does not occur in the Pacific islands, although it is well represented in the Philippine and Austro-Oriental subregions. I therefore propose to erect a new genus Lallemandia to hold those Pacific islands species which have previously been referred by Lallemand to Clovia Stål.

# Genus LALLEMANDIA, new genus

Head as wide as pronotum, angularly rounded anteriorly, slightly shorter than wide between the eyes; ocelli about as far from one another as from eyes; eyes more transverse than in Clovia; vertex flattened; frons moderately convex, smooth and shining; clypeus not carinate medianly. Disc of pronotum moderately convex, distinctly more so than in Clovia, the surface moderately strongly rugosely striate; lateral margins relatively longer than in Clovia. Tegmina apically rounded, not subacute as in Clovia (fig. 1), five apical cells

<sup>&</sup>lt;sup>1</sup> Cheesman, I., E., A contribution towards the insect fauna of French Oceania, pt. 1, Ent. Soc. London, Trans., pp. 147-161, pls. 14-16, 1927.

<sup>2</sup> Lallemand, V., Description de nouveaux Homoptères du Muséum de Londres: Ann. Mag. Nat. Hist., 10th ser., vol. 1, pt. 5, pp. 634-638, 1928.

<sup>3</sup> Stål, Carl, Hemiptera Africana, pt. 4, pp. 68, 75, 1866.

<sup>4</sup> Distant, W. L., The Fauna of British India, Rhynchota, pt. 4, p. 93, 1908.

<sup>5</sup> Lallemand, V., Wytsman, Gen. Ins., Cercopidae, p. 43, 1912.

\* Pacific Entomological Survey Publication 6, article 8. Issued January 14, 1933.

instead of four; branching of outer sector invisible, making only one complete subapical cell instead of two as in *Clovia*, although a transverse fold of the surface tends to delimit two further subapical cells (fig. 1). Surface of tegmen shining, but much less finely punctate than in *Clovia*, the pubescence also coarser and more sparse. Venation of hind wings as in *Clovia*. Hind tibiae with two spurs. Male genitalia of different type; parameres not bifurcate apically, aedeagus directed anteriorly instead of vertically, its apex simple instead of complex (figs. 4, 5, 6; *Clovia bigoti* Signoret is figured for comparison). This genus resembles the Fijian *Nesaphrestes* Kirkaldy in general appearance, but differs in the noncarinate clypeus. Apart from the characters mentioned above, the species of this genus show a definite color pattern which is very distinct from that typical of true *Clovia* species which show longitudinal stripes on vertex and pronotum and subarcuate pale stripes on the tegmina. Genotype: *Cicada fenestrata* Fabricus.

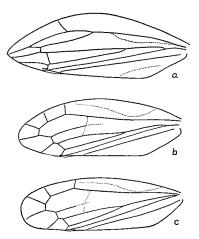


FIGURE 1. Diagrammatic figures of tegmina to show venation: a, Clovia bigoti Signoret; b, Lallemandia cheesmani (Lallemand); c, Lallemandia fenestrata (Fabricius).

### Lallemandia fenestrata (Fabricius).

Cicada fenestrata Fabricius: Syst. Ent., p. 684, 1775; Syst. Rhyng., p. 67, 1803.

Clovia fenestrata, Stål: Hemipt. Fabriciana 2, p. 16, 1869; Lallemand: Wytsman Gen. Ins., fasc. 143, Cercopidae, p. 43, 1912.

This species was apparently overlooked by Lallemand when he was working out the Polynesian Cercopidae collected by the St. George Expedition. Fortunately the types are still preserved in the British Museum (Banks collection) although both specimens are females. A careful comparison of these specimens with all available material from the South Pacific revealed the fact that this species occurs in different color forms in many of the

Pacific islands. At first the inclination was to regard these forms as merely varieties, but a study of the genitalia revealed very distinct differences in the structure of the aedeagus and the parameres. As these forms are apparently restricted to definite islands, they have been regarded as subspecies and are here so treated. In order to demonstrate this subspecificity satisfactorily, it has been necessary to include a discussion of those forms which properly belong outside the territorial limit of the Society Islands.

Lallemandia fenestrata fenestrata (Fabricius) (figs. 1, c; 2, b; 3, d; 4, g; 5, c; 6, c).

Vertex yellow, posterior region between eyes and across ocelli entirely black. Pronotum entirely black; scutellum yellow. Tegmen with pale costal region crossed by a black transverse band to the costa, and with a short elongate fuscous spot at apex of clavus. Aedeagus more or less sinuate in lateral view, its apex simple, paramere obliquely truncate at apex.

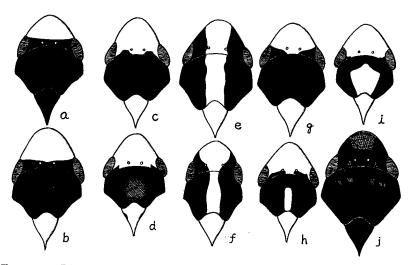


FIGURE 2. Diagrammatic figures of head, pronotum, and scutellum to show color pattern: a, Lallemandia fenestrata rapana (Lallemand); b, L. fenestrata fenestrata (Fabricius); c, L. fenestrata mooreana, new subspecies; d, L. fenestrata insignis (Distant); e, L. fenestrata adamsoni, new subspecies; f, L. fenestrata sociabilis (Lallemand); g, L. fenestrata tahitiensis, new subspecies; h, L. fenestrata pallida (Lallemand), normal form; i, L. fenestrata interrupta (Lallemand); j, L. cheesmani (Lallemand).

Tahiti: Vallée de la Reine, 2 miles from sea, altitude 460 feet, December 17, 1928, 1 female, Mumford and Adamson. This specimen agrees very well with the Fabrician type. The typical material was originally recorded rather vaguely by Fabricius "in maris pacifici Insulis."

Lallemandia fenestrata tahitiensis, new subspecies (figs. 2, g; 3, g; 4, e; 5, b; 6, b).

Vertex yellow, the posterior angles on each side broadly black. Pronotum black, scutellum yellow. Tegmen without the transverse black band across pale costal region to the costa, although exhibiting an acute projection of the black region into the white; a narrow white stripe at apex of clavus. Genitalia very similar to those of the typical subspecies but aedeagus rather shorter and more rounded at apex and paramere with a distinct tubercle at lower end of oblique apical truncation.

Tahiti: Anaroii Plateau, 8 miles from sea, altitude 1,600 feet, October 31, 1928, 7 males (including type), 3 females; Papenoo Valley, 6 miles from sea, altitude 500 feet, October 23, 1928, 3 males, 1 female; Papeari, November 9, 1928, 1 male; Adamson. Papara Valley, altitude 750 feet, December 21, 1928, 1 female, Mumford and Adamson.

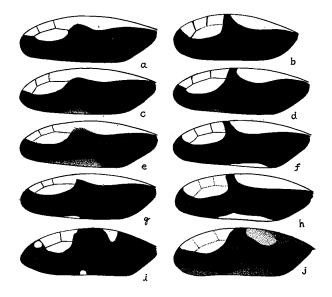


FIGURE 3. Diagrammatic figures of tegmina to show color pattern: a, Lallemandia fenestrata rapana (Lallemand); b, L. fenestrata interrupta (Lallemand); c, L. fenestrata pallida (Lallemand), normal form; d, L. fenestrata fenestrata (Fabricius); e, L. fenestrata insignis (Distant); f, L. fenestrata mooreana, new subspecies; g, L. fenestrata tahitiensis, new subspecies; h, L. fenestrata sociabilis (Lallemand); i, L. cheesmani (Lallemand); j, L. fenestrata adamsoni, new subspecies.

This is apparently the common form in Tahiti. The female specimen from Papara Valley has the posterior region of the vertex entirely black, as in *L. fenestrata fenestrata*. This subspecies shows a certain amount of variation with regard to the color pattern of the tegmen, which sometimes approaches that in the typical subspecies. The genitalia are also closely similar. It has been thought best, however, to regard this as a distinct subspecies rather than as an aberration.

Lallemandia fenestrata pallida (Lallemand) (figs. 2, h; 3, c; 4, d, f; 5, e, f; 6, h, i).

Clovia pallida Lallemand: Ann. Mag. Nat. Hist., 10th ser., vol. 1, p. 635, 1928.

Clovia insignis Lallemand, not Distant: Ann. Mag. Nat. Hist., 10th ser., vol. 1, p. 634, 1928.

This species was described from an immature adult or teneral specimen which had been killed before attaining its coloring. The mature form was incorrectly determined by Lallemand as *C. insignis* Distant. The very inappropriate name *pallida* must therefore be applied to the subspecies, the true coloring of which is similar to that of the rest of the group and is herewith described.

Vertex yellow, the posterior margin narrowly black except between the ocelli where the black band is broken. Pronotum black with a short median longitudinal yellow stripe on posterior two-thirds. Scutellum yellow. Tegmen without a black band across the pale costal region, a fuscous spot at apex of clavus. Aedeagus seen in lateral view dilated in middle, the apex widened obliquely with its anterior apical angle provided with two recurved bristles and its posterior apical angle toothed. Paramere seen in lateral view suddenly narrowed sub-apically and apically minutely bifid. In figures 4, 5, and 6 the genitalia of both the teneral form described by Lallemand and the mature form are shown for comparison. It will be seen that although there are varietal differences, the main sub-specific details are identical.

Tahiti: Hitiaa, July 9, 1925, 1 teneral female (type); no definite locality, March 6, 13, 1925, 2 males, 1 female, normal form; Tautira, Vaitepiha Valley, August 9, 1925, 1 teneral female; L. E. Cheesman. Hitiaa, 4 miles from sea, altitude 1,000 feet, November 20, 1928, 1 teneral male; Anaroii Plateau, 8 miles from sea, altitude 1,600 feet, October 31, 1928, 2 normal females; Adamson.

**Lallemandia fenestrata sociabilis** (Lallemand) (figs. 2, f; 3, h; 4, k; 5, d; 6, a).

Clovia sociabilis Lallemand: Ann. Mag. Nat. Hist., 10th ser., vol. 1, p. 634, 1928.

Vertex and pronotum black with a broad median longitudinal percurrent yellow stripe, its margins more or less parallel from posterior margin of pronotum to middle of pronotum, thence narrowed to apical margin of pronotum from which the stripe gradually widens to and beyond the ocelli in the shape of a funnel. Scutellum yellow. Tegmen as in *fenestrata* Fabricius, but with a moderately broad white stripe along claval commissure. Aedeagus comparatively long, constricted and bent in the middle, the gonopore opening before and dorsad of the apex which is lobed; paramere bent almost at right angles apically, both apex and angle acute.

Tahiti: no detailed locality, March 6, 1925, 1 male (type), March 13, 1925, 1 female; Lake Vaihiria, July 17, 1925, 1 female; L. E. Cheesman. Vaipuarii Valley, altitude 600 feet, on *Freycinetia*, August 28, 1928, 1 male; Anaroii Plateau, 8 miles from sea, altitude 1,600 feet, October 31, 1928,

1 male and 1 female; Papenoo Valley, 6 miles from sea, altitude 500 feet, October 23, 1928, 1 male, October 25, 1928, 2 females; Adamson. Vallée de la Reine, 3 miles from sea, altitude 460 feet, December 17, 1928, 1 female; Papara Valley, altitude 750 feet, December 21, 1928, 1 male; Mumford and Adamson.

This subspecies is apparently less common in Tahiti than *tahitiensis* although the two occur together in some localities. In some specimens there is considerable variation in the coloration of the head and pronotum, which approaches that in *pallida* Lallemand (normal form).

# Lallemandia fenestrata mooreana, new subspecies (figs. 2, c; 3, f; 4, j; 5, h; 6, d).

Vertex yellow with two small black marginal spots along basal margin on each side between eye and ocellus. Pronotum entirely black; scutellum yellow. Tegmen as in sociabilis Lallemand, but the white stripe along claval commissure shorter. Aedeagus moderately dilated in middle, apically simple and narrowly truncate. Paramere in profile similar in type to that of pallida, but apical angle not bifid and the lower angle distinctly toothed (fig. 4, j).

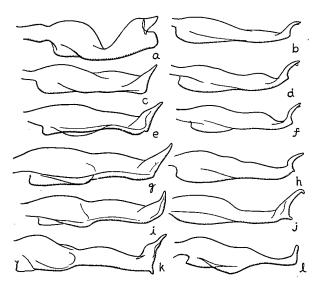


FIGURE 4. Left-hand male parameres: a, Clovia bigoti Signoret; b, Lallemandia fenestrata rapana (Lallemand); c, L. fenestrata interrupta (Lallemand); d, L. fenestrata pallida (Lallemand), teneral form; e, L. fenestrata tahitiensis, new subspecies; f, L. fenestrata pallida (Lallemand), normal form; g, L. fenestrata fenestrata (Fabricius); h, L. fenestrata insignis (Distant); i, L. fenestrata adamsoni, new subspecies; j, L. fenestrata mooreana, new subspecies; k, L. fenestrata sociabilis (Lallemand); l, L. cheesmani (Lallemand).

Moorea: Opunohu Valley, 2 miles from sea, altitude 100 feet, September 30, 1928, 1 male (type), Adamson.

This subspecies closely resembles *fenestrata* Fabricius in color pattern, differing only in the presence of the white marginal claval stripe and the noncontinuous black band along posterior margin of vertex. The aedeagus, although of the same type, is distinctly shorter. The parameres are of a quite different type.

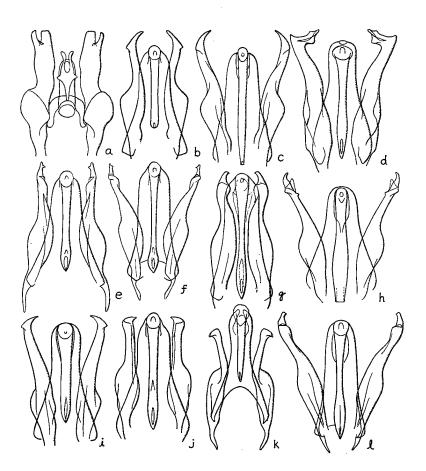


FIGURE 5. Diagrammatic figures of male aedeagus and parameres, dorsal view: a, Clovia bigoti Signoret; b, Lallemandia fenestrata tahitiensis, new subspecies; c, L. fenestrata fenestrata (Fabricius); d, L. fenestrata sociabilis (Lallemand); e, L. fenestrata pallida (Lallemand), teneral form; f, L. fenestrata pallida (Lallemand), normal form; g, L. fenestrata insignis (Distant); h, L. fenestrata mooreana, new subspecies; i, L. fenestrata adamsoni, new subspecies; j, L. fenestrata interrupta (Lallemand); k, L. cheesmani (Lallemand); l, L. fenestrata rapana (Lallemand).

Lallemandia fenestrata adamsoni, new subspecies (figs. 2, e; 3, j; 4, i; 5, i; 6, f).

Vertex and pronotum blackish brown with a broad percurrent yellow median stripe. Scutellum yellow. Tegmen blackish brown, the usual pale costal region divided by a very broad transverse brown fascia into two spots, the basal one yellowish and infuscate towards base of tegmen (fig. 3, j). Pilosity much denser and slightly longer than in all the other subspecies. Aedeagus of the *fenestrata* type similar to that of *mooreana* but much broader apically. Paramere of the *fenestrata* type but rounded towards apex and without the lower angle.

Tahiti: Papenoo Valley, 6 miles from sea, altitude 500 feet, October 23, 1928, 1 male (type), Adamson.

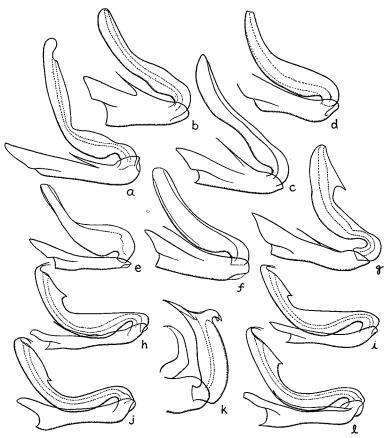


FIGURE 6. Diagrammatic figures of aedeagus, lateral view: a, Lallemandia fenestrata sociabilis (Lallemand); b, L. fenestrata tahitiensis, new subspecies; c, L. fenestrata fenestrata (Fabricius); d, L. fenestrata mooreana, new subspecies; e, L. cheesmani (Lallemand); f, L. fenestrata adamsoni, new subspecies; g, L. fenestrata interrupta (Lallemand); h, L. fenestrata pallida (Lallemand), normal form; i, L. fenestrata pallida (Lallemand), teneral form; j, L. fenestrata rapana (Lallemand); k, Clovia bigoti Signoret; l, L. fenestrata insignis (Distant).

This subspecies diverges much more from the typical than any of the others and might almost be regarded as specifically distinct.

Lallemandia fenestrata interrupta (Lallemand) (figs. 2, i; 3, b; 4, c; 5, j; 6, g).

Clovia insignis Distant variety interrupta Lallemand: Ann. Mag. Nat. Hist., 10th ser., vol. 1, p. 634, 1928.

Vertex yellow with a small black spot in each posterior angle; pronotum black with a broad pentagonal yellow spot in middle touching posterior margin. Scutellum yellow. Tegmen similar to that of *fenestrata*; the two transverse veins in the apical pale costal spot more or less broadly infuscate; no pallid or infuscate claval markings. Aedeagus of the *pallida* type, but excessively broadened apically and without the two apical bristles. Paramere of the *fenestrata* type, but in profile with the apex truncate almost perpendicularly, the lower angle rounded.

Borabora: Fanui, June 20, 1925, 2 males; vanilla plantation, altitude 500 feet, June 19, 1925, 1 female; Cheesman.

This distinctive subspecies is the only one so far recorded from Borabora. Although the two following subspecies occur outside the territorial limit of the Society Islands, they have been included to show the range of *L. fene-strata* and its subspecies in the South Pacific.

Lallemandia fenestrata insignis (Distant) (figs. 2, d; 3, e; 4, h; 5, g; 6, l). Clovia insignis Distant: Ann. Mag. Nat. Hist., 8th ser., vol. 11, p. 557, 1913.

Vertex sordid white with a small transverse black spot in each posterior angle at base of eyes. Pronotum black, with a large obscure whitish grey spot on disc. Scutellum sordid white with a small black stripe in middle of each lateral margin. Tegmen similar to that of pallida, but the apical half of the clavus and surrounding part of the corium indefinitely whitish. Aedeagus of the same type as in pallida, but less dilated in the middle and more widened apically. Paramere also similar to that of pallida but not bifid apically, the lower angle dentate.

Tuamotus: Henderson (Elizabeth) Island, 1,200 miles southeast of Tahiti (128° W., 24° S.) 1 male, 1913, D. R. Tait.

This subspecies was wrongly recorded by Lallemand from Tahiti, the subspecies referred to being actually *L. fenestrata pallida* Lallemand, normal form. Henderson Island is probably near the eastern limit of *Lallemandia*.

Lallemandia fenestrata rapana (Lallemand) (figs. 2, a; 3, a; 4, b; 5, l; 6, j). Clovia rapana Lallemand: Ann. Mag. Nat. Hist., 10th ser., vol. 1, p. 634, 1928.

Vertex yellow with a broad black band across posterior margin between the eyes and across the ocelli. Pronotum and scutellum entirely black. Tegmen as in pallida but without the obscure pallid spot at apex of clavus. Aedeagus of the pallida type but not dilated in the middle and with the apical funnel-shaped dilation much compressed

antero-posteriorly. Paramere also similar to that in pallida but apical process shorter and not bifid.

Rapa: 27° 36′ S., 144° 77′ W. (nearly 800 miles south-southeast of Tahiti) April, 1925, 2 males (including type) and 2 females on herbage, C. L. Collenette.

This is probably the southern limit of Lallemandia.

# Lallemandia fenestrata oceanica (Jacobi).

Clovia oceanica Jacobi: Arch. f. Naturges. Jahrg. 87, Abt. A., Heft 12, p. 14, 1921.

Vertex yellow with posterior half black. Pronotum and scutellum black. Tegmen as in *interrupta* Lallemand but with a transverse pale spot extending from apex of clavus into middle of corium. Unfortunately this form was described from two females so that the male genitalia are unknown.

Tonga: 2 females (Godeffroy Museum, Hamburg).

Jacobi's species is known to me only from the description, which leaves little doubt that it is a subspecies of the widely distributed *L. fenestrata* Fabricius. The above description is taken from that of Jacobi.

#### Lallemandia fenestrata samoensis, new subspecies.

Clovia oceanica variety, Jacobi: Arch. f. Naturges. Jahrg. 87, Abt. A., Heft 12, p. 14, 1921; Lallemand: Insects of Samoa, pt. 2, fasc. 2, p. 49, 1928.

Judging by Jacobi's description this variety is a distinct Samoan subspecies, differing from the Tongan *oceanica* in the yellow scutellum and in absence of the pale costal border to the black tegmen. Genitalia unfortunately not described.

Samoa: 1 male (Godeffroy Museum, Hamburg).

It will be seen from the above that Lallemandia offers a striking example of species in the making. The incidence of the subspecies tahitiensis, sociabilis, pallida, and adamsoni in Tahiti has yet to be studied from ecological and geological points of view. From the data at hand it would appear that these subspecies sometimes occur together in the same locality, but this may not actually be the case. It is significant that in each of the smaller islands only a single distinct and unvariable form has been found. The idea of regarding the various forms as mere aberrations is discountenanced by the striking differences in genitalia. Two distinct types of aedeagus and two distinct types of paramere are found within the species, but these cannot be correlated. Thus, although pallida, insignis, and rapana all have the funnelshaped aedeagus (lateral view) combined with the apically narrowed and curved paramere, interrupta with the same type of aedeagus has the apically

dilated and obliquely truncate type of paramere. Similarly, although tahitiensis, sociabilis, fenestrata, and adamsoni all have the tubular nondilated type of aedeagus, combined with the apically dilated and obliquely truncate type of paramere, mooreana, with the same type of aedeagus, has the apically narrowed and curved paramere. Neither can the color pattern of the vertex, pronotum, scutellum, and tegmina be correlated with these genital differences. It seems fairly probable, however, that in course of time L. fenestrata, instead of being composed of several subspecies, will have split into two distinct species, each with one of the two above-mentioned types of genitalia and each comprising several subspecies. There seems little doubt that this specific evolution has resulted primarily from geographical isolation, with geological (lava flows) and ecological isolation within a given island as secondary causes. It is interesting in this connection to speculate on the origin of the genus Lallemandia and whence it has spread. Clovia flavipes Fabricius [type in Banks Collection, British Museum (Natural History)], which was described from Rotterdam Island in the Macassar Straits, halfway between Borneo and Celebes, undoubtedly belongs to the genus Lallemandia and is closely related to fenestrata Fabricius. Unfortunately both the cotypes are females. It is not unreasonable to suppose that Lallemandia originated at the eastern limit of distribution of the genus Clovia and that flavipes Fabricius propably represents the type of ancestor. Clovia eugeniae Stål and possibly also C. phaleratus Stål from Guam (Marianas Islands) and Pouynipet (Caroline Islands), respectively, belong to the genus Lallemandia and demonstrate the distribution of the genus in the Western Pacific.

Strangely enough, in Fiji the genus has not yet been recorded, although Kirkaldy described the closely allied Nesaphrestes. In Samoa the following species of Clovia recorded by Lallemand 6 may be referred to the genus Lallemandia: C. juddi Lallemand, C. biformis, Lallemand, C. bryani Lallemand, C. armstrongi Lallemand, C. buxtoni Lallemand, C. navigans Jacobi, and also probably C. swezeyi Lallemand. In all these species the frons is rather more convex than in L. fenestrata (Fabricius), and the apex of the tegmen is more narrowed and less broadly rounded. In this respect, these species might almost be regarded as representing a distinct subgenus. To this last group also belong the remaining two Society Islands species.

Lallemandia cheesmani (Lallemand) (figs. 1, b; 2, j).

Clovia cheesmani Lallemand: Ann. Mag. Nat. Hist., 10th ser., vol. 1, p. 635, 1928.

Tahiti: Anaroii Plateau, 8 miles from sea, altitude 1,600 feet, October 31. 1928, 2 males, 1 female, A. M. Adamson.

Described from a single female specimen taken by L. E. Cheesman at Lake Vaihiria, Tahiti, July 19, 1925.

<sup>&</sup>lt;sup>6</sup> Lallemand, V., Cercopidae: Insects of Samoa, pt. 2, pp. 47-54, 1928.

## Lallemandia mumfordi, new species.

Yellowish brown (rust brown), mid-anterior region of vertex, disc of pronotum and scutellum rather paler brownish yellow; lateral margin of head in front of each eye, lateral margin of pronotum and costal margin of tegmen, except apical fourth, dark brown. Eyes blackish. Entire underside rust brown, the hind coxae and basal region of venter pale brownish yellow. Frons with a row of eight yellow transverse striae on each side. Legs and ovipositor sheath dark rust brown; claws, tips of tibial and tarsal spurs and apical segment of rostum black. Pubescence golden yellow, moderately sparse and short.

Tahiti: Te Aroa Pass, 7 miles from sea, altitude 2,900 feet, October 31, 1928, 2 females (including type), Adamson.

So far as is known the cercopid fauna of the Society Islands is thus composed of three species. Two of these are endemic in the island of Tahiti. The third, although widely distributed in the South Pacific islands, is represented in Tahiti by five endemic subspecies and in Borabora and Moorea, respectively, by two additional endemic subspecies. We therefore have the extraordinary phenomenon of 100 per cent specific or subspecific endemism in the cercopids of Society Islands, although further collecting may reveal the existence of nonendemic species. In spite of this extreme degree of endemism, there is little doubt that the fauna originated from the Austro-Oriental subregion.