

CRITICAL GENERA OF THE CIRIACREMINAE (HEMIPTERA-HOMOPTERA: PSYLLIDAE) (I) THE GENUS *CARSIDARA* WALKER, ITS STATUS, SYNONYMY AND RELATIONSHIPS.

By G. HESLOP-HARRISON.

WHEN it was appreciated that the "subfamily" Carsidarinae Crawford (Hemiptera-Homoptera: Psyllidae) was not merely invalid but imperfectly constituted, it became imperative that as many as possible of its critical genera should receive exhaustive investigation. As a result of such investigation, some remarkable facts were uncovered, but it was neither expedient nor practical to refer to all of these in detail in the texts where the breakdown and redistribution of the parts of the original subfamily were undertaken (cf. *Annals and Magazine of Natural History*, Ser. 13, vol. 1, p. 561, 1958).

Of necessity, therefore, several critical genera are to receive special discussion in a series of communications of which this is to be the first. The additional information which it is intended to present in these communications should be considered as supplementary to that afforded in the definitions and descriptions of the tribes of the Ciriacreminae as they appear in the text of the major work cited above.

The genus *CARSIDARA* of Crawford's conception.

The "subfamily" Carsidarinae was first designated and defined by Crawford in 1911 (*Pomona College Journal of Entomology*: 3, p. 481). The typical genus on which it was founded purported to be that of *Carsidara* Walker (*Journal of Proceedings, Linnean Society of London*, vol. x, p. 329, 1870), but such a genus was characterised and assessed entirely by Crawford for his immediate purposes, on a series of four species which did not include *Carsidara marginalis* Walker, the type and, at the time, only known authentic representative of this genus. The four species were "*Carsidara*" *gigantea* Crawf. and "*C*" *rostrata* Crawf., both from Nicaragua, and a "*C*" *concolor* Crawf. from Cuba and a "*C*" *mexicana* Crawf. from Mexico. It was indicated in the text that "*Carsidara*" *dugei* Löw, also from Mexico, belonged to the same genus and that *Carsidara marginalis* Walker, from the Celebes, should be considered as the designated type species of the genus.

However, other than by mention in this fashion, Walker's original species, *Carsidara marginalis*, did not appear to have been used, or even seen, when a genus "*Carsidara*" was defined with the objective of providing the typical genus of the "new" subfamily. The justification underlying this rather severe criticism will be indicated later in the present text.

In the meantime it should be obvious that this extraordinary circumstance has had a very important bearing on Crawford's conception of the status of *Carsidara*, but it cannot be said to have had any real effect on the constitution of the subfamily erroneously bearing the same name. This has been because the new definition of *Carsidara* embodied all of the essential characters which have since been recognised as giving distinction to the subfamily version, and these were also characteristic of Walker's *Carsidara* and a considerable number of the ultimately associated and critical genera. As a result, a seemingly stable position was maintained for this "subfamily" until the present investigation on subfamily separation commenced in 1947.

At about that time the material was being assembled for such a revision of the subfamilies of the Psyllidae, and in that connection the author received a series of insects bearing the name "*Carsidara*" *dugesii* Löw, from Prof. L. D. Tuthill. It was then that the first intimation that all was not well with Crawford's version of the genus *Carsidara* came to light, and this was followed by a critical examination of Walker's holotype female of *Carsidara marginalis*, which is at present lodged in the British Museum.

With all due respect for Prof. Tuthill's ability to identify psyllid species, but in accordance with the present author's usual practice, the name the former had appended to this series of insects was not accepted until it had been given personal check. It was whilst this was being undertaken that it was discovered that there were a number of important discrepancies between the published names and descriptions of species referred to *Carsidara* Walker, as afforded Löw in 1886 (Verhandlungen der Kaiserlich-Königlichen Zoologisch-botanischen Gesellschaft in Wien, **36**, p. 160), Crawford in 1911 (Pomona College Journal of Entomology, **3**, pp. 484-488) Aulmann in 1912 (Entomologische Rundschau, **2**, p. 19) and again by Crawford in 1914 (United States National Museum, Bull. **85**, pp. 57-59). Furthermore, this check revealed a significant lack of uniformity in the apparent configuration of the pterostigma amongst the several species that by then had been referred to this genus. The circumstances of these differences have since led to a very important discovery having been made in connection with the true nature of the pterostigma and pterostigmatic area, at least in this section of the Ciriacreminae; the details of this discovery will be discussed elsewhere at an early date.

Prof. Tuthill's identification of the species he presented to the author as "*Carsidara*" *dugesii* Löw, appears to have been effected by means of Crawford's 1914 monograph, and thus it did not conform with the identity of the species indicated by Löw in 1886.

Löw's description was very full, and his illustrations were up to his usual high standard of accuracy and very much better than those given by Crawford. On "Taf. VI" of Löw's work describing the new species *dugesii*, Fig. 9 depicted the forewing and its venation and Figs. 7 and 8, the male and female genitalia respectively. It is on these and the

accompanying text that the identity of the species concerned has now been established and not by any subsequent erroneous interpretation that Crawford had given.

It is to be noted that in 1911, Crawford indicated the species *dugesii* by name only, but in 1914 the name of one of the new species defined in 1911, namely "*Carsidara*" *rostrata* was recognized as an invalid synonym of "*Carsidara*" *dugesii* Löw, and the original illustrations provided for *rostrata* were those also used to illustrate the form said to be *dugesii* in the 1914 treatment. In 1911, however, there were incorporated errors in the labelling of the illustrations, but these errors could be checked and corrected from the accompanying text. Whilst the same errors were transcribed into the 1914 monograph, the text concerning the species and serving to identify them had dwindled to a point of uselessness, and without reference to the 1911 work it had become impossible to detect, let alone correct the original errors of labelling.

However, by working with both of Crawford's texts together, it is certain that *rostrata* Crawf. is a distinct and separate species from *dugesii* Löw and that if any synonymy is involved, it is between the latter and *concolor* Crawf.; all three belong to the same genus.

As stated, this group of American species could be divided into two sections on the basis of pterostigmal character; two genera were not involved in this case for reasons that will be made apparent when the nature of the pterostigma of this and related groups of species is discussed in later communications. That such a division was possible, must have been apparent to Crawford, but in his customary fashion he did not consider the presence or absence of a pterostigma, or even pterostigmal formation or character, at any higher level than the specific. It was fortuitous only, that in this case, the observed differences noted at that time did not carry any higher significance than the specific. In the appropriate texts it was indicated in the description of the species that "*Carsidara*" *gigantea* and "*C*" *concolor* both had the "pterostigmal space open" and that "*C*" *rostrata* and "*C*" *mexicana* had the "pterostigmal space closed".

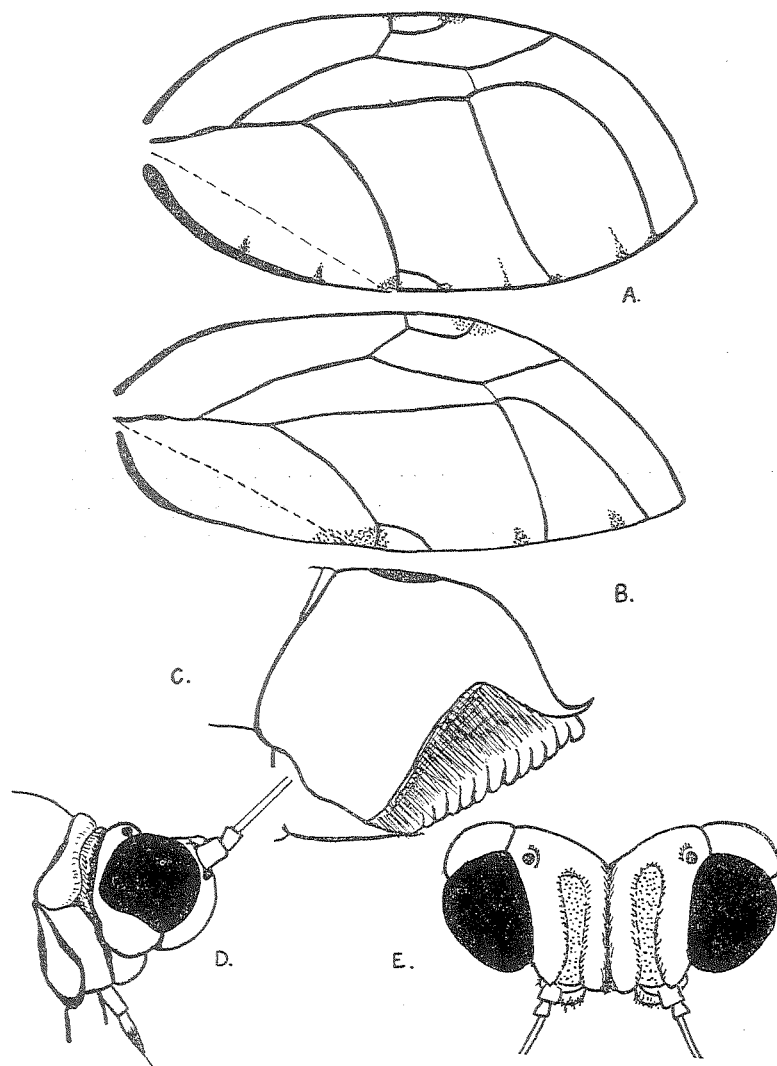
In both description and illustration Löw clearly indicated that his species *dugesii* had an "open pterostigmal space", and on this basis it should have been immediately obvious to both Crawford and Tuthill, had they ever seriously referred to the original account of *dugesii* Löw, that the latter was distinct, at least in this respect, from *rostrata* Crawf., a species with a closed pterostigma.

The critical examination of Walker's *Carsidara marginalis* that had been made in the present connection proved to be extremely useful and informative. Whilst this was being undertaken it did not take very long for it to be realised also, that *Carsidara* Walker, and the *Carsidara* of Löw, Crawford, Tuthill *et al.* represented two very distinct although related genera. The immediately obvious character which suggested this distinction was also that indicative of the fact that in redefining the "genus" for the purpose of founding a new subfamily, *Carsidara*

of Walker's conception had never been considered at all. This was the character of the female genitalia, a character Crawford subsequently described and gave special consideration in an entirely different connection. The circumstances were these:—

In 1913 (Philippine Journal of Science, 8, p. 293) a new genus *Dynopsylla* Crawf. had been erected to accommodate a very curious

Fig. 1.



Carsidara Walker; A, tegmen of *marginalis* type; B, tegmen of *minor* type; C, female genitalia; D, lateral view of head and prothorax; E, dorsal view of head.

(Note: Figs. 1 and 2 are semi-diagrammatic and are intended to denote group-forms only.)

species *D. cornuta* Crawf. and this, together with one or two more species like it is now considered to belong to the ciriacreminae tribe Homotomini. In 1915 (Philippine Journal of Science, 10, p. 264) the same author added a new species *minor*, to this genus, and this, or a species like it, he transferred to a new genus defined under the name *Thysanogyna* in 1919 (Philippine Journal of Science, 15, pp. 157–158).

In the texts of both the 1915 and 1919 communications reference was made to the general likeness of the species *minor* and the American forms hitherto placed in the genus *Carsidara*, but it was also appreciated fully that they were generically distinct. It is to be noted, of course, that a genus *Carsidara* was considered in this connection in its American connotation only.

In defining the "new" genus *Thysanogyna*, Crawford made special reference to the aforementioned curious and distinctive character of the female genitalia; had he seen anything like this structure before it is quite unlikely that he could have forgotten it so easily. The significant fact now, is that the same condition of the female genitalia was recognised immediately by the present author when he came to examine the type of *Carsidara marginalis* Walker. As a consequence, a new species from Madagascar which had, in the interim, been referred provisionally to Crawford's genus *Thysanogyna*, was re-examined in conjunction with the latter. Its necessary transference to *Carsidara* was recorded in the notes made at the time.

It was in this fashion, however, that it was learned that *Thysanogyna* Crawford was the invalid synonym of *Carsidara* Walker, and that the *Carsidara* of Löw, Crawford, Tuthill *et al.* appeared to be an American genus devoid of a name.

In providing a new name for the latter, an effective separation mechanism must be afforded between it and *Carsidara* Walker in order to preclude all further confusion between them. Before this can be done it is necessary to stress the fact that any previous association that may have been made between true species of *Dynopsylla* Crawford and *Carsidara* Walker, has been in error. *Carsidara* and *Dynopsylla* are not closely related and belong to distinctly different tribes of the Ciriacreminae. That they are so distinct is immediately obvious on considering the differences observable in the venation and configuration of the forewing but this is adequately confirmed in numerous, but perhaps not quite so obvious or striking ways.

The genus *CARSIDARA* Walker, 1870.

Synonymy

Carsidara Walker, 1870.

= *Carsidara* Scott, 1882.

nec. *Carsidara* Löw, 1886.

nec. *Carsidara* Crawford, 1911.

nec. *Carsidara* Aulmann, 1912.

nec. *Carsidara* Crawford, 1914.

= *Dynopsylla* Crawford, 1915 (partim.).

= *Thysanogyna* Crawford, 1919.

= *Thysanogyna* Enderlein, 1926.

Insects of this genus are typically "carsidarine" in general facies, that is, with the head strongly cleft in front and with long slender anteriorly directed antennae, which seemingly arise from just beneath the extreme antero-lateral margins of the lobes of the vertex. Known species are robust, with broad, parallel-sided, but acutely pointed wings. Wing membranes clear, although sometimes marked in the posterior and anterior margins with wedge-like pigment spots. The radular areas of cells M and MCu are very prominent.

Head: Small, scarcely, or less than the width of the thorax; horizontal. **Genæ** not excessively large, but developed beneath the vertex into tubercles on which the antennae are inserted. **Vertex** divided down the middle by a deep suture. Each half is more or less deeply excavated by a long narrow longitudinal foveum. The lateral margins of the latter are raised in some species, and then project anteriorly into small, horn-like epiphyses overlying the corresponding antennal base. **Anterior ocellus** scarcely, or not quite visible in dorsal view since it lies on the anterior-most extremity of the deeply recessed frons. The **frons** is long and narrow and wholly located in a ventral position. **Compound eyes** prominent, and angled forwards in a typical carsidarine fashion. **Antennæ** with proportionately small basal segments; long and slender, but prominently placed and directed forwards. At least two-thirds as long as the forewing, usually longer. **Clypeus**, obscure and poorly developed. **Labium** developed into a beak of only moderate length.

Thorax: Robust, moderately arched; flat dorsally, bulging and curved laterally. **Pronotum**, narrow, curved anteriorly at the lateral extremities; either with lateral foveae or with a long narrow transverse median foveum. **Propleurites** unequal, vertical. Dividing suture sinuate. **Proepisternum** semiquadrate, **proepimeron** smaller and ellipsoidal.

Wings: **Membrane** clear, **veins** moderately stout. **Radular areas** very distinct; in medial and medio-cubital cells only. **Cubital cell** very small and always very much less than one fifth of the area of the medial cell. **Medial cell** very large and wedge-shaped, but with anterior bounding vein, M_{1+2} , paralleling the upper apical margin of the wing in a characteristic fashion. The base of M_{1+2} , i.e. at the point of furcation, connected to Rs by a moderately strong RM "callus", with Rs making a distinct angular approach at the point of junction. **Cubito-medial/radial petiole ratio** within the range of $1/2\frac{1}{2}$ –3. Medial stem and cubito-medial petiole forming an almost straight line. **Pterostigma** small but distinctive and apparently of a unique type. R_1 subdivides into R_{1a} and R_{1b} and an elongate-quadrate, thickened, pterostigmal space is enclosed. A **costal nodal break** is absent.

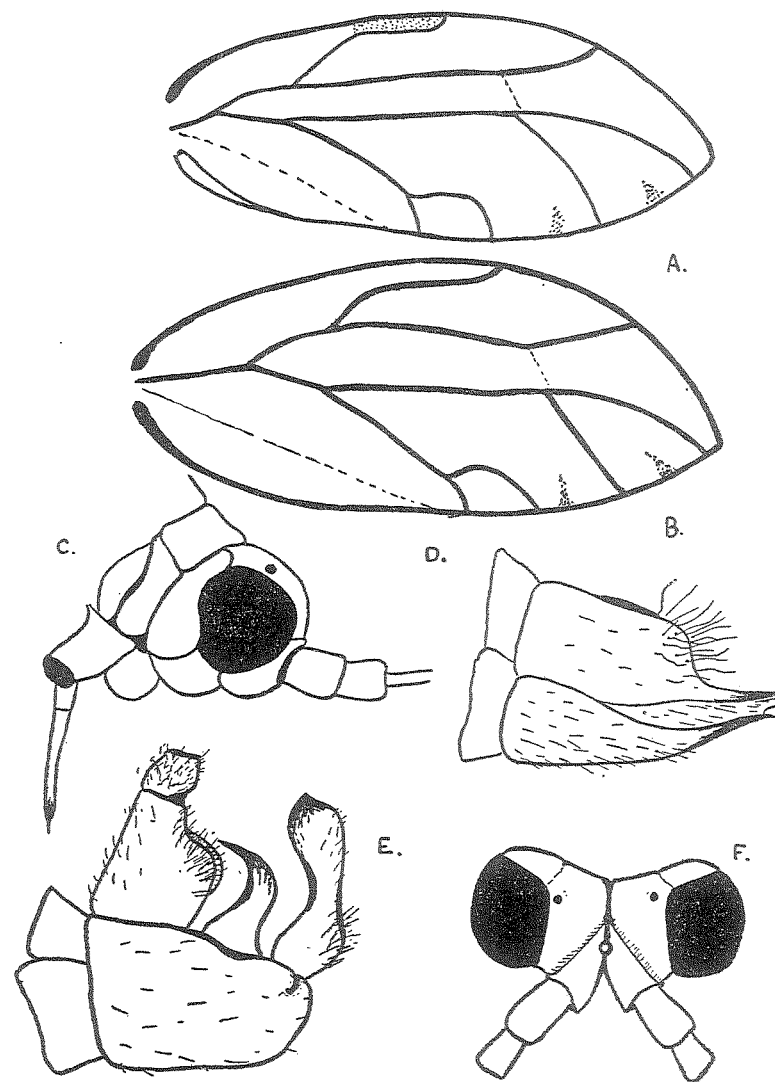
Legs: Stout and well developed. **Hind tibia** with a strongly developed basal spur; apex dilated in characteristic carsidarine fashion with one prominent isolated, and several not so prominent approximating apical spines. **Basal segment of metatarsus** with one spine only. **Terminal segment of metatarsus** very long and slender.

Male Genitalia: Apparently with a bipartite proctiger, simple

"fusiform" parameres, and no lateral epiphyses on the phallocrypt of segment nine (see note below).

Female Genitalia: Of a unique type; whole structure quite large. "Dorsal valve" broad and bulging, and terminating ventrally in an

Fig. 2.



Paracarsidara Heslop-Harrison; A, tegmen of *rostrata* type; B, tegmen of *dugesii* type; C, lateral view of head and prothorax; D, female genitalia; E, male genitalia; F, dorsal view of head.

upwardly curved hook-like process. *Ovipositor structure* of segment eight ("median valve") fringed with a dense matt of fine setae located sub-apically and diagonally; ventrally terminating in a distinctly fluted marginal area of unique character and appearance. "*Ventral valve*" (sternite of segment seven) quite small and acutely pointed.

Type of the Genus: *Carsidara marginalis* Walker 1870. Additional species to be referred to the genus are *Thysanogyna minor* Crawf., 1919, (= *Dynopsylla minor* Crawf. 1915? (see note below)) and one other new species from Madagascar which has yet to be described.

Distribution: Old World Tropics, from Madagascar to Tanimbar Islands*, the Celebes and the Philippines (Luzon).

Notes: *Carsidara marginalis* has been defined on the basis of a single unique holotype female; males are unavailable for the additional species which the author possesses from Madagascar. The conclusions concerning the possible generic character of the male genitalia of the genus *Carsidara* have thus been assessed on the very inadequate notes given by Crawford in 1915 and 1919, and may require modification later.

Crawford remarked on the existence of two distinct forms in his material of *minor*, which he referred to as "incipient species". Bearing in mind the numerous cases where this author discussed complexes involving several species and even genera as if they were each homogeneous and unipartite, the suggestion is now made that it is possible that his "incipient species" were in fact distinct species. It may or may not be significant in this connection to note that his material was drawn from localities separated spatially by at least 1,500 miles of islands and seas in the Indonesian Archipelago, and between which points, *Carsidara marginalis*, another distinct species, was known to occur in the Celebes.

In redefining the genus *Carsidara*, Scott (1882), remarking on the derivation of the name itself, signified that he considered that it was "*Vox et praeterita nihil*. A thing of sound and . . . signifying nothing".

This name could have been derived from the Greek *carsios* (κάριος)—a cross, and may have been suggested to its author by the presence of cross-veins in the forewings of the insect he was describing. Scott neither mentioned the existence of cross-veins in his text nor included such in his wing illustration of *Carsidara marginalis*.

The genus "PARACARSIDARA" Mihi.

Synonymy

- = *Carsidara* Löw, 1886.
- = *Carsidara* Crawford, 1911.
- = *Carsidara* Crawford, 1914.
- = *Carsidara* Tuthill, 1950.
- nec. *Carsidara* Walker, 1870.
- nec. *Carsidara* Scott, 1882.

(The identity of the *Carsidara* of Aulmann's 1912 usage is at present uncertain; there are indications that it is possible that the species con-

* In order to establish some sort of uniformity in the spelling of the names of geographical locations, the Gazetteer of the Oxford Atlas, Oxford University Press, 1957, will be used in this and all other similar contributions by the present author.

cerned, namely "*Carsidara*" *camerunus* Aulmann, may yet have to be referred to a separate genus, related to, but distinct from either *Carsidara* or *Paracarsidara*.)

Quite robust insects of carsidarine type, but with the head more deeply cleft in front than in the preceding genus, and antennae seemingly more prominently placed. Wings acutely pointed, with clear membranes but with pterostigmatic areas opaque in species with the "closed pterostigma".

Head: Small; less than the width of the thorax, horizontal, and so very deeply cleft in front that each half of the *vertex*, although pentagonal, appearing almost triangular, an impression enhanced and exaggerated by the nature and method of insertion of the antennae; without anterior horn-like epiphyses. *Antennae* with characteristically enlarged basal segments and therefore quite different from those of the preceding genus. Long and slender, usually more than two-thirds of the length of the forewing. *Anterior ocellus* visible in dorsal view and located between the genae, not the lobes of the vertex. *Compound eyes* projecting forwards thus exposing a large portion of the occipital area behind. *Frons* poorly developed and nearly obscured by the genae. *Genae* not developed into conical swellings or tubercles but simply represented by somewhat tubular areas surrounding the antennal insertions and forming part of the anterior cleft of the head. *Clypeus* more or less globular. *Labium* developed into a beak of extraordinary length.

Thorax: Only slightly broader than the head, and hardly so robust as in the preceding genus. Quite strongly arched dorsally. *Propleurites* developed as in the preceding genus with a sinuate dividing suture, an ellipsoidal *proepimeron* and a larger, more quadrate *proepisternum*.

Wings: *Membrane* clear, *veins* moderately developed. *Radular areas* present in cells M and MCu. *Cubital cell* ranging in size from approximately one-half to less than one-third of the area of the medial cell. The size discrepancy is never so extreme as in the preceding genus. *Medial cell* large and wedge-shaped, but with the anterior bounding vein, M_{1+2} , not parallelling the apical margin of the wing but diverging from it in a characteristic and uniform fashion in all known species. The base of M_{1+2} is connected to Rs by an RM callus, Rs making an angular approach at the point of junction. This callus is present in all known species, but very obscure in some and never so strongly developed as in the preceding genus. *Cubito-medial/radial petiole ratio* approximately 1/1 in all known species. *Pterostigmal area* closed or open, opaque and somewhat thickened when closed, but never formed by the division of R_1 into R_{1a} and R_{1b} and never preceded by a *costal nodal break*.

Legs: Stout and generally well-developed. *Hind tibia* with a strongly developed basal spur; apex dilated, with one isolated and several grouped, stout spines. *Basal segment of metatarsus* with one spine. *Apical segment of metatarsus* of normal development; not slender and long as in preceding genus.

Male Genitalia: *Proctiger* bipartite, that is with a small free apical

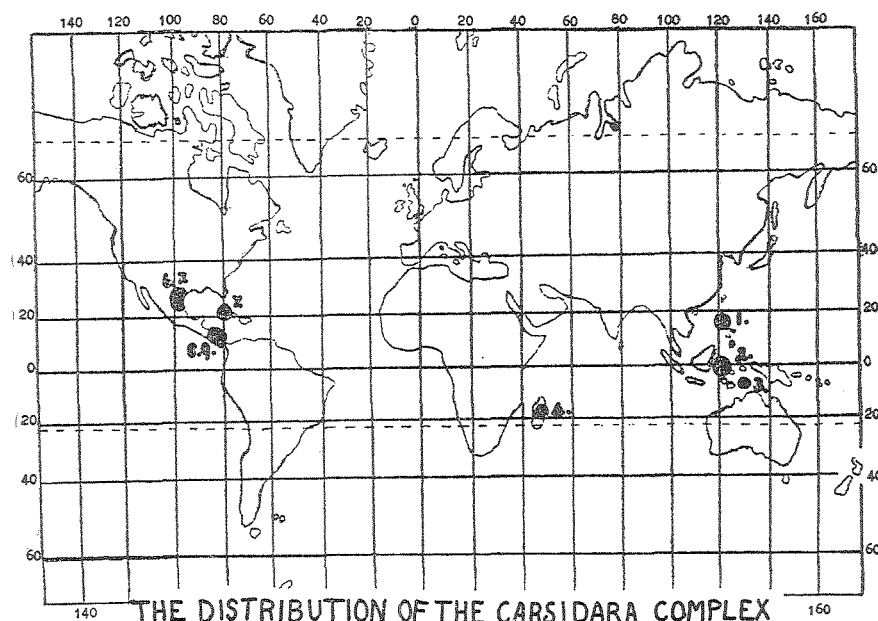
portion representing the epiproct of a reduced eleventh segment. *Segment nine* (phallocrypt) with characteristic lateral, pointed immovable epiphyses curving towards the proctiger. *Parameres* simple.

Female Genitalia : *Dorsal valve* and *ventral valve* subequal, of normal development; pointed at apex.

Type of the Genus : "*Carsidara*" *dugesii* Löw, 1886; "*Carsidara*" *gigantea* Crawford, 1911, "*Carsidara*" *rostrata* Crawford, 1911, and "*Carsidara*" *mexicana* Crawford, 1911 are other species to be referred to this genus. "*Carsidara*" *concolor* Crawford, 1911, is herein considered to be an invalid synonym of the type of the genus.

Distribution : All known species occur in the adjacent Mexican and Central American zones of the North American Continent and although their host associations are not known*, like the members of the genus *Carsidara*, it may be possible that they, too, are significantly associated

Fig. 3.



PARACARSIDARA Heslop-Harr.
 6. *P. mexicana* (Crawford).
 7. *P. dugesii* (Löw).
 8. *P. rostrata* (Crawford).
 9. *P. gigantea* (Crawford).

CARSIDARA Walker.
 1. *C. minor* (Crawford).
 2. *C. marginalis* Walker.
 3. *C. minor?* (Crawford).
 4. *C. sp. nov.*

The presently known world distribution of species of *Carsidara* (1, 2, 3 and 4) and *Paracarsidara* (6, 7, 8 and 9); "*Carsidara*" *camarunus* Aulmann has not been included since its identity remains unsettled.

* *Carsidara dugesii* Löw was said to feed on a species of the Malvaceae.

with elements of the natural, perhaps relict, evergreen hygrophytic forests of the areas concerned.

NOTES ON THE CARSIDARA COMPLEX.

Whilst the circumstances revealed above preclude all possibility of *Carsidara* continuing as the root of a subfamily name, even if such a subfamily category were to remain as constituted originally by Crawford, these circumstances do not preclude the present author's use of *Carsidara* Walker as the type genus of a tribe of the same name, for such a genus has been used in the latter connection in its original form. The tribe Carsidarini is therefore *not* a reduced version of Crawford's subfamily Carsidarinae.

The affinities which exist between *Carsidara* Walker and the new genus *Paracarsidara* are close and obvious, but the distinctions are considered to be more than sufficient to uphold their present generic separation.

Thus it is to be seen that whilst the venational and tegminal similarities are quite significant the detailed differences in tegminal character, genitalia, head configuration, etc., whilst not destroying the obvious indications of an original community of origin, suggest considerable divergence—a divergence made possible, no doubt, by spatial isolation of long duration. The latter is indicated by the known distribution patterns of the several species now to be referred to each of the two genera.

It would be most unrealistic if mention were not made of the genus *Mesohomotoma*, Kuwayama, before concluding this account. The latter genus obviously shares the same community of origin as *Carsidara* and *Paracarsidara* and serves as a strong connecting link between the two. *Mesohomotoma*, however much has been written about it in the past, is a poorly understood genus, has an extraordinary complex synonymy, and is inclusive of at least one species (*Mesohomotoma tessmanni* (Aulmann)) of very great economic importance. *Mesohomotoma* has therefore been made the subject of an additional special study and in a later contribution in this series it will be discussed at length, and also in connection with the members of the *Carsidara* complex.

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