The periods of origin and diversification of the Superfamilies of the Homoptera-Auchenorhyncha (Insecta) as determined by a study of the wings of Palaeozoic and Mesozoic fossils

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INTRODUCTION

The Homoptera-Auchenorhyncha comprise four very distinctive superfamilies of insects, the Fulgoroidea, Cercopoidea, Cicadoidea and Cicadelloidea.

The fossil record of the Auchenorhyncha is a remarkable one, and an abundance of wings, especially forewings, or tegmina, have been recorded from strata in many parts of the world, ranging from Lower Permian times onwards.
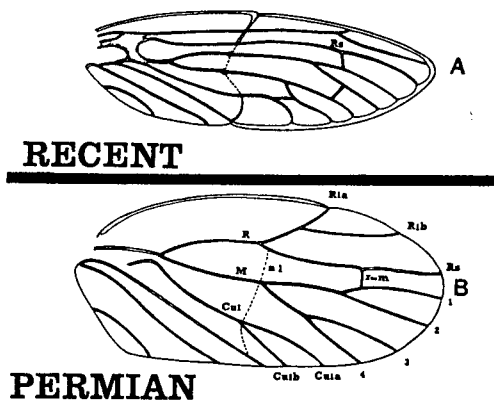
Text-fig. 1. Tegmina of A, *Tettigarcta crinita*; B, *Prosbole reducta.*

Some of these tegmina have been regarded as belonging to groups of Homoptera now extinct and others have been ascribed to existing superfamilies. There is, however, at present, no certainty as to the correctness, or otherwise, of several of the various relationships which have been claimed.

It is the purpose of this paper to seek to analyse the salient stable venational features of certain present-day Homoptera and to re-assess the possible relationships of some insect fossils in the light of the selected characteristics. If the characteristics chosen are reliable, it will enable many fossils to be associated with existing superfamilies with a greater degree of confidence than has been possible in the past. The resulting associations should thus provide new knowledge of the composition of the Homopterous faunas of Palaeozoic and Mesozoic times and, as well, provide confirmation, or otherwise, of claimed periods of origin of existing superfamilies.

The sequence in which the superfamilies are discussed is not a phylogenetic one, but has been chosen as the most convenient arrangement for the purposes of this paper. The subject of the phylogeny of the Homoptera has recently received separate consideration (Evans, 1963a).

<div align="center">CICADOIDEA</div>

The tegmen of a cicada, *Tettigarcta crinita* Distant, is illustrated in Fig. 1A. This insect is a relict form which occurs in south-eastern Australia and belongs to the family Tetti-garctidae (Evans, 1941). Apart from the Tasmanian *Tettigarcta tomentosa* White, all other known tettigarctids have been recorded solely as Mesozoic fossils (Evans, 1957).

RECENT

TRIASSIC

PERMIAN
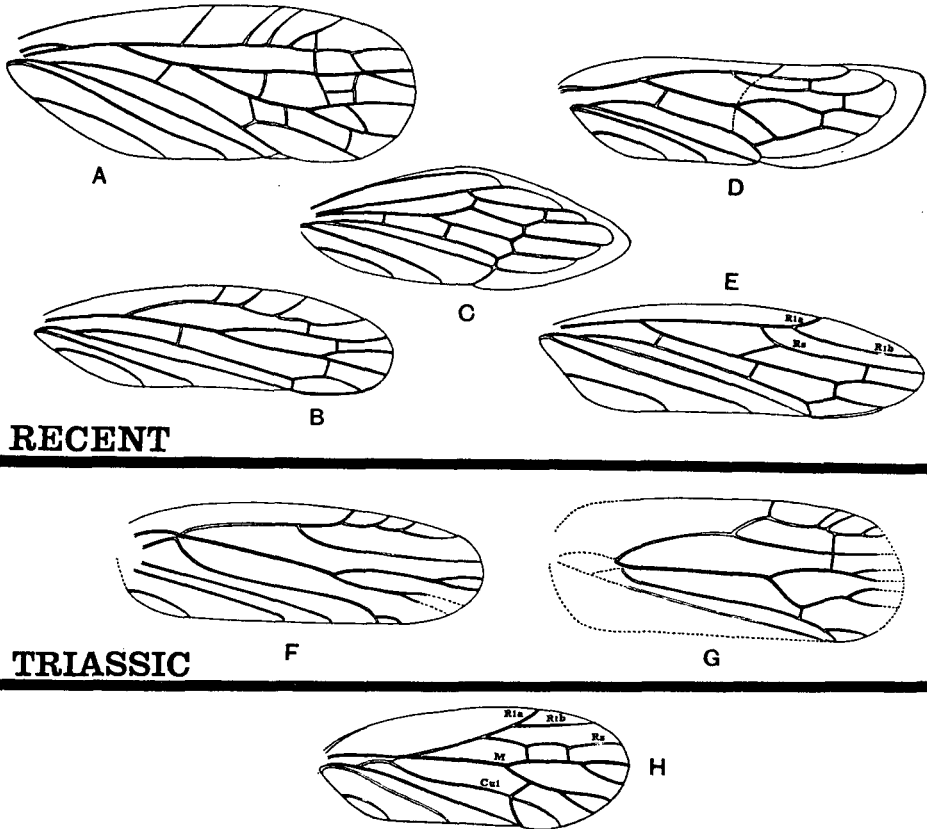
Text-fig. 2. Tegmina of A, *Aetalion* sp.; B, *Australoscopus whitei*; C, *Eufrenchia falcata*; D, *Balala fulviventris*; E, *Putoniessa nigra*; F, *Triassoscytinopsis stenulata*; G, *Mesothymbris perkinsi*; H, *Homaloscytina plana*.

The venation of Recent and Tertiary cicadas belonging to the family Cicadidae is identical in all essential features with that of *Tettigarcta* spp., except in respect to the proximal parts of R and Rs. In the Cicadidae, R is incorporated proximally in the costal margin and is not a separate vein, as in *Tettigarcta*, and Rs arises from R in a more distal position.

If a comparison is made between the tegmen of *T. crinita* and that of the Permian, *Prosbole reducta* Martynov (Fig. B) it will be found that there are no significant venational

rences between the two wings. Such differences as occur are ones of shape and proportions; the apparent lack of a marginal vein in *P. reducta*; the position of the association of the nodal line with Rs, M and Cu1; the more proximal derivation of Rs from R and in respect to the initial branching of M in *Tettigarcta*.

The fact, that over a period of some two hundred million years there has been no significant change in the venation of the forewings of cicadoids, demonstrates the stability of this structural feature, and suggests that wing venation in the Homoptera, if correctly interpreted, can provide dependable data of diagnostic significance.

CICADELLOIDEA

A great diversity of venational types is to be found among representatives of the Cicadelloidea. Nevertheless, it is possible to distinguish five principal basic patterns, each of which is associated with a particular family (Evans 1946a, 1948). These are illustrated in Fig. 2.

In the Aetalionidae the venation, which is highly variable, tends to be obscured by a reticulate condition (Fig. 2A). However, Rs is always lacking, and M, which arises from R, has always two principal branches, of which either, or both, may have two branches.

The Eurymelidae likewise lack Rs and have a median vein with two principal branches (Fig. 2B, *Australoscopus whitei* China). They resemble *Aetalion* spp. also in R1 having more than two branches.

In the Cicadellidae, M1+2 is distally incorporated in the same vein as Rs, and M, proximally, is incorporated in the same vein as R (Fig. 2E, *Putoniessa nigra* Kirkaldy).

The Hylicidae, like the Aetalionidae, are a relict family. Their tegmina differ from those of other families of the Cicadelloidea in having both Rs and M1+2 extending separately to the apex of the tegmen and in having M3+4 apically incorporated in the same vein as Cu1a (Fig. 2D, *Balala fulviventris* (Distant).

While, in the Membracidae, the usual condition is for M to be fused basally with Cu1, forms with a more generalized pattern of venation occur and in these M is basally separated both from R and Cu1 (Fig. 2C, *Eufrenchia falcata* Walker).

A comparison of the venation of the tegmina of the five insects mentioned above discloses certain features common to all. These are, except in the Membracidae, the basal incorporation of M and R in the same vein, and the invariable separation of M into two principal branches in a more proximal position than the division of Cu1 into Cu1a and Cu1b.

These features are also apparent in the Upper Triassic and the Upper Permian tegmina illustrated in Fig. 2. Furthermore, the four branches of R1 in the tegmen of *Triassoscytinopsis stenulata* Evans (Fig. 2F) parallels the condition of this vein in the tegmen of the eryumelid figured. A two-branched condition of R1, such as occurs in *Homaloscytina plana* Tillyard (Fig. 2H), is retained, on the other hand, in the tegmina of the membracid, hylicid and cicadellid illustrated.

It will be noted that the venation of *H. plana* is, to all intents and purposes, identical with that of *Prosbole reducta* (Fig. 1B). The principal difference between the two tegmina is the presence of a nodal line in the tegmen of *P. reducta* and its absence in that of *H. plana*.

CERCOPOIDEA

In Fig. 3, there are illustrated the tegmina of four Homoptera, of which two (Fig. 3A, *Aufidus tripars* Walker and Fig. 3B, *Hemitriecphora variabilis* (Distant)) are of Recent cercopoids and two (Fig. 3C, *Trifidella perfecta* Evans and Fig. 3D, *Dysmorphoptiloides elongata* Evans) are Upper Triassic fossils which have been attributed to the Cercopoidea (Evans, 1956, 1961).

Bekker-Migdisova (1962b) has not accepted *D. elongata* as a cercopoid and regards this insect as a fulgoroid of uncertain position.

If a comparison is made between the venation of *T. perfecta* (Fig. 2C) and that of the

two Recent cercopoids, the following resemblances will be noted; the presence of numerous costal cells; Rs arising from R in the proximal half of the tegmen; R1 and Rs sloping downwards apically, and M proximally incorporated in the same vein as Cu1.
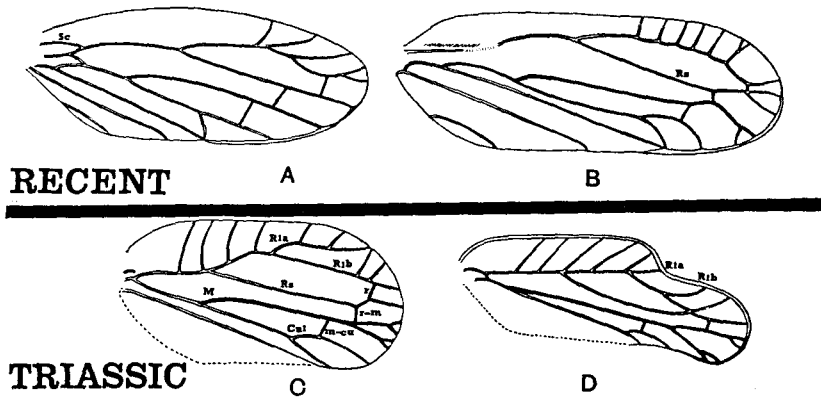
Text-fig. 3. Tegmina of A, *Audfidus tripars*; B, *Hemitriecphora variabilis*; C, *Trifidella perfecta*; D, *Dysmorphoptiloides elongata*.

In the tegmina of both *T. perfecta* and *D. elongata* (Fig. 3D) the proximal branching of M takes place distally of the separation of Cu1 into Cu1a and Cu1b. This circumstance, combined with the shortness of the four apical branches of M, suggests a trend towards the reduction of M from its presumed former more generalized condition, as is shown, for example, in Fig. 4D.
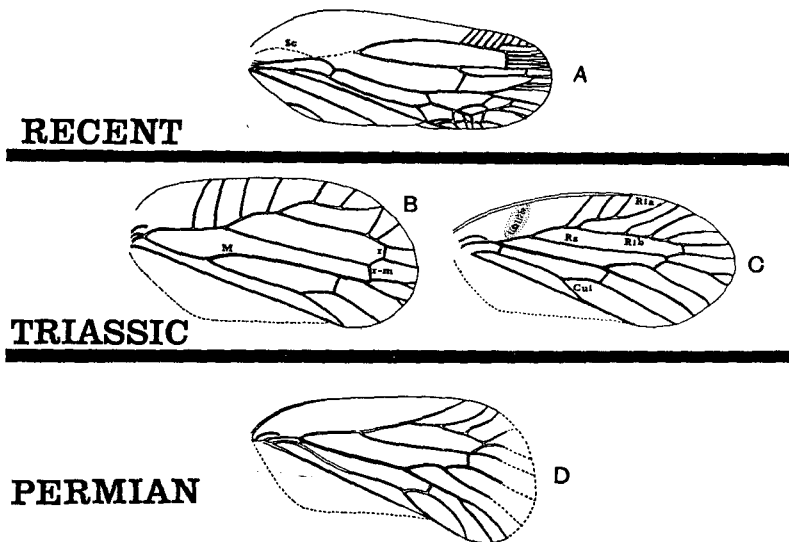
Text-fig. 4. Tegmina of A, *Cosmoscarta incanescens*; B, *Trifidella perfecta*; C, *Eoscartoides bryani*; D, *Belmontocarta perfecta*.

The only apparent significant feature in which the two Upper Triassic tegmina differ from the two Recent ones illustrated, is in respect to R, since in the tegmen of *T. perfecta*, R1a is unusually long and parallel with R1b; moreover R1a and R1b are both branched. A

similar sub-divided condition of R1b occurs also in the tegmen of *D. elongata*. The differ-ences between the fossil and extant forms illustrated in respect to these veins are, however, more apparent than real, since in the tegmen of *A. tripars*, R1a has two branches and so likewise has R1b.

The tegmen of *Trifidella perfecta* is again illustrated in Fig. 4B, where it is placed beside an illustration of a tegmen of another Upper Triassic insect, likewise attributed to the Cercopoidea (Fig. 4C, *Eoscartoides bryani* Evans). The two tegmina resemble each other in the branched condition of R1a and R1b, and in the proximal derivation of Rs from R. They differ in the greater development of M in the tegmen of *E. bryani* and in this vein being basally associated with R and not with Cu1.

Although, within the Cercopoidea, it is usual for M and Cu to be basally fused, such a condition is not an invariable one, and in Fig. 4A there is illustrated the tegmen of a Recent cercopoid (*Cosmoscarta incanescens* (Butler)), in which, as in *E. bryani*, M is separate from Cu1, with which it is associated by a basal cross-vein.

In Fig. 4D is shown the tegmen of an Upper Permian Homopteron (*Belmontocarta perfecta* Evans), also with presumed cercopoid affinities. The principal significant feature in which the venation of this tegmen differs from that of *E. bryani* is, not only in having a Media with four complete branches, but also in the initial branching of this vein into M1 + 2 and M3 + 4 taking place slightly more proximally than the separation of Cu1 into Cu1a and Cu1b.
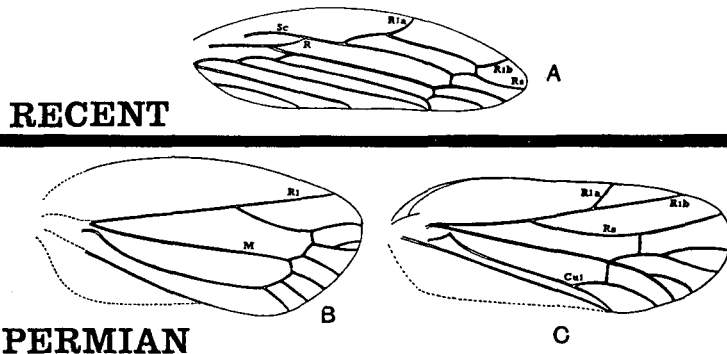
Text-fig. 5. Tegmina of A, *Philagra parva*; B, *Sarbaloptera sarbalensis*; C, *Permocicada nigrita*.

If the fossil tegmina attributed to the Cercopoidea have been correctly placed, it would seem that they share a common venational characteristic in which they differ strikingly from the Cicadelloidea. This, apart from the progressive reduction of M from an original four-branched to a single-branched condition, is the fact that, except in the tegmen of *Belmontocarta perfecta*, the initial branching of M invariably takes place distally and not proximally of the separation Cu1 into two veins.

Examination of published illustrations of the tegmina of fossil Homoptera discloses that numerous Palaeozoic and Mesozoic tegmina have been described with corresponding features in respect to M, and two such tegmina are shown in Fig. 5. (Fig. 5C, *Permocicada nigrita* B.-M., Fig. 5B, *Sarbaloptera sarbalensis* B.-M.)

Although these tegmina resemble those shown in previous illustrations in respect to M, they differ in having R1 occurring in a generalized condition. Such a condition, however, occurs also in many Recent cercopoids as, for example, in the tegmen of *Philagra parva* Donovan (Fig. 5A).

It may be of significance that those tegmina of Recent cercopoids illustrated, in which R1 is profusely branched, belong to insects in the family Cercopidae, while *P. parva*, in which R1a and R1b alone are present, belongs to another family, the Aphrophoridae.

Apart from those venational features which have already been mentioned, Recent cercopoids share another character which is lacking in the tegmina of representatives of the Cicadelloidea. This is the presence of Sc as a short, independent vein. It is possible, though not certain, that Sc is present also in tegmina of certain fossil Homoptera attributed to the Cercopoidea.

Its apparent absence in the tegmina of some fossils regarded as belonging to the Cercopoidea need, however, have little significance. This is because in Recent cercopoids Sc is usually not raised above the surface of the tegmen in the same way as are the other veins and for this reason its absence from fossil impressions is to be expected.

A characteristic common to all the fossil Homoptera which have been ascribed above to the Cercopoidea is that their tegmina are uniformly coarsely rugose in texture.

<div align="center">FULGOROIDEA</div>

The Fulgoroidea lie on a different line of descent from the rest of the Homoptera–Auchenorhyncha and for this reason the Auchenorhyncha are regarded as comprising two distinct divisions, the Fulgoromorpha and the Cicadomorpha (Evans, 1951). Of these, the former were differentiated before the latter (Evans, 1963a).

It has not been found possible to suggest evolutionary sequences, in the same way as has been done for the three other superfamilies, in respect to the tegminal venation of the Fulgoroidea. This is partly because the fossil record of the Fulgoroidea does not extend sufficiently far backwards in time and partly because of the difficulty of determining the nature of basic fulgoroid venation from a study of present-day forms.

It is possible, as has been suggested by Heslop-Harrison (1955), and accepted by the present author, that the venation of the Fulgoroidea is basically identical with that of the rest of the Homoptera. However, Fennah (1944), who has made a detailed study of fulgoroid venation, has provided an interpretation which conflicts with this assumption.

While among present-day fulgoroids it is possible to discover forms with a pattern of tegminal venation identical, in essential features, with that of the basic pattern of venation of the Cicadomorpha, it is uncertain whether this represents the basic pattern for the Fulgoroidea as a whole. It is, in fact, quite possible that it represents no more than a reduced, and hence a specialized condition.

In spite of these difficulties, recognition of the tegmina of fossil fulgoroids is usually possible. Because this is so, and also because of the very wide diversity of form of their tegmina, no illustrations are given of representatives of this group. Their salient venational features are as follows: a tendency to vein proliferation; Sc sometimes present as a distinct vein, not incorporated in the costal margin (for example in the Flatidae, Ricaniidae and Eurybrachidae); R frequently, and Rs usually, with numerous branches; M usually multi-branched, but sometimes with four or less branches and never basally fused with Cu1, to which it is usually joined by a cross-vein close to, or at its point of junction with, R; Cu1 usually with two very long branches, but sometimes, as in the Flatidae, unbranched; anal veins invariably apically joined to form a Y-vein.

Although numerous undoubted fulgoroids have been recorded from Jurassic strata (e.g. Handlirsch, 1939) in comparison with the Cicadomorpha very few are known from strata of an earlier age. This lack of fossils may have an ecological explanation, since it is possible that the earlier representatives of the group, which presumably must have lived during the Carboniferous period, frequented environments unfavourable for their preservation as fossils.

Definitions of the principal tegminal characteristics of the Cicadoidea, Cicadelloidea and Cercopoidea are given below and it is hoped these will enable the tegmina of many fossil Homoptera–Auchenorhyncha to be ascribed to their correct superfamilies. A number, however, will remain impossible to place correctly, not only because they may have

belonged to representatives of groups now no longer in existence, but also because anomalous forms will have occurred in former geological periods, just as they do at the present time.

In preparing definitions, present-day anomalies have been disregarded since their inclusion would tend to confuse a picture which otherwise is reasonably clear. For example, while it is stated below that in the Cicadelloidea M is usually proximally associated with R, it may, as in the Membracidae, be usually basally fused with Cu1. Then, in certain cicadellids such as in the Neocoelidiinae, M is an unbranched vein, and this condition is not in accordance with the definition provided of the venation of the Cicadelloidea. It is improbable, however, that either of the specialized features mentioned above was established prior to Cretaceous times.

Cicadoidea

Complete venation; presence of a transverse nodal line.

Cicadelloidea

Progressive reduction of venation, so that in Recent forms, four, instead of seven veins, usually support the apex of the tegmen; Sc lacking as a separate vein; R1 usually short and accessory costal veinlets of infrequent occurrence; Rs, if present, arising from R, either approximately in its centre, or else nearer to the apex of the tegmen than the base; M, except in the Membracidae, and in certain Permian forms, usually arising proximally, from a common stem with R, and initially branching proximally of the branching of Cu1; arms of Cu1 usually angulate; surface of tegmen sometimes, in part, or wholly, punctate, seldom, if ever, coarsely rugose.

Cercopoidea

Sc present as a short and separate, but not a prominent vein; in some representatives a progressive increase in the development of R1; Rs always present and derived from R, either near its centre, or closer to the base of the tegmen than to the apex; a progressive reduction in the development of M, which may either, basally, be incorporated in the same vein as Cu1, or be joined to Cu1 by a proximal cross-vein; branches of Cu1 sometimes long and curved; surface of tegmen, frequently, though not invariably, coarsely rugose.

DISCUSSION

It is assumed, for purposes of discussion, that those Homoptera in which a transverse line of weakness, the nodal line, is apparent in the forewing, belonged to the Cicadoidea. Furthermore, that their nymphs were subterranean.

In an Appendix, a number of Palaeozoic and Mesozoic Homoptera is listed under the headings of the three remaining superfamilies. The associations claimed with particular superfamilies have been based on a balanced assessment of the venational and texture characteristics discussed in previous pages. It needs to be stressed that in instances where the associations suggested depart from ones that have previously been proposed, that they are to be regarded, at present, as no more than tentative ones and not as firm changes in systematic position.

It has previously been supposed by the present author that the greater proportion of the recorded tegmina of fossil Auchenorhyncha belonged to insects comprised in the Cicadelloidea, and not to the Cercopoidea, as the numbers listed suggest.

Since the apparent predominance of cercopoids in fossil faunas is unexpected, there is a need to seek supporting evidence derived from other sources. The hind wings, unfortunately, seem to fail to furnish any constant differentiating characteristics between representatives of the two superfamilies. This is because although, apparently, the usual condition of the venation of the hind wings of cercopoids is one in which M is single and Cu1

two-branched and cicadellids and eurymelids have a two-branched Media and a single-branched First Cubitus, in the hind wings of both the Hylicidae and the Aetalionidae, these veins are in the same state as the one described for the Cercopoidea.

Nevertheless, if venational trends, as apart from the actual presence or absence of veins, are taken into account, it is possible to use hind wings as indicators of relationships. Thus, for example, in the hind wings of *Scytinoptera reducta* (Martynov) and *Anomalo-scytina metapteryx* Davis (both illustrated in Evans, 1956) while M and Cu1 each has two branches, the branching of M in both wings takes place more distally than that of Cu1. On the basis of a corresponding development in the tegmina of fossil Homoptera, this condition seems to suggest cercopoid, rather than cicadelloid, affinities.

Although cercopoids and cicadelloids resemble each other superficially and share many structural and certain behavioural characteristics, the two superfamilies differ from each other in a very striking fashion. This has to do with their respective degrees of evolutionary activity.

The Cercopoidea are a comparatively stable group of insects, not only in respect to structure, but also because of the apparent absence of readily recognizable groups at different levels of evolutionary development. It is of interest, also, to note in this connection that in spite of the long isolation of the Australian continent that there are, within Australia, no endemic groups of cercopoids with a status higher than that of a genus. This stability suggests that the Cercopoidea achieved evolutionary equilibrium well before the commencement of the Tertiary.

The Cicadelloidea, on the other hand, are far from stable. Not only do many of their structural characteristics occur at different levels of evolutionary development in the various comprised groups, and several inter-tribal sequences may be recognized, but it would seem that a number of tribes, subfamilies and possibly even one family have been differentiated comparatively recently, that is to say during, or since, mid-Mesozoic times.

The variable position of the ocelli in the Cicadelloidea is an example of an unstable morphological feature. It is presumed that the primitive position of the ocelli in the Homoptera generally, will have been a ventral one, and while in some groups of the Cicadelloidea, the ocelli are ventral, in others, they are marginally, or dorsally, situated. In the Cercopoidea and Cicadoidea, on the other hand, the ocelli are invariably situated on the crown of the head and no transitional forms are known.

Then, the fact that some representatives of several groups of the Cicadelloidea, such as the Lampropteridae, Ulopinae and Macropsinae, share many generalized features, suggests that they have a reasonably close degree of relationship with each other. Nevertheless, these groups differ very considerably in their degree of evolutionary stability, since while the Lampropteridae are represented only by relict forms, the two others may well have been ancestral to several of the tribes and subfamilies of other present-day cicadellids (Evans 1946b).

The hypothesis is accordingly presented that during Permian, Triassic and early Jurassic times the Cercopoidea and Cicadoidea were undergoing considerable evolutionary divergence and that, at that time, many diverse groups became differentiated. Some of these, such as the Dysmorphoptilidae and the Ipsviciidae in the Cercopoidea, and the Palaeontinidae in the Cicadoidea will have become extinct by the commencement of, or during, the Cretaceous. Others, which survived into the Cretaceous, will by then have reached a degree of comparative stability, which has subsequently been maintained.

It is assumed, on the other hand, that during Permian and Triassic times, the Cicadelloidea, which may have represented an unimportant part of the Homopterous faunas of the times, were comparatively inactive from the evolutionary point of view and that it was not until the Jurassic that they received an evolutionary impetus which resulted in the proliferation of the numerous and diverse present-day subfamilies and tribes.

Such a hypothesis, as well as explaining the present comparative evolutionary stability of the Cercopoidea and the Cicadoidea, would account also for the retention in some of the

Cicadelloidea of various generalized features which are no longer found in representatives of the other groups.

For example, in ulopids (Cicadellidae) the maxillary plates are not completely fused with the genae, and in the nymphs of some species in the genus *Tartessus* Stål an epistomal suture is retained.

The suggested early-acquired stability of the Cercopoidea and the Cicadoidea may possibly be correlated with the fact that the nymphs of both groups, unlike those of the Cicadelloidea and Fulgoroidea, live in a specialized environment. On the other hand, the late evolutionary radiation of the Cicadelloidea may have an association with adaptive opportunities provided by the change from a gymnosperm to a predominantly angiosperm flora, which took place in mid-Mesozoic times.

So far as the Fulgoroidea are concerned, while they have great stability in cephalic characteristics, the existence of no less than twenty separate families implies a period of former evolutionary diversification. While it is presumed that this will have been well before the commencement of the Tertiary it is not known whether it will have preceded the Jurassic.

The relationships of fossil insects suggested in this paper have been based exclusively on a study of wing venation and texture and so far no attention has been paid to the few well-preserved remains of the other parts of the bodies of fossil Homoptera which have been recorded.

Sufficient remains of two Homoptera have been recorded which have enabled illustrations to be given of complete reconstructions.

One of these insects is *Scytoneura elliptica* Martynov and the other *Permocicada integra* B.-M. (Bekker-Migdisova, 1940, 1948, 1962b).

In the appendix which follows, *S. elliptica* is ascribed to the Cercopoidea and while *P. integra* is not listed, a possibly related species, *Permocicade nigrita*, is included as also belonging to the same superfamily.

The published illustrations of the head of *S. elliptica* in no way suggest an insect with obvious cercopoid affinities. This is because the post-clypeus is shown as not extending as far as the hind margin of the face of the head, as it does in all present-day representatives of this group. The lora, moreover, are not completely laterally differentiated.

On the other hand, in the head of *P. integra*, the post-clypeus, as in Recent cercopoids and cicadas, does extend as far as the hind margin of the face, and the frons is consequently dorsal in position.

In explanation of these anomalies, it is suggested that, just as at the present time, representatives of the Cicadelloidea occur with heads at different degrees of morphological development, so during the presumed corresponding period of cercopoid evolutionary activity, there will likewise have been cercopoids with heads having different structural features. Hence, lack of correspondence of fossil heads with those of Recent forms need not necessarily be an indication of lack of affinity.

Earlier, attention was drawn to the fact that the venation of cicadoids has not changed in essential features since Permian times. Subsequently, it has been shown how, within the several and diverse families of the Cicadelloidea, the position of the initial branching of M in respect to the branching of Cu1 has remained identical in all families. Because of this established stability of venation, it is claimed that clues to relationships based on venation, though sometimes liable to misinterpretation, are nevertheless more dependable by themselves than evidence made available by any other morphological features.

APPENDIX

The list that follows does not purport to include all, or even the greater number, of described Palaeozoic and Mesozoic Homoptera, but only a representative selection. Because, in many instances, of the uncertainty of the limits of genera based solely on wings, generic names, by themselves, have not been used.

Cicadoidea

Permian: *Prosbole reducta* Martynov (1935), *Prosbole similis* B.-M. (1940), *Evanscicada speciosa* (B.-M.) (1961, 1962b).

Triassic: *Fletcheriana triassica* Evans (1956), *Mesogereon superbum* Tillyard (1921).

Jurassic: *Pseudocossus zemcuznikovi* Martynov (1931), *Cicadoprosbole sogutensis* B.-M. (1947).

Cicadelloidea

Triassic: *Mesojassus ipsviciensis* Tillyard (1916), *Mesoscytina australis* Tillyard (1919), *Eurymelidium australe* Tillyard (1919), *Triassoscytinopsis aberrans* Evans (1956), *Hylicella colorata* Evans (1956).

Jurassic: *Archijassus geinitzi* Handlirsch (1906), *Jassites punctatus* Brodie (Handlirsch, 1906), *Permododa membracoides* B.-M. (1961).

Cretaceous: *Mesojassoides gigantea* Oman (1936).

Cercopoidea

Permian: *Scytoneura elliptica* Martynov (B-.M., 1948), *Tychticola longipenna* B.-M. (1952), *Tingiopsis reticulata* B.-M. (1953), *Belmontocarta perfecta* Evans (1958), *Cicadopsis rugospina* B.-M. (1959), *Ingruo lanceolata* B.-M. (1960), *Permocicada nigrita* B.-M. (1961), *Kaltanospes elongata* B.-M. (1961), *Kaltanopsis ornata* B.-M. (1961), *Prosboloneura kondomensis* B.-M. (1961), *Orthoscytina skoki* B.-M. (1961), *Prosbole kaltanica* B.-M. (1961), *Sarbaloptera sarbalensis* B.-M. (1961), *Scytinoptera picturata* B.-M. (1961), *Surijokicixius tomiensis* B.M. (1961).

Triassic: *Chiliocycla scolopoides* Tillyard (1919), *Ipsvicia jonesi* Tillyard (1919), *Permoscarta mitchelli* Tillyard (1919), *Apheloscyta mesocampta* Tillyard (1922), *Permocentrus trivenulata* Tillyard (1926), *Permagra distincta* Evans (1943a), *Permovicia obscura* Evans (1943b), *Stenovicia angustata* Evans (1943b), *Stanleyana pulchra* Evans (1943b), *Palaeovicia incerta* Evans (1943b), *Eoscartoides bryani* Evans (1956), *Dysmorphoptiloides elongata* Evans (1956), *Ipsviciella asiatica* B.-M. (1962b).

Fulgoroidea

Permian: *Permocixiella venosa* B.-M. (1962b).

Jurassic: *Asiocixius fulgoroides* B.-M. (1962b).

Triassic: *Boreocixius sibiricus* B.-M. (1955), *Beaconiella multivenata* Evans (1963b).

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