

The maxillary plate of Homoptera-Auchenorrhyncha

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SYNOPSIS

It is suggested that a sensory structure situated on the maxillary plates of Homoptera may represent a modified maxillary palp. A discussion on the origin of the maxillary plates of Hemiptera is included.

Although there has been more controversy concerning the origin of the mandibular plates, or lora of Homoptera than concerning the maxillary plates, these too, have been the subject of considerable discussion. Recently Matsuda (1965), who has reviewed the findings of embryologists on maxillary plate development, suggested that further study was needed in this field. The homologies of the various parts of the maxilla in different orders of insects are tabled by Matsuda (1965, Table 7), and in the Hemiptera column the maxillary stylet and its lever alone are indicated as being of maxillary origin.

Ferris (1942) wrote that most of the work of the embryologists should bear the warning "Morphologists use this road at their own risk". He added, the intent of comparative morphology should be to trace the threads of continuity throughout the evolution of a group and to relate every structure to the antecedent one from which it evolved. Moreover, unless the evidence is conclusive, it should never be assumed that any structure represented an entirely new development and could not have been derived from a preceding one.

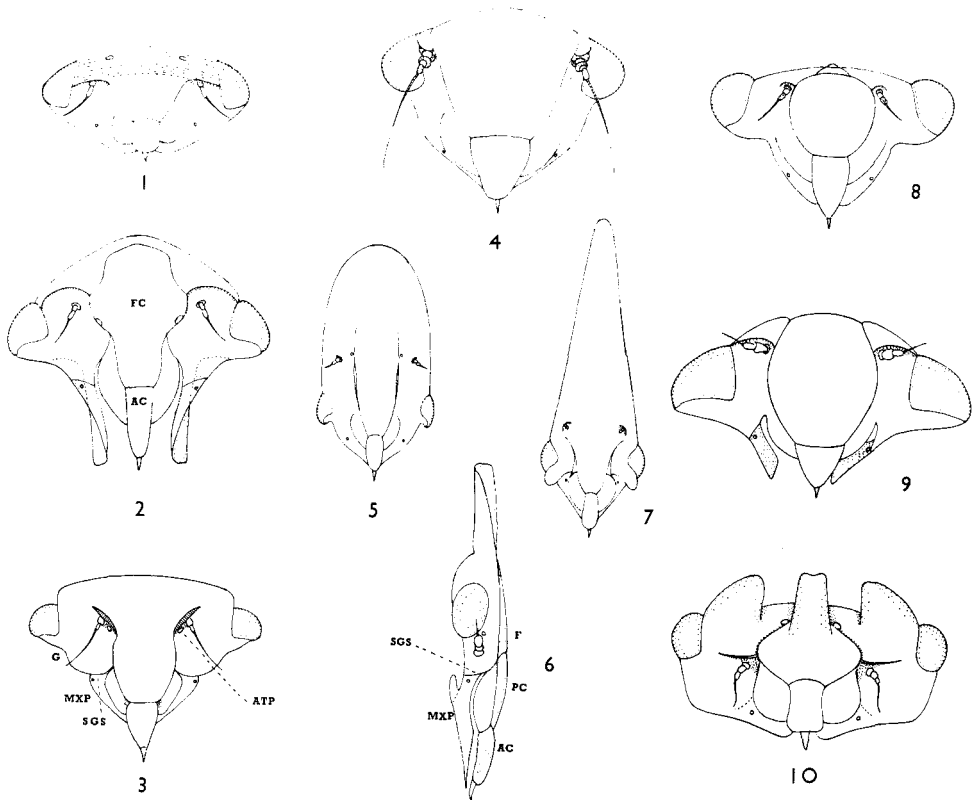
Matsuda (1965), though acknowledging that the evidence provided by embryologists is generally more reliable than the deductions of other investigators, likewise has called for caution in its acceptance. He suggests the structures of Hemiptera can be explained only by tracing a series of changes through the Orthoptera-Psocoptera-Thysanoptera-Hemiptera series.

The findings of embryologists, as well as being sometimes suspect, may also be inconsistent. Thus, as a result of her embryological studies of the heads of Hemiptera, Parsons (1964), suggested that the views of Heymons (1899) and Muir & Kershaw (1911) on the origin of the maxillary plates should be discarded. These authors found the plates arose from a fusion of the outer lobe of the maxillary appendage with the sides of the cranium. Parsons, on the other hand, regards them as non-appendicular parietal lobes.

A sensory pit containing a palp-like process occurs on the maxillary plates of many, and possibly most, Homoptera-Auchenorrhyncha. This is illustrated in figures 14 and 15 which show part of the head of a *Macropsis* sp. (Cicadellidae). It is suggested that the

finger-like lobe contained in the pit, rather than being a new structure peculiar to Hemiptera, may represent a reduced and modified maxillary palp.

In most Auchenorrhyncha, the maxillary plates are continuous with the genae as illustrated in figures 1, 4, 5, and 8. In others, the genae are separated from the maxillary plates by a transverse thickening of the cranial wall, and, following Kramer (1950) I have previously suggested this may represent the subgenal suture (Evans, 1968). Some



Figs. 1-10. Heads of: (1) *Trocnada dorsigera* Walker, (Cicadellidae); (2) *Stenocotis depressa* (Walker), (Cicadellidae); (3) *Monteithia anomola* Evans, (Cicadellidae); (4) *Cicadella spectra* (Distant), (Cicadellidae); (5) *Ledropsis crocina* Distant, (Cicadellidae); (6) *Scolops pungens* Germar, (Fulgoridae); (7) *Cephaleus punctatus* Evans, (Cicadellidae); (8) *Parnkalla muelleri* (Distant), (Cicadidae); (9) *Chaetophyes compacta* (Walker), (Machaerotidae); (10) *Cornutipo tricornis* (Evans), (Eurymelidae). *AC*, anteclypeus; *ATP*, anterior tentorial pit; *F*, frons; *FC*, frontoclypeus; *MXP*, maxillary plate; *PC*, postclypeus; *SGS*, subgenal suture.

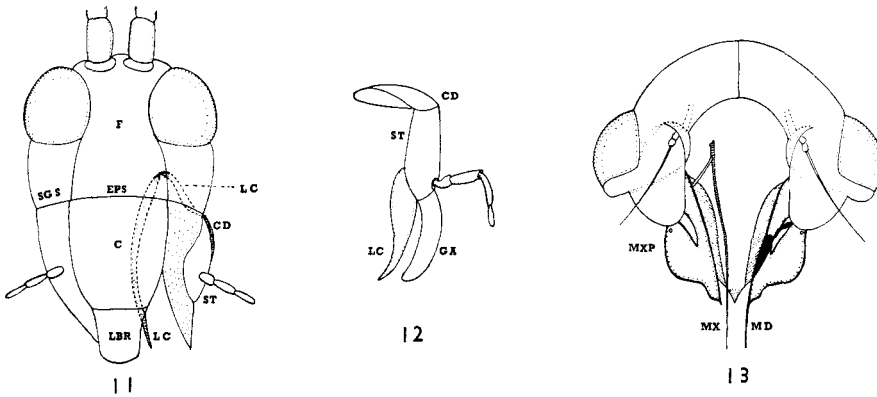
heads in which a presumed subgenal suture is retained are illustrated in figures 2, 3, 6, 7, 9 and 10.

If, as is generally supposed, the Thysanoptera form part of the same evolutionary complex as the Hemiptera, then it seems reasonable to suppose that the transformation of part of the maxilla into a piercing organ has followed similar lines in both orders. Although all recent Thysanoptera have a single mandibular stylet, and consequently

their heads are asymmetrical, they must have been derived from insects with paired mandibles and bisymmetrical heads.

Figure 11 represents the head of a hypothetical Protothysanopteran from which the labium has been omitted, this reconstruction is based on Matsuda (1965, figures 17B and C, and 55B). Figure 12 represents a generalised insect maxilla. According to this author in *Aeliothrops* a well formed maxillary cardo is articulated with the head capsule and is attached to the subgenal suture, while the lacinia, which consists of the stylet and its lever, arises from the dorsal margin of the stipes. The galea in Thysanoptera is unrecognizable.

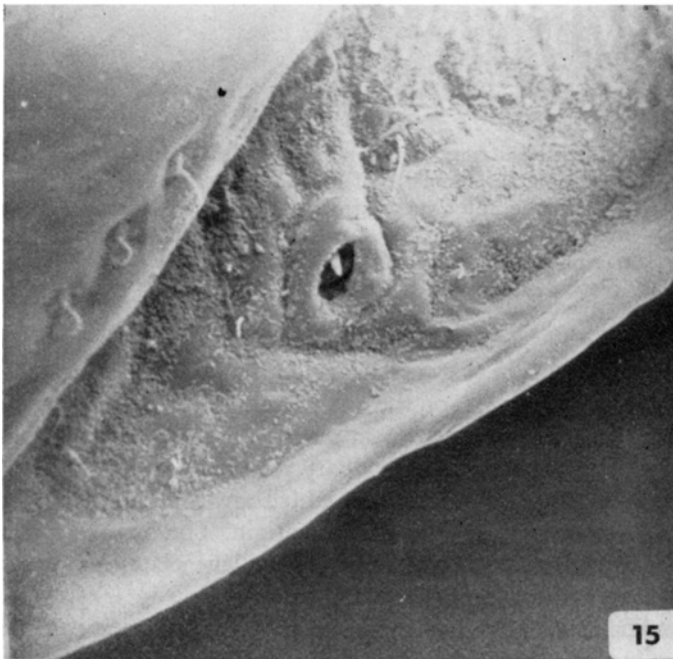
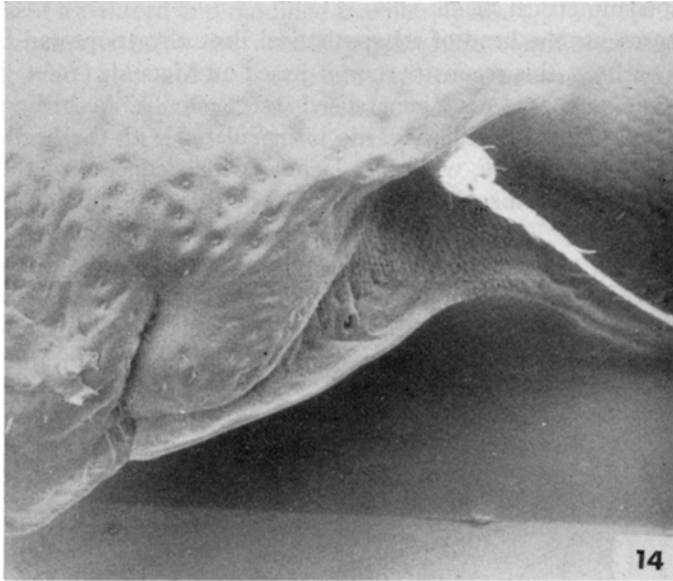
If, for the purpose of discussion, it is accepted that the sense organ of Homoptera, situated on the maxillary plate, is homologous with the maxillary palp, then that part of the plate on which it is situated must be derived from the stipes. It is not unknown in Insecta for the maxillary palp to be situated on the hind margin of an extensive stipes



Figs. 11-13. (11) Reconstruction of the head, with the labium omitted, of a protothysanopteran. (12) A generalised maxilla of a mandibulate insect. (13) Head of *Austrolopa brunensis* (Cicadellidae), the anteclypeus, frontoclypeus, lora and dorsal surface of the hypopharynx, removed. *C*, clypeus; *CD*, cardo; *EPS*, epistomal suture; *F*, frons; *GA*, galea; *LBR*, labrum; *LC*, lacinia; *MD*, mandibular stylet; *MX*, maxillary stylet; *MXP*, maxillary plates; *SGS*, subgenal suture; *ST*, stipes.

and for the galea to be lacking (e.g. see Matsuda, fig. 109B), hence the maxillary plate may be entirely of stipal origin. As, on the other hand, in the Psocoptera the galea is fused with the stipes, the maxillary plate of Hemiptera could also consist largely of the galea. Further, as in the Thysanoptera the maxillary levers are attached to the stipes, those parts of the maxillary plates of Homoptera which are concealed, and lie alongside the arms of the hypopharynx, may also be of stipal origin. The head of a cicadellid (*Austrolopa brunensis* Evans, Ulopinae) in which the maxillary plates are completely exposed is illustrated in figure 13 for comparison with figure 11.

Possible homologies such as are discussed above are mere speculation and all it is wished to suggest in this paper is that the maxillary plates of Hemiptera, in their entirety, may be of maxillary origin, on the grounds that they bear sense organs which possibly are modified maxillary palps.



Figs. 14-15. (14) Part of the face of the head of a *Macropsis* sp., (Cicadellidae) $\times 130$.
(15) The same, $\times 650$.

Thanks are expressed to Professor H.E.Hinton for taking the scanning electron micrographs reproduced in figures 14 and 15. Also to my wife, for assistance in the preparation of illustrations.

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