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The hindwing venation and its taxonomic value in *Dinidoridae* (*Hemiptera*: *Heteroptera*)

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ABSTRACT. The hindwing venation in eight genera of *Dinidoridae* (*Dinidorinae* and *Megymeninae*) is studied and compared with the same character in other *Pentatomoidea* (*Pentatomidae*, *Tessaratomidae*). Five types of venational pattern are recognised, and the taxonomic value of the hindwing venation in *Dinidoridae* is briefly discussed.

Key words: Entomology, morphology, hindwing venation, *Hemiptera*, *Heteroptera*, *Dinidoridae*.

INTRODUCTION

Hind wings in *Heteroptera* are all rather similar, and often show convergence (BETTS 1986). Nevertheless, some characters, especially those concerning the venation, were used in the taxonomy of several high-level taxa, namely *Piesmatidae* (DRAKE & DAVIS 1958), *Lygaeidae* (SLATER & HARLBUTT 1957), *Reduvioidea* (USINGER 1943; DAVIS 1961).

Among the *Pentatomoidea*, FROESCHNER (1960) put to use the hindwing venation as a character supporting the division of the family *Cydnidae* into five subfamilies. Unfortunately in most of pentatomoid families studies on the wing venation were almost totally neglected. Usually, the venation of one species was treated as generally applying to the whole family. It was also the case in *Dinidoridae*. The first and only known character in the hindwing venation of *Dinidoridae* ("hind wings with the primary and subtended veins widely spaced at base converging at apex") was given by STÅL (1870). It was treated as a very important character to recognise the family within the *Pentatomoidea*, and then was repeated by subsequent authors without any comments in descriptions and keys (SCHOUTEDEN 1913; DURAI 1987).

The aim of the present study was to present the types of venation found in different genera of *Dinidoridae*, and verify, if this hitherto generally accepted rule concerning the venation of hindwings was true.

MATERIAL AND METHODS

Representatives of eight genera of *Dinidoridae* (out of total 15) were used to present the types of venation in the hindwing. Altogether, 21 species were studied, as follows: *Dinidorinae*: *Thalmini*: *Thalma secunda* LIS & KOCOREK; *Dinidorinae*: *Dinidorini*: *Dinidor rufocinctus* (STÅL), *Colpoproctus pullus* (STÅL), *Cyclopelta obscura* (Lepeletier et Serville), *C. funebris* (Fabricius), *Coridiellus patruelis* (STÅL), *C. figlinus* (DISTANT), *Coridius nubilus* (WESTWOOD), *C. kerzhneri* LIS, *C. lividus* (DISTANT), *C. fuscus* (WESTWOOD), *C. cuprifer* (WESTWOOD), *C. chinensis* (DALLAS), *C. viduatus* (FABRICIUS), *C. putoni* (BOLIVAR), *C. remipes* (STÅL); *Megymeninae*: *Megymenini*: *Megymenum dentatum* GUÉRIN, *M. spinosum* (BURMEISTER), *M. brevicorne* (FABRICIUS), *Byrsodepsus sundanus* BREDDIN; *Megymeninae*: *Eumenotini*: *Eumenotes obscura* (WESTWOOD).

Additionally, the hind wing venation of representatives of two closely allied pentatomoid families, i.e. *Pentatomidae* (*Palomena prasina* (LINNAEUS), *Carpocoris fuscispinus* BOHEMAN), and *Tessaratomidae* (*Tessaratoma papillosa* (DRURY), *Eusthenus cupreus* (WESTWOOD)) was studied in order to compare characters in certain genera of *Dinidoridae* to those occurring in other pentatomoid families.

The wing morphology was studied under the standard optical equipment (Olympus SZH-10). The hindwing of *Dinidor* sp. was used as a model for the veins terminology (fig. 1), which follows WOTTON & BETTS (1986).

All the specimens (except the holotype of *Thalma secunda* LIS & KOCOREK, that is preserved in Muséum National d'Histoire Naturelle in Paris, France) are kept in the collection of the Department of Zoology, University of Opole, Poland.

RESULTS

The following characters of hindwing venation were used to present the venation pattern in the studied genera; these were also used to find affinities between certain taxa:

1. presence or absence of hamus;
2. distance between Sc+R and aCu;
3. shape of radial cell;
4. shape of R;
5. distance between apices of R and M;
6. shape of aCu in its apical part;
7. presence or absence of pCu;
8. presence or absence of interclaval veins;

9. length of anal veins - 1A, 2A, 3A;
10. maximal distance between R and M in comparison to that between M and aCu;
11. presence or absence of additional cross-veins.

Dinidorinae: *Thalmini*

Thalma WALK. (fig. 2) - Hamus present; Sc+R and aCu closest at the base; radial cell broad; R almost straight; apices of R and M distant, but M apically slightly recurved towards R; apical part of aCu almost straight; pCu absent; interclaval veins very long; 1A very long, 2A as long as 3A, both veins shorter than 1A; maximal distance between R and M almost the same as that between M and aCu; additional cross-veins absent.

Material examined: *Thalma secunda* LIS & KOCOREK, holotype, New Guinea.

Dinidorinae: *Dinidorini*

Dinidor LATR. (fig. 1) - Hamus absent; Sc+R and aCu closest at the base; radial cell broad; R almost straight; apices of R and M distant, but M apically distinctly recurved towards R; apical part of aCu strongly recurved and connected to M; pCu present; interclaval veins very long; 1A very long, 2A almost as long as 3A, both veins distinctly shorter than 1A; maximal distance between R and M a half of that between M and aCu; additional cross-veins absent.

Material examined: *Dinidor rufocinctus* (STÅL), 2 ex., Chiriqui.

Colpoproctus STÅL (fig. 3) - Hamus absent; Sc+R and aCu parallel, close to each other; radial cell narrow; R concave in the apical third; apices of R and M distant, almost straight; apical part of aCu recurved towards M; pCu absent; interclaval veins absent; 1A very long, 2A almost as long as 3A, both veins distinctly shorter than 1A; maximal distance between R and M only slightly shorter than that between M and aCu; additional cross-veins absent.

Material examined: *Colpoproctus pullus* (STÅL), 1 ex., Tanzania, Amani.

Cyclopelta AM. et SERV. (figs. 4 & 5) - Hamus absent; Sc+R and aCu parallel, close to each other; radial cell narrow; R slightly convex; apices of R and M distant, straight and parallel to each other; apical part of aCu recurved towards M; pCu present; interclaval veins present, moderately long; 1A very long, 2A as long as 3A, both veins shorter than 1A; maximal distance between R and M a half of that between M and aCu; additional cross-veins arising from M found in one wing of *C. obscura*.

Material examined: *Cyclopelta obscura* (LEP. et SERV.), 2 ex., Indonesia, Sumatra; *C. funebris* (F.), 1 ex., Tanzania, Dar-es-Salaam.

Coridiellus LIS (figs. 6) - Hamus absent; Sc+R and aCu almost parallel and close to each other; radial cell narrow; R concave medially; apices of R and M close to each other; apical part of aCu strongly recurved towards M; pCu present; interclaval veins present, long; 1A very long, 2A almost as long as 3A, both veins shorter than 1A; maximal distance between R and M about a half of that between M and aCu; additional cross-veins found in one wing arising from M.

Material examined: *Coridiellus patruelis* (STÅL), 1 ex., Tanzania, Uhehe-Iringa; *C. figlinus* (DIST.), 1 ex., Nyassa Lake.

Coridius ILLIGER (figs. 7-11) - Hamus absent; Sc+R and aCu diverging from base; radial cell very narrow basaly, broadening towards a cross-vein; R concave medially; apices of R and M close to each other; apical part of aCu strongly recurved towards M; pCu present; interclaval veins present, long; 1A very long, 2A almost as long as 3A, both veins shorter than 1A; maximal distance between R and M about a half of that between M and aCu; additional cross-veins found in few specimens (arising from R, M, aCu), but always asymmetrical and forming no stable pattern.

Material examined: *Coridius nubilus* (WESTW.), 3 ex., Rhodesia, Broken-Hill; *C. kerzhneri* LIS, 1 ex., Togo, Bismarckburg; *C. lividus* (DIST.), 1 ex., Chinchoxo; *C. fuscus* (WESTW.), 1 ex., Indonesia, Java, Tengger Mts; *C. cuprifer* (WESTW.), 1 ex., Cameroon, Johan-Albrechtshöhe; *C. chinensis* (DALL.), 1 ex., Taiwan; *C. viduatus* (F.), 1 ex., Tanzania; *C. putoni* (BOL.), 1 ex., Tanzania, Usambara; *C. remipes* (STÅL), 5 ex., Cameroon, Bipindi.

Megymeninae: Megymenini

Megymenum GUÉR. (figs. 12-16) - Hamus absent; Sc+R and aCu closest at the base; radial cell narrow, broadening towards a cross-vein; R convex; apices of R and M close (sometimes very) to each other, apex of M bifurcated; apical part of aCu straight, lying far from the apex of M; pCu absent; interclaval veins present, moderately long; 1A very long, 2A as long as 3A, both veins distinctly shorter than 1A; maximal distance between R and M only slightly shorter than that between M and aCu; additional cross-veins numerous, arising mainly from M, R and aCu.

Material examined: *Megymenum dentatum* GUÉR., 2 ex., New Guinea, Stephensort; *M. spinosum* (BURM.), 1 ex., Indonesia, Sumatra, Deli; *M. brevicorne* (F.), 1 ex., Laos, 1 ex., Vietnam, Tonkin, Hajiank.

Byrsodepsus STÅL (fig. 17) - Hamus absent; Sc+R and aCu closest at the base; radial cell narrow, almost parallel; R straight; apices of R and M close to each other; apical part of aCu recurved towards the apex of M; pCu absent; interclaval veins present, moderately long; 1A very long, 2A shorter than 1A, 3A slightly shorter than 2A; maximal distance between R and M almost a half of that between M and aCu; additional cross-veins absent.

Material examined: *Byrsodepsus sundanus* BREDD., Holotype, Indonesia, Sumatra, Soekaranda.

Megymeninae: *Eumenotini*

Eumenotes WESTW. (fig. 18) - Hamus absent; Sc+R and aCu closest at the base; radial cell broadening from base to a cross-vein; R almost straight, only apically slightly recurved towards M; apices of R and M close to each other; apical part of aCu only slightly recurved towards M, but lying far from its apex; pCu absent; interclaval veins present, moderately long; 1A very long, 2A as long as 3A, both distinctly shorter than 1A; maximal distance between R and M more than a half of that between M and aCu; additional cross-veins absent.

Material examined: *Eumenotes obscura* (WESTW.), 1 ex., Indonesia, Sumatra, Soekaranda; 1 ex., Sikkim.

DISCUSSION AND CONCLUSIONS

The results of our study shown that there exists no uniform type of venation pattern of hindwings in the *Dinidoridae*. The characters of the hind wing in this group are somewhat variable and its general pattern of venation is impossible to define.

We also realise that there is a great risk of error and doubtful validity in basing phylogenetic relations on a single-character complex. It may be useful, however, to indicate similarities in venation pattern of the hind wings among certain genera of *Dinidoridae*.

As we conclude from the present study, five different types of venational pattern of the hind wing can be found in *Dinidoridae*.

The first type occurs in the genus *Thalma* (*Dinidorinae*: *Thalmini*); its most distinctive character (not found in other genera of *Dinidoridae*) is the presence of hamus. In respect to this feature the venation is similar to that of representatives of the family *Tessaratomidae* (*Tessaratoma papillosa* (Drury) and *Eusthenus cupreus* (Westw.) - figs. 19 & 20). Literature data show (Froeschner, 1960; Betts, 1986) that among *Pentatomomorpha* the hamus occurs also in *Oncopeltus fasciatus* Dall. (*Lygaeidae*), *Coreus marginatus* (L.) (*Coreidae*), *Alydus calcaratus* (L.) (*Alydidae*), and many *Sehirinae* (*Cydnidae*). As a remnant of M the hamus should be regarded

as a plesiomorphic character. Additionally, the hind wing of *Thalma* lacks the pCu vein and in this character it is similar to *Colpoproctus* and all *Megymeninae*.

The second type was found only in the genus *Dinidor* (*Dinidorinae*: *Dinidorini*). Sc+R and aCu are closest at the base and at the apex, forming very broad radial cell not found in any other studied genera of *Dinidoridae*. The pattern of remaining veins makes *Dinidor* similar to *Coridius*, *Coridiellus* and *Cyclopelta*.

The third type of venational pattern occurs only in the genus *Colpoproctus* (*Dinidoridae*: *Dinidorini*). It is characterised by the absence of both, pCu and interclaval veins; the former represents an apomorphic state, while the latter is plesiomorphic. Such a case is not found in any other studied genus of *Dinidoridae*.

The fourth type was found in *Cyclopelta*, *Coridius* and *Coridiellus* (*Dinidoridae*: *Dinidorini*). The veins Sc+R and aCu are almost parallel and the radial cell is narrow; both, pCu and interclaval veins are present. The presence of pCu is a plesiomorphy, while the presence of interclaval veins is an apomorphic state.

The fifth type occurs in all the studied genera of the subfamily *Megymeninae* (*Megymenum*, *Byrsodepsus* and *Eumenotes*). It is somewhat similar to the preceding type, but differs in lacking the pCu vein. This character represents an apomorphic state.

As can be seen, out of two subfamilies of *Dinidoridae* only the genera representing the subfamily *Megymeninae* have the same type of venation pattern. The genera of *Dinidorinae* have no uniform pattern of hindwing venation.

Nevertheless, all the studied genera of the family *Dinidoridae* have one character of hindwing venation in common - the veins Sc+R and aCu are closest at their bases. This is the only feature distinguishing representatives of the *Dinidoridae* from those of the *Pentatomidae*. In the latter, Sc+R and M are very close to each other from their bases to three fourth of their length (figs. 21 & 22).

REFERENCES

BETTS, C.R., 1986. The comparative morphology of the wings and axillae of selected *Heteroptera*. J. Zool. Lond. (B), **1**: 255-282.

DAVIS, N.T. 1961. Morphology and phylogeny of the *Reduvioidea* (*Hemiptera*: *Heteroptera*). Part II. Wing venation. Ann. Ent. Soc. Amer., **54**: 340-354.

DRAKE, C.J., DAVIS, N.T., 1958. The morphology and systematics of the *Piesmatidae* (*Hemiptera*), with keys to World genera and American species. Ann. Ent. Soc. Amer., **51**: 567-581.

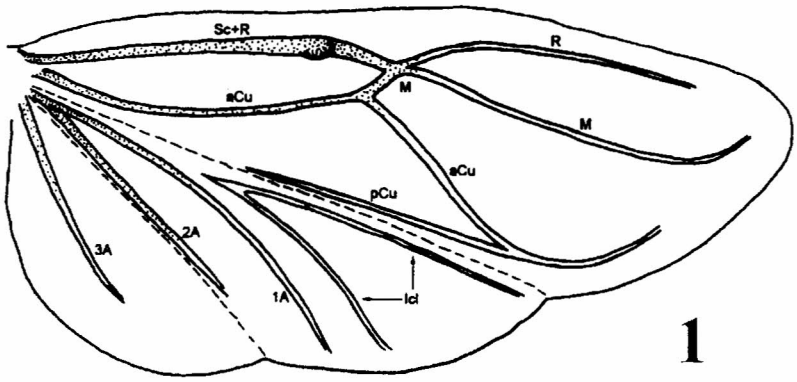
DURAI, P.S.S., 1987. A revision of the *Dinidoridae* of the World (*Heteroptera*, *Pentatomoidea*). Orient. Ins., **21**: 163-360.

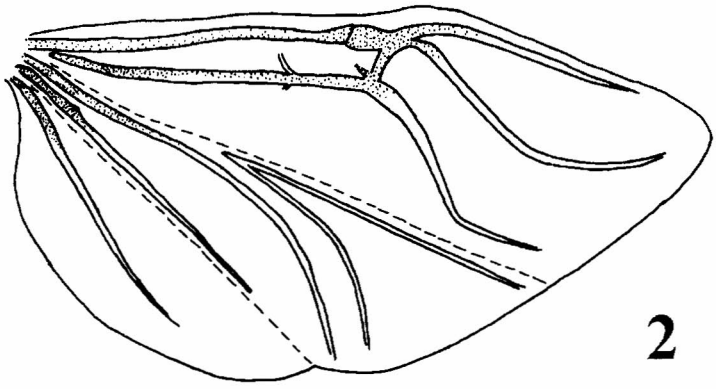
FROESCHNER, R.C., 1960. *Cydnidae* of the Western Hemisphere. Proc. US Nat. Mus., **111**: 337-680.

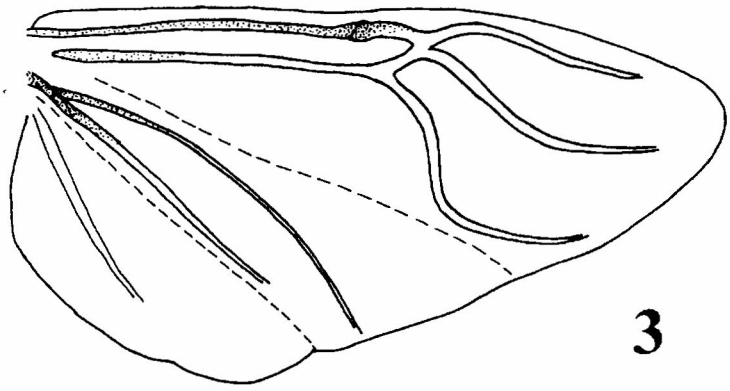
SCHOUTEDEN, H., 1913. Fam. *Pentatomidae*, subfam. *Dinidorinae*. Gen. Ins., **153**: 1-19.

SLATER, J.A., HARLBUTT, H.W., 1957. A comparative study of the metathoracic wing in the family *Lygaeidae*. Proc. Ent. Soc. Wash., **59**: 67-79.

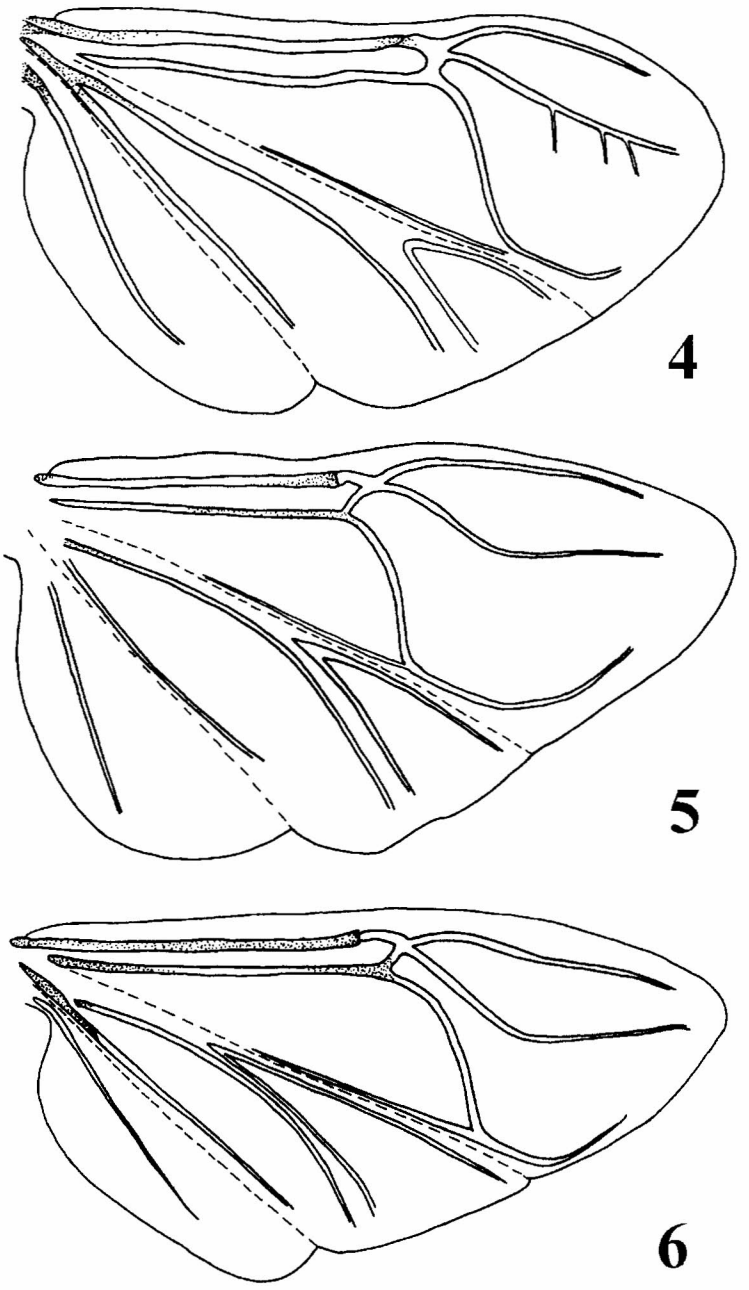
USINGER, R.L., 1943. A revised classification of the *Reduvioidea* with a new subfamily from South America (Hemiptera). Ann. Ent. Soc. Amer., **36**: 602-618.



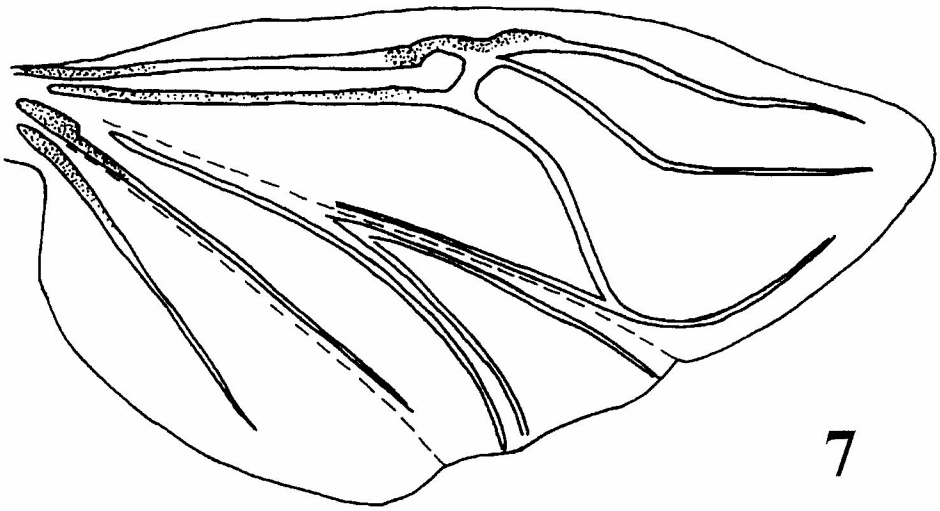


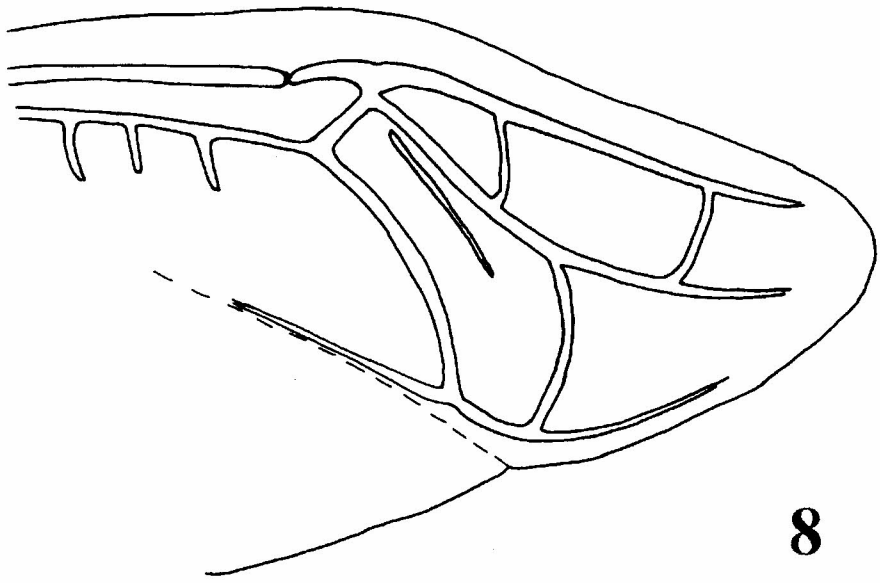


1-3. Hindwing venation: 1. *Dinidor rufocinctus*: Sc - subcostal vein, R - radial vein, M - median vein, aCu - anterior cubital vein, pCu - posterior cubital vein, Icl - interclaval veins, 1A, 2A, 3A - first, second and third anal veins; 2. *Thalma secunda*; 3. *Colpoproctus pullus*

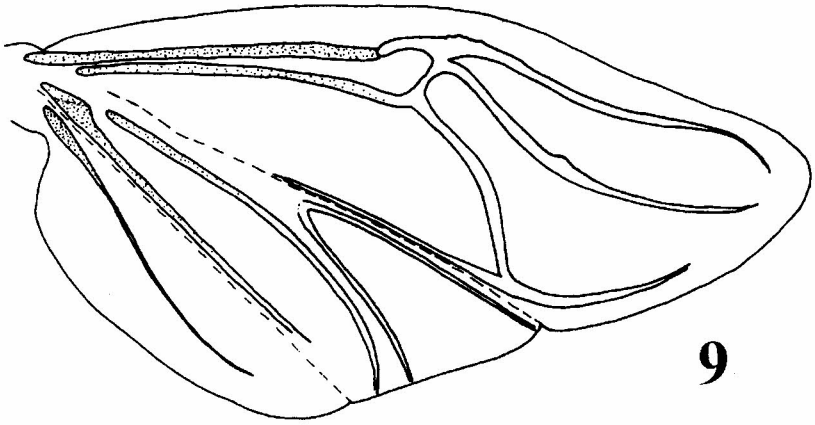


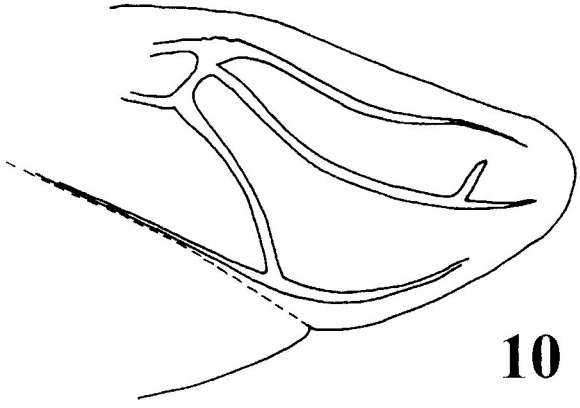
4-6. Hindwing venation: 4. *Cyclopelta obscura*; 5. *Cyclopelta funebris*; 6. *Coridiellus patruelis*

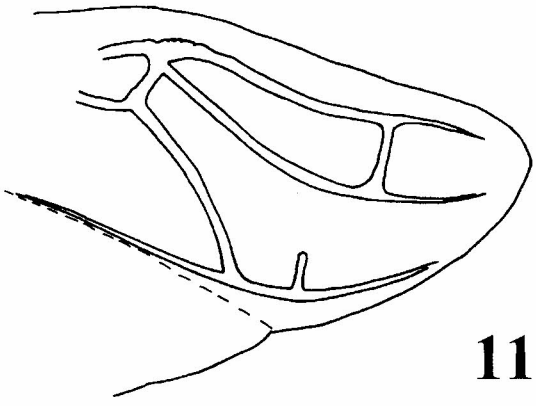




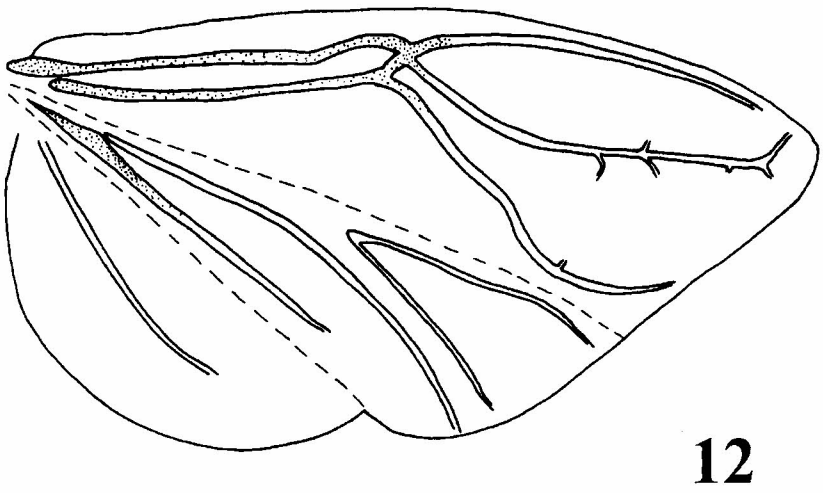
7-8. Hindwing venation:7. *Coridius nubilus*; 8. *Coridius putoni*.







9-11. *Coridius remipes*, hindwing venation.



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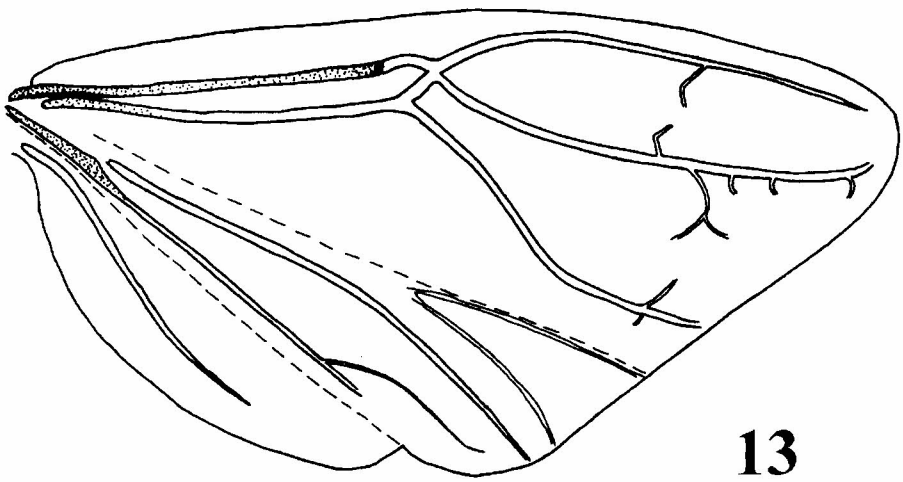

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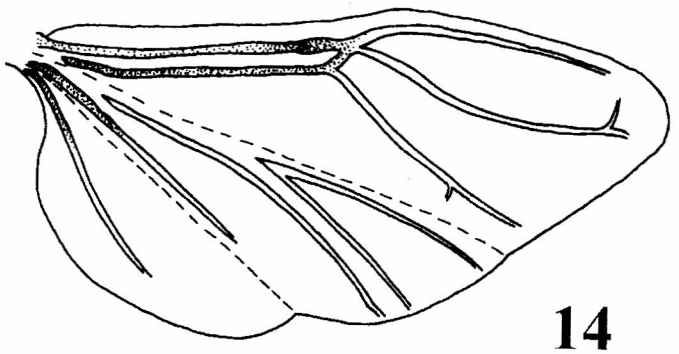
12-13. Hindwing venation: 12. *Megymenum dentatum*; 13. *M. spinosum*.



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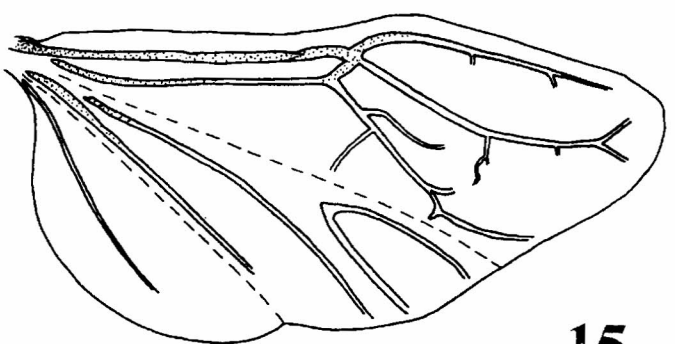

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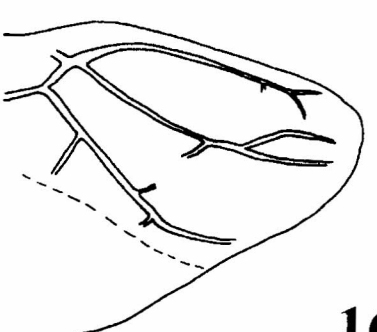

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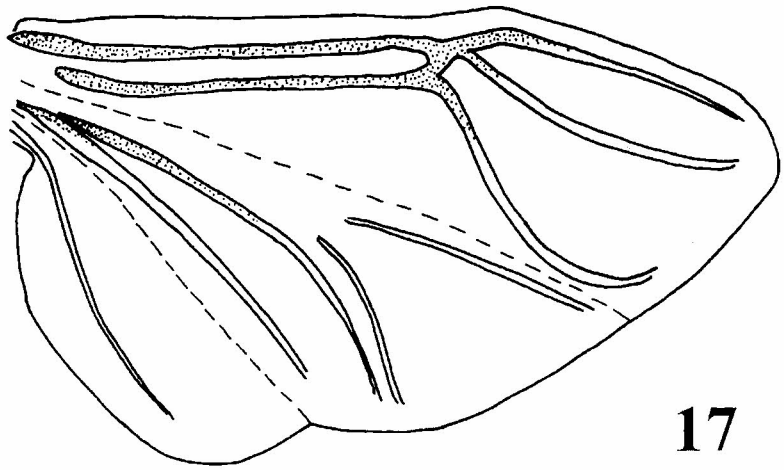
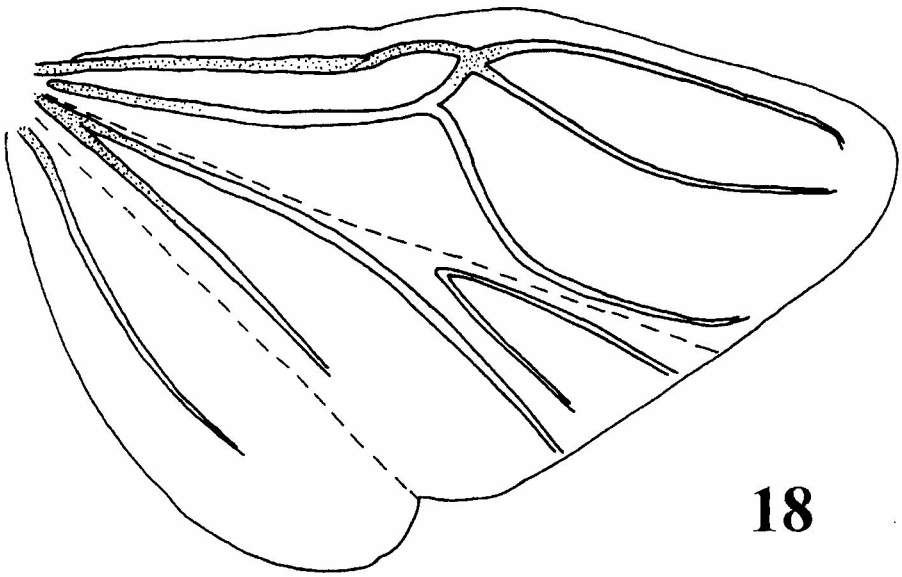
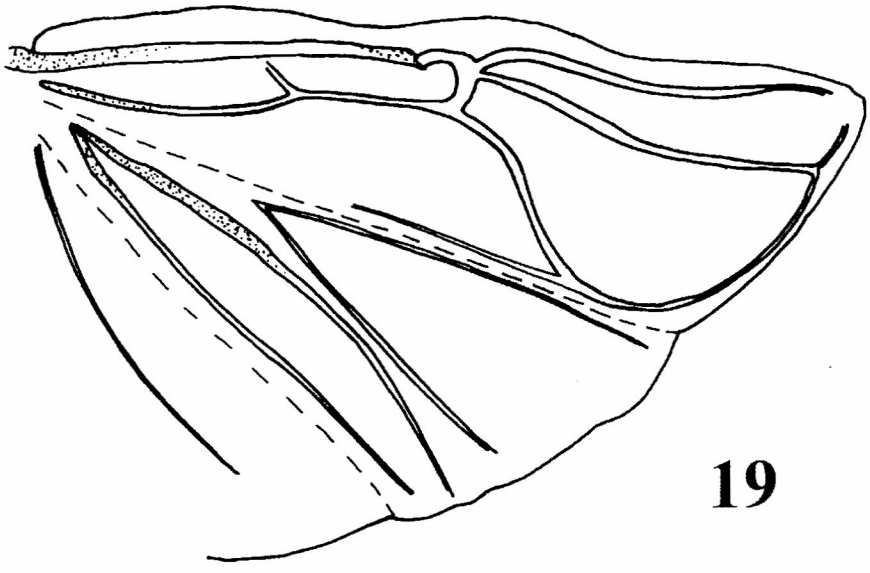
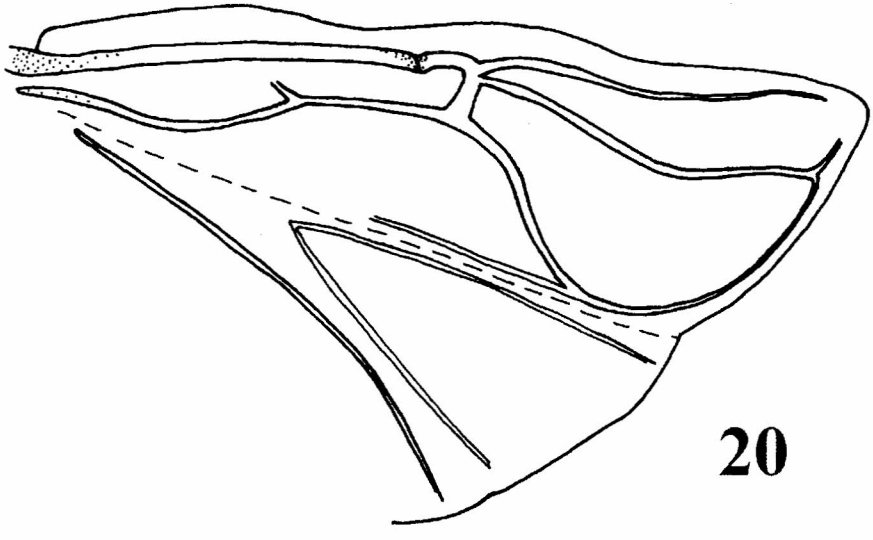
14-16. *Megymenum brevicorne*, hindwing venation.



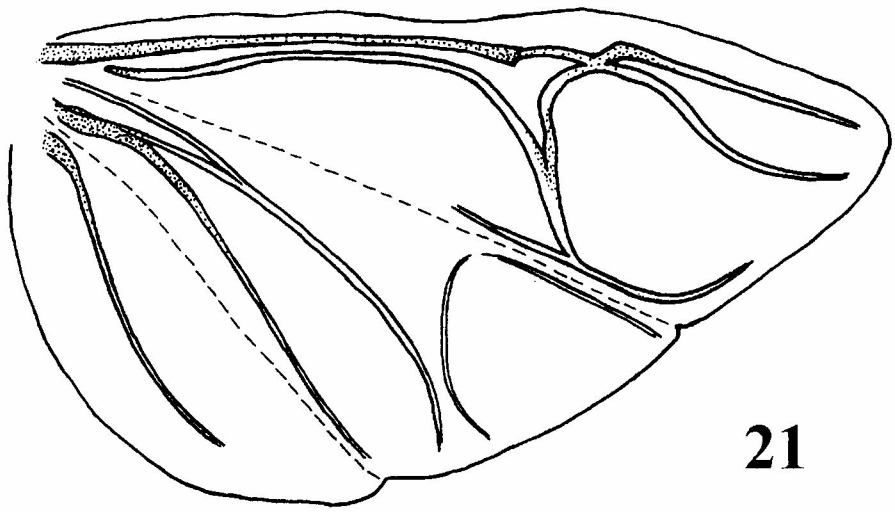


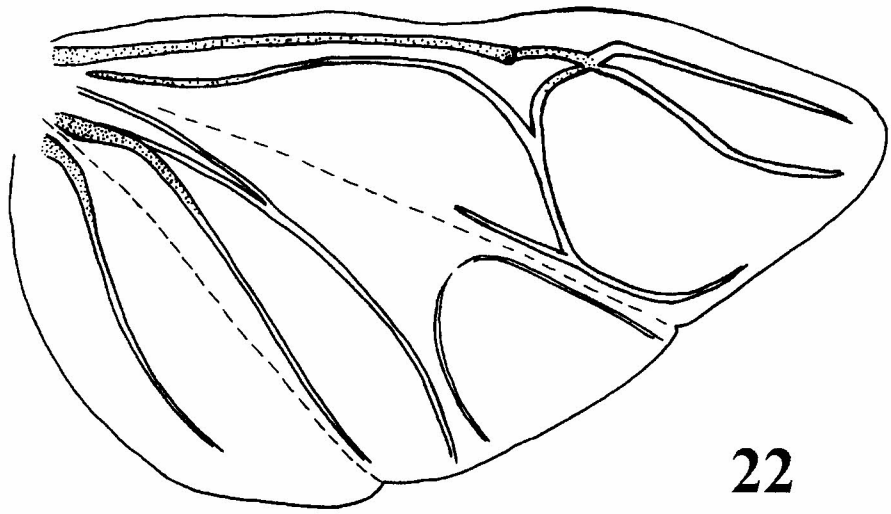
17-18. Hindwing venation: 17. *Byrsodepsus sundanus*; 18. *Eumenotes obscura.*





19-20. Hindwing venation: 19. *Tessaratoma papillosa*; 20. *Eusthenus cupreus*.





21-22. Hindwing venation: 21. *Palomena prasina*; 22. *Carpocoris fuscispinus*.