

Toward the Problem of the Limits and Subdivisions of Achilidae (Homoptera, Cicadina)*

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Abstract. Division of the family Achilidae into subfamilies and tribes is revised. Taxonomic rank of the family Achilixiidae Muir, 1923 is reduced and is included in the Achilidae as 2 subfamilies — Achilixiinae (genus *Achilixius*) and Bebaiotinae (genus *Bebaiotes*). Subfamily Achilidae (Achilidae auct.) is divided into 3 supertribes and 12 tribes, 6 of them new: supertribe Myconites includes tribes Rhotalini Fenn., Myconini trib. n. (Madagascar), Amphignomini trib. n. (Vietnam), and Plecotoderini Fenn.; supertribe Achilites includes tribes Achilini Stål (= Elichopterini Fenn.) and Achillini trib. n. (Guinea); and supertribe Apatesonites includes tribes Saeviini trib. n. (Central and South America) Ilvini trib. n. (South Africa); Apatesonini Metc.; and Tropiphlepsini trib. n. (Australia). Three new monotypic genera with new species are described in the tribe Mycarini (*Mycarus psyche*, *Mycarinus subrubrinervis*, and *Acocarinus punctatus*). *Achilla hecate* sp. n. is described in the tribe Achillini; a new monotypic genus *Amphignoma* in the tribe Amphignomini with the new species *A. corybas*, and a new genus *Phradmonicus* in the tribe Achilini with the new species *P. fennachi* from Mexico. A key to the subfamilies and tribes is given.

Achilidae Stål, 1866 remained undivided for a long time. Only Metcalf (1938) distinguished Apatesoninae and Achilinae. After 12 more years, Fennah (1950) made a thorough revision and divided the family into 7 tribes, but he recognized no subfamilies and thus reduced the rank of Apatesoninae to tribe. Since that time, the system of the family has not been revised. The originator of the modern system of Fulgoroidea, F. Muir (1923) described Achilixiidae, close to Achilidae, and until now, nobody has expressed doubts about its independence, although analysis of the morphology of its representatives show that evidence in favor of its independence are insufficient and that it is more correct to consider it as one of two independent subfamilies within Achilidae.

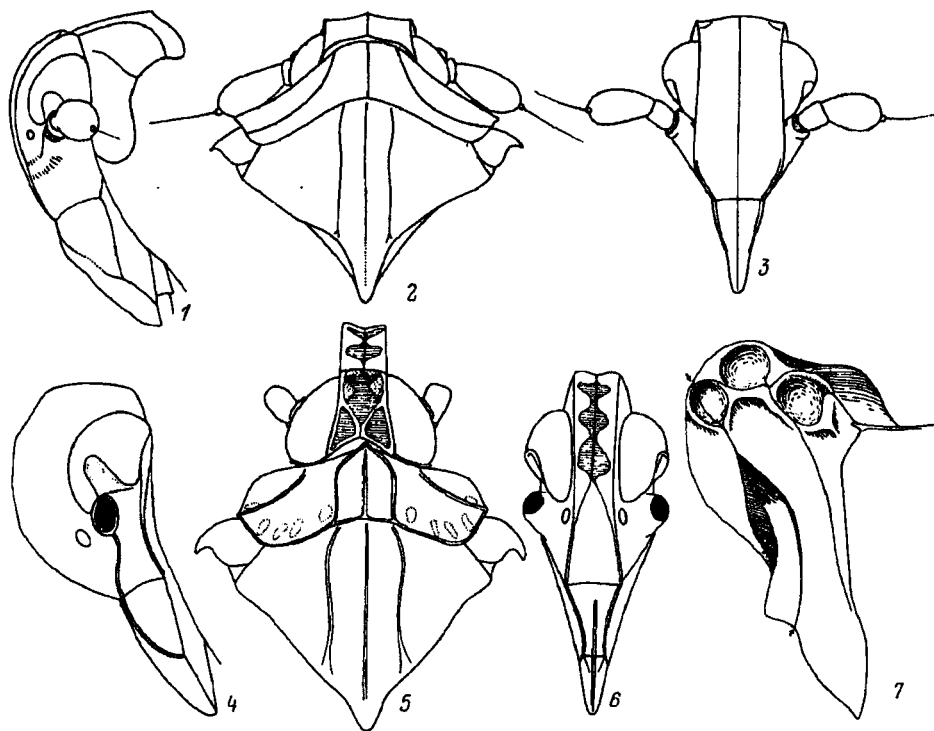
The system of Fennah also needs improvements to correct some obvious errors in the characteristics of the taxa distinguished: For example, Fennah did not pay enough attention to the structure of the hindwings, which led him to erroneous placing of *Cixidia* (= *Epiptera*) in the tribe Myconini. In order to clarify the systematic position of several original representatives of the family, materials obtained from several foreign museums through the kindness of Dr. M. R. Wilson, C. A. B. International Institute of Entomology, London; Dr. P. Lindskog, Swedish Museum of Natural History, Stockholm; and Dr. G. N. Nishida, Bishop Museum, Honolulu, were very important. I am deeply thankful to all of them.

*Originally published in Entomologicheskoye Obozreniye, No. 2, 1991, pp. 373-393.

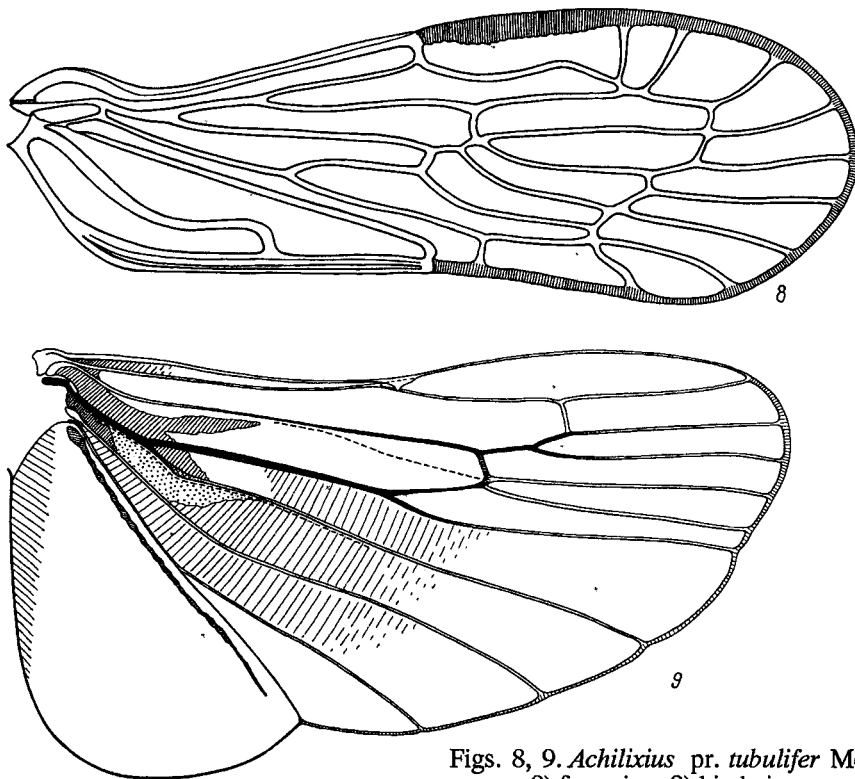
STATUS OF ACHILIXIIDAE MUIR, 1923 AND ITS POSITION IN THE SYSTEM
(Figs. 1-11)

Achilixiidae was separated and established by Muir (1923), initially only to include *Achilixius* Muir, and then with the addition of *Bebaiotes* Muir (1924b). By the main character of venation, the apically truncate clavus, in the apex of which the claval vein enters, both genera are not distinguishable from Achilidae. Muir considered the high tectate folding of wings as not typical of Achilidae, although that is not true because *Tropiphlepsia*, which was described by Muir himself (1924a) and placed in Achilidae, has steep tectate wings. In another important character, long apical segment of the proboscis, both genera of Achilixiidae also do not differ from typical Achilidae. Important evidence in favor of the unity of Achilixiidae, according to Muir, are cylindrical abdominal organs with depressions on their apices. However, these organs have a different structure in *Achilixius* and *Bebaiotes*, and similar (but not homologous) structures are present in *Benna* (+*Bennaria*) and *Bennarella* Muir from Cixiidae; structures in *Benna* are more similar to those in *Achilixius*, and structures in *Bennarella* are similar to those in *Bebaiotes*. These are convergent structures (4 independent cases in 2 families).

Details of the structure of ♂ genitalia are described and portrayed in the work of Muir with insufficient clarity and need to be revised with additional material. In any case, this concerns the structure of ♂ genitalia, characters that are rather variable and difficult to use in the evaluation of higher taxa. Genitalia of species of Achilidae have so far not been investigated.



Figs. 1-7. 1-3) *Achilixius pr. tubulifer* Mel.: 1) anterior part of body in lateral view, 2) anterior part of body in dorsal view, 3) head in anterior view, 4-7) *Bebaiotes bucayensis* Muir: 4) head in lateral view, 5) anterior part of body in lateral view, 6) head in anterior view, 7) lateral part of base of abdomen from left (arrows indicate border of abdominal segments III and IV).

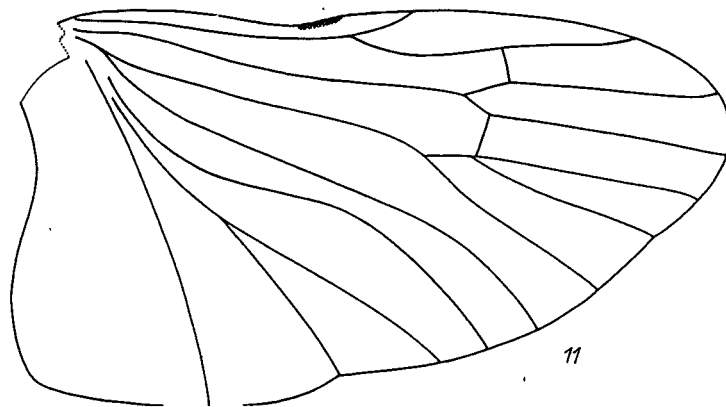
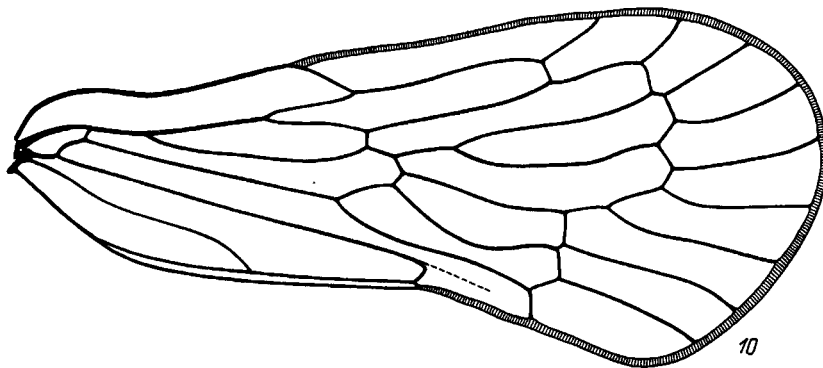


Figs. 8, 9. *Achilixius* pr. *tubulifer* Mel.:
8) forewing, 9) hindwing.

The ♀ genitalia are described only for *Bebaiotes* and in greater details in *Achilixius* (Fennah, 1947; Wilson, 1989), they belong to a nonreduced raking-kneading type, as in typical achilids.

To analyze the status and possible affinity of Achilixiidae, it is necessary to compare, besides Achilidae, Derbidae and Kinnaridae — Meenoplidae. Similar analysis was duly done by Fennah (1947), but he did not doubt the independence of Achilixiidae. General habitus and tectate folding of wings can be considered in favor of its placing in Derbidae. Since Meenoplidae and Kinnaridae have reduced ovipositor developed from the raking-kneading type, it is impossible to exclude that Achilixiidae have the ancestral structure from which Kinnaridae-Meenoplidae originated. Although Derbidae sometimes have the clavus similarly formed to that of the Achilidae (*Derbe*), they still do not have a typical appearance and form on a strongly transformed wing with extended and polymerized veins. A major point is that the proboscis of *Achilixius* is not similar to the proboscis of Derbidae, in which the distal segment is strongly shortened, whereas in *Achilixius* it retains the plesiomorphic condition, being long and not apically truncate. In *Achilixius*, wax glands are absent on tergites V-VII, and the ovipositor not reduced; therefore it cannot belong to Kinnaridae and Meenoplidae.

The external similarity of *Achilixius* to more advanced Meenoplidae is better developed than to Kinnaridae and it is therefore possible to consider that this similarity was formed as a result of parallelism. In *Achilixius*, the general outline of the head is very similar to that in Meenoplidae, but sensory pits are absent and carinae are not high. Such a type of head occurs in some Achilidae. The pronotum of *Achilixius* is long enough, well sclerotized and with distinct carinae, as is typical of Achilidae. The venation of the corium of the forewings is typical of the entire group of families discussed. Absence of distinct vein *R-RA*, not typical of Achilidae, can be considered as a plesio-



Figs. 10, 11. *Bebaiotes bucayonsis* Muir.: 10) forewing, 11) hindwing (latter after Wilson, 1989).

morphy within the Achilidae. The presence of an isolated cubital cell between CuA_1 and CuA_2 is rather a convergence with Meenoplidae-Kinnaridae, even more so because in *Achilixius* it is long and narrow, abruptly truncate with transverse vein apically. In *Achilixius*, transformations of veins in the area of the root of the cubital system in the hindwing (Fig. 9) are peculiar; here the arculus disappeared and the common cubital stem became elongate. Strong shortening of the branch $ScRA_1$ is also unusually strong, almost entirely hidden by the locking bend and differentiated sclerotized plate of the wing shown in Fig. 9.

If we do not consider truncate clavus in Achilixiidae and Achilidae as a convergence, there are no reasons for considering Achilixiidae a separate family, but one that should be merged with the Achilidae as a subfamily. Sensory structures of the abdomen of *Achilixius* are special new formations, bearers of which are usually considered at the rank of tribe (Bennini and Bennarelini), if other peculiar features are also absent, then *Achilixius* differs from Achilidae (i.e., Achilinae) also in the appearance and tectate wings without the reinforcement of veins $R-RA$.

Achilixius Muir and *Bebaiotes* Muir strongly differ from each other in wing venation and structure of abdominal sensory appendages; these are convergent groups that I believe should be included in Achilidae as two distinct subfamilies. In Achilidae, therefore, 2 subfamilies are to be added: Achilixiinae Muir, 1923 and Bebaiotinae subfam. nov.

KEY TO SUBFAMILIES OF ACHILIDAE (= ACHILIXIIDAE)

- 1(4). Abdominal sternites IV-VI separated along meson. Lateral parts of abdominal segments III and V or IV and V with large processes with 1-3 deep apical depressions.
- 2(3). Metopical area strongly compressed laterally. Sharp carina present from antennal base to upper ends of lateral carinae of postclypeus. Nodal vein recurrent. First cubital cell not narrowed distally and limited by normally long transverse vein. Sensory appendages not articulate and not separated, located on segments III and IV and forming single process...
..... **Behaiotinae** subfam. n.
- 3(2). Metopical area of head developed normally, not narrower than coryphal one. Distinct carina absent from antenna to ventral part of lateral carinae, metopa significantly higher than epistomal suture. Nodal vein transverse. First cubital cell distally almost closed, limited by very short transverse vein. Sensory appendages on segment III articulate, on segment V not articulate, separated from segment IV..... **Achilixiinae** Muir, 1923.
- 4(1). Abdominal sternites IV-VI as well as other sternites not separated along meson. Abdomen lacking special structures in pleural area..... **Achilinae** Stål, 1866.

ACHILIXIINAE, Muir, 1923

Description based chiefly on *Achilixius tubulifer* Mel. (Figs. 1-3, 8, 9)

Head of meenoplid type, without border of corypha and metopa, with approximately parallel lateral carinae converging to clypeus below antennae, laterally arcuately convex, in upper part more sharply. Posterolaterally with rather indistinct triangular pits. Ocelli 2. Eyes small, with deep depression ventrally, base of antennae in the depression at 1/2 of length. Below antennal bases, genae slightly swollen, without distinct carina from antennal bases obliquely forward and slightly ventrally, formed by weak bend of lateral surface of head. Postclypeus small, cunate, with 3 carinae, lateral carinae not reaching anteclypeus. Postclypeus with strong medial carina, compressed laterally, high-tectate. Proboscis long, with 2 basal segments, middle segment 1.5 times as long as apical segment, apex of middle segment below hindtrochanters. Antennae of usual size, segment I small, isodiametric, slightly bent upward; segment II swollen basally and becoming cylindrical, twice as thick and 3 times as long as 1st segment, flagellum strictly apical. Pronotum with distinct lateral and discal carinae, disc 1.5 times as long as wide anteriorly, lateral carinae in posterior 1/3 gradually turning posteriorly and continuing parallel to posterior margin as far as upper lateral carinae. Posterior margin sloped, concave in basal part, and almost transversely truncate laterally next to tegulae. Scutellum convex, large, with 3 narrow parallel carinae disappearing in posterior part. Wings as shown in Muir (1922), but his drawing transverse vein posteriorly of the apex of clavus omitted. All veins except *C* and A_1 -*Pcu* + A_1 in cross section roundly protruding, not differentiated, thick, as typical of other Achilidae. Weakened transverse vein continuing to apex of clavus. Legs of moderate proportions, simple. Hindtibia with tooth in distal 1/3 and on knee apex usually with 8 teeth (4+4), on hindtarsi 6+6. Hindcoxae with subuliform, small meracantha well developed.

Forewings (Fig. 8). Crimped margin of wing in stigmal cell slightly dilated as in Cixiidae. Costal vein to nodus with carina, posterior claval vein (A_1 - A_1 +*Pcu*) also with carina. Costal margin subbasally with gradual emargination, leaving space below it for sensory appendages of abdomen. Nodal vein transverse, short. *RA* with 2 apices, often anastomosing with *RP* distally of

branch RA_1 . RP with one apex, except anastomosed sometimes ir of nodal series present. M with 4 ends, MA branching immediately following 1st branching of M at same nodal level, MP in middle part of membrane preceding subapical series of transverse veins rm , im_{1-2} , im_{2-3} , mcu . Anterior cubital fork closed at level of apical mcu , forming isolated cell, oblique transverse vein coming off its apex, dividing postmarginal field of membrane, this possibly being vein CuA_2 , but it is unpigmented, as other undoubtedly transverse veins. Nodal veins mcu present and postclaval vein reaching posterior margin of wing posterior to clavus.

Hindwings (Fig 9). Rather peculiar. Costal in basal half almost straight. Branching of R overlain by coupling, RA , therefore, actually not developed. M with 3 branches in posterior set CuA with 2 endings, separated from MP by short transverse vein. All branches of M and CuA distinctly closer and subparallel. Arculus absent, branching of Cu distant from base of wings. Pcu regular. A_1 with two endings, A_2 closer to A_1 and continuing parallel to it along entire length. Basal part of wings with differentiated characteristic sclerotization of membrane and some veins. Area of basal cell and base of cubital field posterior to it strongly sclerotized, strong veins from M to Pcu , posterior cubital field distally of sclerotized part strongly desclerotized at section near division of cubital stem into primary branches, farther along CuP from this part with posterior cubital suture (fold). Medial fold reaching to soft weakened vein mcu and farther distally not distinct. Part of stem of M , slightly away from base and almost to level of coupling weakened, performing role of fold.

Abdominal tergites rather similar to each other, sternites considerably transformed. Sternite III protruding posteriorly at angle, sternites IV-VI separated in middle, sternite IV narrow and filling in width and length lateral parts of sternite III, sternite V and VI wide. Sternite VII narrow, but long, in sternite VIII of ♂ more or less reduced (not apparent without preparation). Lateral parts of sternite III with fused appendages with 2 very large sensory pits apically. Appendage compressed dorsoventrally, anteriorly and posteriorly with carinae, slightly narrowing toward base. Subbasal emargination of costal margin of forewing leaving space for movement of appendage. Lateral parts of sternite V posteriorly bearing single similar very large sensory pit, elevated on conical process above surface of sternite. Posterior part of sternite VI with shallow but large pit-like depressions.

The lateral abdominal appendages of abdomen of *Achilixius* and *Bebaiotes* are not homologous. In *Achilixius* they are on segments III and V separately, their depressions are strongly enlarged sensory pits. In *Bebaiotes* the appendage is single (Fig. 7), belonging to segments III and IV, the depressions are not sensory pits because they have no setae. Fennah (1947) showed a figure with setae of *Muirilixius guianesus* Fenn. in position characteristic of sensory pits; however, I found no traces of them in type specimens of *Bebaiotes bucayensis* Muir. Moreover, connections between pits are severed. Other characters of these 2 genera are also rather different: shape of head, outline of wings and peculiarities of venational details, and structure of abdominal sclerites. Similarity in the structure of genitalia of ♂s, which Muir (1923) pointed out, is the most significant character which can be taken as synapomorphic; however, in this case convergence cannot be excluded because peculiarities of the structure of genitalia of meenoplidoid type can be explained by reductions.

BEBAIOTINAE Emeljanov, subfam. n.

Description based chiefly on *Bebaiotes bucayensis* Muir (Figs. 4-7, 10, 11).

Habitus of meenoplid or specialized derbid. Wings reach beyond apex of abdomen by half length, abdomen of derbid type, reduced. Head strongly compressed laterally, of derbid type.

Corypha narrow, metopa compressed laterally, narrow, with groove along midline in upper 3/4, moderately widened below eye level to clypeus. Corypha elongate trapezoid, slightly narrowed anteriorly, posterior margin obtusely emarginate, anterior border transverse in form of indistinct smoothed carina. Posterior angle of surface of corypha separated by pair of oblique pits, similar to Meenoplidae. Narrowed preocular part of metopa with 3 dark rounded depressions one above the other, each occupying entire width of metopa. Each pit is probably a result of fusion of depression of pair of larval sensory pits. Ventral wide part of metopa even, without medial carina and traces of unpaired ocellus, clypeal border of depression straight. Head with broad pre- and supraocular areas, genae also broad, crossed by distinct subantennal carina, as in Delphacidae. Lateral ocelli large, anterior to antennal bases, at distance of one ocellus diameter from eye margin. Frons and vertex in profile rounded, metopa bent evenly, corypha bent slightly less and connected by indistinct angle with metopa. Clypeus small, generally tectate, with strong medial carina, lateral carinae of postclypeus ventrally arcuate, along lower border of frenulum. Distinct carina continuing from dorsoposterior angle of frenula marking lateroposterior margin of head. Antennae small, with 2 basal segments cylindrical, each (scape and pedicel) approximately twice as long as wide, directed obliquely upward and laterally. Eyes with deep emargination above bases of antennae, occupied by elevated callus. Proboscis with basal segment divided as in Cixiidae; relatively thin and long, reaching beyond hindcoxae by 1/2 of length of apical segment. Pronotum with well separated disc, with strong carinae, including medial and anterior carinae, lateral carinae developed incompletely, extending to posterior margin, approximately parallel. Lateral parts of dorsum posteriorly with 4 calli dividing indistinct depressions at site of 5 larval sensory pits, preocular carina substituted by groove, postocular area broad, lateral of pronotal dorsum not high, uneven, other carinae absent. Anterior part of disc protruding at obtuse angle, posterior margin of dorsum arcuately concave. Scutellum with 3 parallel carinae, lateral carinae slightly farther apart than those on pronotum. Forelegs and midlegs thin, of medium length. Hindtibia with two lateral teeth: one near knee and second distant at 2/3 of length from base of tibia. Apex of hindtibia with 2+7 teeth, distal group consisting of large teeth of distal row and small teeth of proximal row, smaller teeth 3, alternate with distal teeth, but lacking between two marginal teeth of 2nd row. Pentate carina continuing onto marginal tooth. Hindtarsus with 6 teeth on basitarsus, 5 on mesotarsus. Basitarsus and less distinctly mesotarsus in section approximately pentagonal, lower rows extending onto premarginal teeth, lateral rows continuing onto marginal teeth.

Forewings (Fig. 10). Outlines of forewing of moderately developed derbid type, elongate, with widened membrane occupying 1/2 of total length of wing, and with obliquely truncate terminal margin. Weakened peripheral vein with transverse incisions, continuing from recurrent vein *ScR*₁ to apex of clavus. Strongly obliquely tilted recurrent vein *ScR*₁ a peculiar feature of *Bebaiotinae* (*Bebaiotes*, *Muirilixius*). *RA* and *RP* simple, not branching. *Media* with 3-ended anterior branch (*MA*), forming anterior comb, and 2-branched posterior branch. *R* and *M* divided at considerable distance from wing base, arculus on dry specimens not visible, but judging by deep depression, which may be considered basal cell, it may be that branching takes place at same distance from basal cell as its length. Basal cell narrow, elongate. *R* (beginning at base of wing as *ScRM*) strongest vein, posterior to branching, *RP* next strongest, but on approaching membrane soon becoming weaker to level of other veins (a character of Achilidae). In Meenoplidae, Kinnaridae, and Derbidae, differentiation of branches of *R* by degree of development is absent, as in Cixiidae. *CuA* with 2 tips, with characteristic "achilid" bend after branching in area of clavus (bend occurring also in other families). Characteristic transverse vein, reaching posterior margin of membrane, slightly slanted forward (i.e., not recurrent, but quite otherwise). Clavus with sharply truncate apex, posterior margin (apex) forming strong, evenly extended angle with *CuP*. *Pcu* and *A*₁ fused near middle of clavus. Vein *A*₁ and further *A*₁+*Pcu* considerably better developed than adjacent one, forming carina along with clavus divides into dorsal and lateral parts. Hindwing model is shown in Wilson (1989), area of wing root with basal cell, position of coupling, folds, and thickness of veins not shown. General outline of wing and drawing of veins completely of achilid type,

only distal part of costal area (beyond coupling) relatively short, a condition which occurs only in Plectoderini.

Abdomen relatively short. Segments III and IV laterally, at border of tergite and sternite together suddenly modified, hypertrophied lipwise, and bearing 3 deep, large pits (Fig. 7). Costal margin of forewing slightly concave and at rest folded into cavity tergite and pit bearing segment. Without maceration and preparation relationships among parts of tergites and sternites cannot be precisely determined. Posterior margin of segment III crossing anterior pit. Metcalf's drawing adequate, but the border of segments is not shown. It is clear that these are not sensory pits. Abdominal sternites IV-VI separated mesally, but more or less retain homogeneity.

ACHILINAE Stål. 1866

KEY TO TRIBES OF ACHILINAE

- 1(16). Wings at rest folded flat, membranes overlapping. Hindwings with median vein coming off basal cell as common stem although independent, but contiguous to radial stem, or arculus absent and basal cell not separated.
- 2(13). Second anal vein of hindwing simple, more or less straight, mostly not reaching wing margin by considerable distance and apically slightly dilated. — Supertribe Myconites supertrib. n.
- 3(4). Hindtibia with more than 3 lateral teeth (5-7); metopa dorsally with intermediate carinae distinct. Disc of pronotum angularly protruding far forward, covering long slanted occiput **Rhotalini** Fennah, 1950
- 4(3). Hindtibia with no more than 3 lateral teeth; no traces of intermediate carinae on metopa.
- 5(10). Hindtibia with 3, rarely with 2 lateral teeth, but then, knee tooth always developed. Hindwings with medial fold not running into cubital area.
- 6(9). Subantennal carinae absent. Lateral carinae of postclypeus incompletely developed. Hindwings with medial fold crossing transverse vein *mcu* and continuing to margin of wing; arculus developed.
- 7(8). Median view of forewing with 6 branches. Anterior cubitus with 4-5 branches. Membrane in lateroposterior cubital area with 1-2 accessory transverse veins. Lateral carinae of postclypeus not continuing onto anteclypeus. Hindwings with *R* separating from *M* distally of arculus..... **Myconini** Fennah, 1950.
- 8(7). Median vein of forewing with no more than 4 ends. Anterior cubitus with 2 ends. Postmarginal cubital area with only main transverse vein. Lateral carinae of clypeus distinctly converge cuneately on anteclypeus. Hindwings with *R* separating from *M* before arculus. **Mycarini** trib. n.
- 9(6). Subantennal carina developed. Lateral carinae of postclypeus not reaching anteclypeus. Hindwings with medial fold not crossing line of transverse veins, arculus not developed. **Amphignomini** trib. n.
- 10(5). Hindtibia with 1-3 teeth, but in any case knee tooth absent. Hindwings with medial fold preceding vein branches of *mcu*, forming second branch preceding vein *CuA*₂.

- 11(12). Hindtibia with 3 lateral teeth. Second anal vein of hindwing reaching wing margin. Forewing with extravenal pterostigma, limited posteriorly by stout vein **Breddiniolini** Fennah, 1950.
- 12(11). Hindtibia with 1, rare with 2 lateral teeth. Second anal vein of hindwing far from reaching posterior wing margin. Forewing without extravenal pterostigma and without stout peripheral vein..... **Plectoderini** Fennah, 1950.
- 13(2). First anal vein of hindwing subbasally or in middle part forming branch entering anojugal process and anastomosing with second anal vein — *Achilites* supertrib. n.
- 14(15). Proboscis long, extended, reaching hindcoxae. Precostal carina of forewing narrow. No branch of anal system in hindwing crossing second anal fold..... **Achilini** Stål, 1866 (*Alidipterini* Fennah, 1950).
- 15(14). Proboscis short, not reaching apices of forecoxae, apical segment considerably shorter than wide. Basal part of forewing with narrow precostal area developed. Posterior branch of anal system in hindwing crossing second anal fold..... **Achilini** trib. n.
- 16(1). Wings at rest tectately folded, membranes overlapping or contiguous with their proximal (ventral) sides. Hindwing with *M* separated from *R* basally of arculus, at point of connection to arculus *M* far distant from *R* — at 1/2 or entire length of arculus — *Apatesonites* supertrib. n.
- 17(20). Forewing with convex costal margin in basal part, at rest folded semitectately and overlap with posterior parts of membranes. Posterior branch of vein *CuA* contiguous to terminal margin of wing.
- 18(19). Hindwing with 1st anal vein not forming branches to anal process. Apex of second anal vein of hindwing at wing margin forming 2 weak branches in direction of first anal vein. Costal vein of forewing subbasally with precostal area (carina) and at this site concave. Vein *MP* branching at postnotal level..... **Seviini** trib. n.
- 19(18). Hindwings with 1st anal vein subbasally forming very weak branch to anojugal process, this branch divided into 2 branches in middle part and with posterior branch fused with *A*₂; *A*₂ remaining straight, not branching. Costal vein subbasally without wide precostal carina and at this point straight. Vein *MP* branching at nodal level, as well as *MA*..... **Ilvini** trib. n.
- 20(17). Forewing with subbasally concave costal margin, wings at rest folded steeply tectately, membranes contiguous on proximal surfaces. Posterior branch of vein *CuA* touching posterior margin of membrane.
- 21(22). Postcubital fold absent. Second anal vein of hindwing entirely straight, weakens and disappearing not far from wing margin, not bending away from fold along posterior margin. Forewing systems *M* and *CuA* not anastomosing..... **Apatesonini** Metcalf, 1938.
- 22(21). Second anal vein of hindwing, not far from margin of wing strongly bending forward and continuing away from fold along posterior margin in basal and middle parts. Veins *MR* and *CuA*₁ anastomosing near bases..... **Tropiphlepsiini** trib. n.

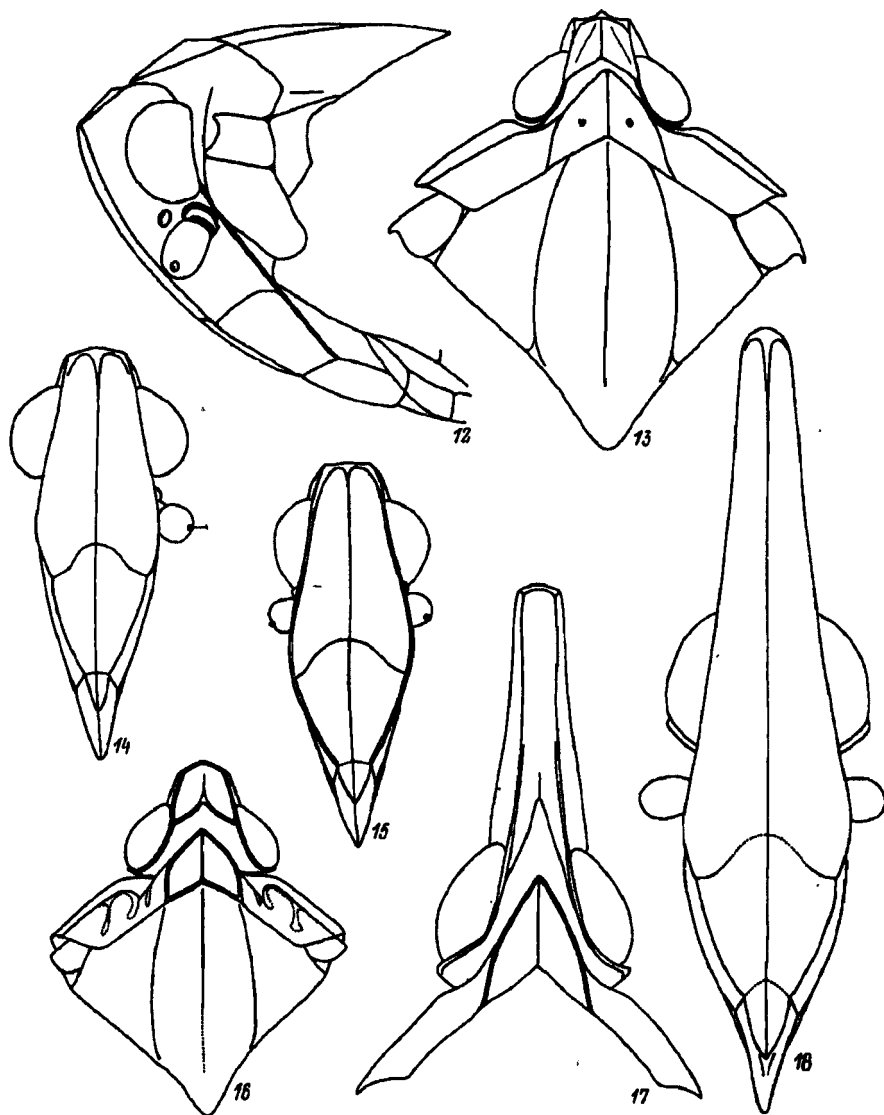
DESCRIPTION OF NEW GENERA AND SPECIES

MYCARIINI Emeljanov, trib. n.

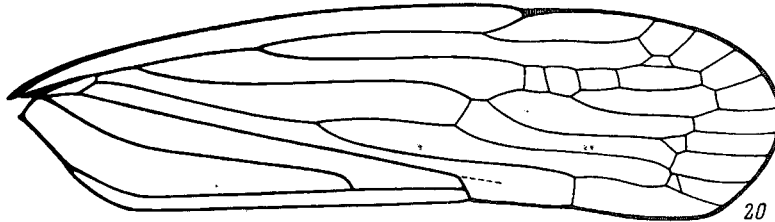
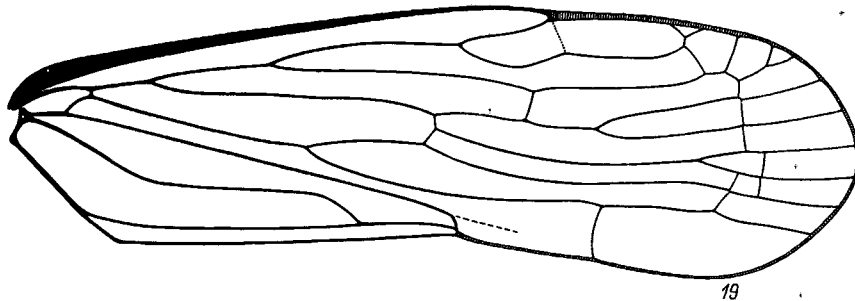
Mycarus Emeljanov, gen. n.

Type species *Mycarus psyche* Emeljanov, sp. n.

Relatively slender, stout, in thoracal part weakly dorsoventrally compressed as in type of many species of Plectoderini (e.g., *Kosalya*). Crown (corypha) small, narrow, narrowing



Figs. 12-18. 12-14) *Mycarus psyche* gen. et sp. n.: 12) anterior part of body in lateral view, 13) anterior part of body in dorsal view, 14) head anteroventrally; 15, 16) *Mycarinus subrubrinervis* gen. et sp. n.: 15) head anteroventrally, 16) anterior part of body in dorsal view; 17, 18) *Acocarinus bipunctatus* gen. et sp. n.: 17) head and pronotum in dorsal view, 18) head anteroventrally.



Figs. 19, 20. 19) *Mycarus psyche* gen. et sp. n., forewing in resting position;
20) *Mycarinus subrubrinervis* gen. et sp. n., forewing in resting position.

anteriorly, anteriorly transversely truncate, posteriorly rounded, rectangularly emarginate. All carinae strong, including middle carina, cells longitudinally depressed. Metopa and clypeus together forming diamond-shaped elongate pattern with truncate ends, carinae sharp (lateral and middle), intervals groove-like, lateral carinae in middle part higher, anteriorly covering bases of antennae. Lateral carinae of postclypeus continuing onto anteclypeus, converge at acute angle in basal 1/3. Postclypeus protruding in metopa at right angle, but epistomal suture in middle part not distinct. Antennae smallish, of usual structure. Proboscis long, extended posteriorly beyond foretrochanters. Pronotum robust, with small elevated arrow-like outlined disc, sides with 2 parallel carinae, all carinae, including middle carina of disc, strong. Length of sides of dorsal part of pronotum, posterior to eyes equal to longitudinal eye diameter or slightly larger. Scutellum rather convex, slightly transverse diamond-shaped, with 3 strong carinae moderately diverging posteriorly. Elytra relatively narrow, 2/5 of length consisting of membrane. Veins stout, roundly carinate. *R* and *M* divided, branching at distance equal to length of *R*, slightly preceding *CuA*. *RA* branching against apex of clavus, *RP* dividing in two only at very margin of wing. *M* with four ends, fork of *MP* somewhat distal of fork *MA*, slightly basad of apex of clavus. *CuA* with two ends. Membrane with continuous transverse line of subapical transverse veins distinct from *RP* to *CuA*₂. Marginal cubital cell of membrane wide, in middle part crossed with transverse vein. Other transverse veins *rm* at nodal level and *mcu* near 1st branching of *M*. Fusion of *Pcu* and *A*₁ against posterior 1/4 of sutural margin of clavus. Hindwing with branches near apex of *ScRA* and with folds as in *Acocarinus*.

Legs of moderate proportions. Hindtibia with 3 lateral teeth, including knee tooth. Apex of tibia with 1+2+4 teeth, starting from distal margin. Hindtarsus on 1st and 2nd segments with 7 teeth each, setae absent.

Ovipositor developed normally, ventrally covered with powerful flat process of sternite VII with 2 ends.

Mycarus psyche Emeljanov, sp. n. (Figs. 12-14, 19).

Dark brown, with yellowish white spotty pattern, probably producing cryptic effect on background of tree bark. Head dark, except corypha, crown yellowish white, carinae of metopa at

margin of corypha of same color. Prothorax dark, disc of pronotum pale. Disc of mesonotum also paler, but less strongly, with pair of diffused longitudinal spots near lateral carinae, distally of carinae, in middle part near carina, with pair of indistinct pale spots. Forewings, white pale spots fusing in form of uneven chain along posterior margin from base to apex of clavus, also with single, partly indistinct spots scattered over entire surface, at level of posterior 1/3 of clavus, in indistinct broken transverse band. Veins in area of membrane slightly paler than background, and transverse subapical veins yellowish whitish, protruding more strongly. Ventrally body and legs more or less dark brown, as also hindwings.

Length of ♂ 14.0 mm.

Material. Madagascar, Analamazotra, Perinét, XI.1930, 1 ♀, holotype (Olsuf'ev).

MYCARINUS Emeljanov, gen. n.

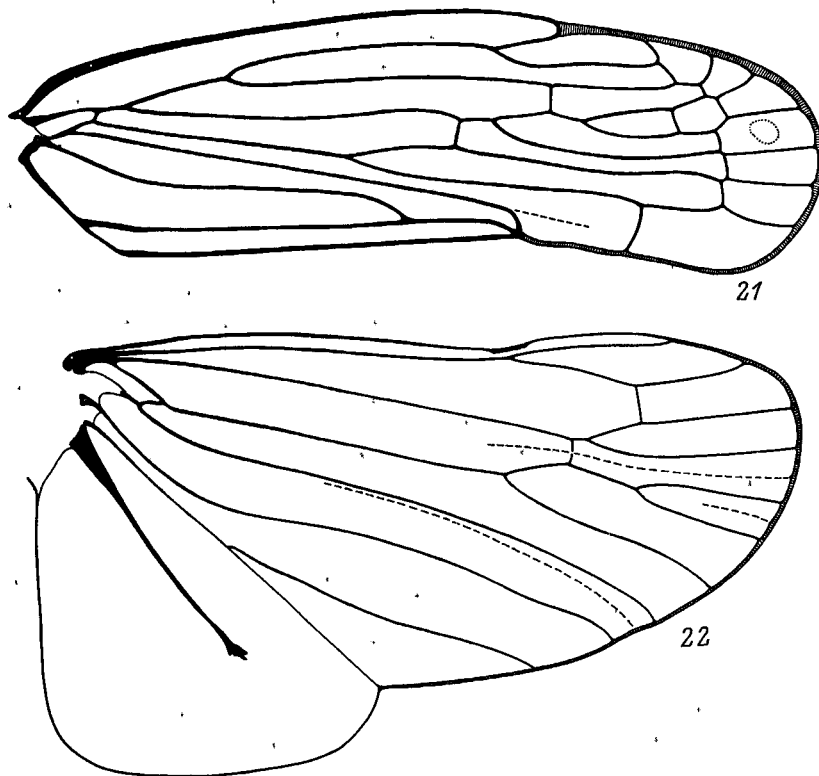
Type species *Mycarinus subrubrinervis* Emeljanov, sp. n., gen. n.

Relatively slender, weakly dorsoventrally flattened, in appearance similar to *Mycarus* gen. n. Corypha small, narrow, narrowing anteriorly, anterior margin protruding at obtuse angle, posterior margin with right angle emargination, slightly deepened apex of notch. All carinae strong, including middle carina, but it ends slightly before reaching anterior margin, cell longitudinally depressed. Metopa and postclypeus together forming diamond-shaped pattern with truncate ends; if in area of clypeus, carinae continuously sloped convex, in middle part of metopa slightly concave; carinae strong, intervals groove-like, lateral carinae in middle part higher, anteriorly covering antennal bases. Lateral carinae of postclypeus continuing on anteclypeus, converging at acute angle in basal 1/3. Postclypeus protruding into metopa at right angle, but epistomal suture in middle part not conspicuous. Antennae moderate, of usual structure. Proboscis long, extending posteriorly beyond hindtrochanters, apex of penultimate segment before anterior margin of hindcoxae. Pronotum stout, with small elevated disc arrow-like outline, sides of pronotum with 2 parallel carinae, all carinae, including middle carinae of disc, strong. Length of sides of dorsal side of pronotum, posterior to eyes, distinctly smaller than longitudinal eye diameter. Scutellum moderately protruding, anterior margin protruding forward at obtuse angle, and posterior margin rectangular protruding backward with slightly extended apex, angle becoming acute. Carinae of scutellum strong, weakly diverging posteriorly. Elytra relatively narrow, membrane constituting 2/5 of length. Veins stout, roundly carina-like. *R* and *M* divided, at distance from basal cell slightly less than length of basal cell. *R* branching distinctly before *CuA*, fork of which lying against fork *Pcu+A₁* of clavus. *RA* branching distinctly distally of apex of clavus. *RP* branching only at margin of wing. *M* with 4 ends, fork *MP* distal to fork of *MA*. At level of clavus. *CuA* with 2 ends. Subapical transverse veins staircase-wise subparallel to margin of wing in anterior part and in one line in posterior part of wing, after vein *MP₁*. Marginal cubital cell of membrane wide, in middle part crossed by transverse vein. Transverse veins *rm* — nodal vein and 1-2 postnodal veins and *mcu* near first branching of *M*. Fusion of *Pcu* and *A₁* against posterior 1/3 of sutural margin of clavus. Hindwing with branches at apex of *ScRA* and with folds as in *Acocarinus*.

Legs of medium proportions. Hindtibia with 3 lateral teeth, including knee tooth. Apex of tibia with 1+2+4 teeth, beginning from distal margin. On hindbasitarsus with 6 teeth without setae, deutotarsus with 7 teeth with 5 proximal teeth with setae.

Mycarinus subrubrinervis Emeljanov, sp. n. (Figs. 15, 16, 20).

Brown with pale yellowish brown diffused parts and spots. Head with pale ridges of carinae. Corypha and major part of metopa brown, in ventral part of metopa, distant from carinae, 2 pale



Figs. 21, 22. *Acocarinus bipunctatus* gen. et sp. n.:
21) forewing, 22) hindwing.

spots continuing and becoming weaker on postclypeus. Lateral parts of head above frenulum pale, frenula brown, antennae dark brown. Pronotum brown, with paler carinae and spots on sides of dorsal part, lateral processes (paranota), below dorsal carina dark brown. Mesonotum brown, anteriorly and on sides of carinae of disc with pair of longitudinal diffused spots and indistinct smaller pale spots. Elytra brown with paler veins on which in distal half reddish lines continue; in cells, grayish irregular spots scattered, disappearing on membrane, where color becomes darker, subapical transverse veins pale. Ventral side of body, legs and abdomen brown, and hindwings also.

Length of ♀ 11.8 mm.

Material. Madagascar, Anamalazotra, pr. Perinét, II.1932, 1 ♀, holotype (Olsuf'yev).

Type species *Acocarinus bipunctatus* Emeljanov, sp. n. (Figs. 17, 18, 21, 22).

Moderately slender, moderately dorsoventrally flattened. Head elongate and pointed. Corypha narrow, deeply groove-like, apically roundly truncate, posteriorly slightly widened, between eyes slightly stronger, than before eyes. Posterior emargination of corypha very acute-angled, with apex protruding forward of eyes for 1/4 length, whence short middle carina begins and soon disappears. Corypha, in lateral view, with straight horizontal upper margin. Head process protruding forward from eyes approximately for 3 times longitudinal eye diameter. Metopa and postclypeus in profile almost straight, in anterior view elongate cuneate, with strong lateral carinae and elevated middle carina, intervals between carinae sloping groove-like, lines of their maximal depth continuing parallel to lateral carinae. Postclypeus with 3 carinae, rather cuneately narrowing to

anteclypeus, lateral carinae continuing to anteclypeus, converging cuneately in upper 1/3 of anteclypeus. Proboscis as long as distance from apex of anteclypeus to anterodorsal margins of eyes (head and pronotum of single specimen shifted from natural position in relation to pronotum). Antennae moderate, of usual structure. Pronotum stout, with small elevated disc and 2 parallel lateral carinae; all carinae, including middle carina of disc, strong. Disc arrow-like, with weakly convex lateral margins, almost acutely cuneate, deeply protruding into coryphal emargination, posterior margin of disc concave at obtuse angle. Length of sides of pronotum posterior of eyes distinctly shorter than longitudinal eye diameter. Scutellum moderately convex, transverse diamond-shaped, with 3 strong, very weakly diverging longitudinal carinae. Elytra relatively narrow, membrane occupying about 1/3 of total length. Veins stout, roundly carinate. *R* and *M* divided at distance from basal cell slightly less than cell length. *R* branching well before *CuA*, proximally of level of middle of clavus. *RA* branching shortly before nodal line, slightly beyond level of apex of clavus. *RP* not branching, recurrent subapical vein beginning at *RP*, cutting off apex of *RA*₂ and touching costal margin of membrane. *M* with 3 ends in form of posterior comb, first branching at level of apex of clavus, second branching slightly distad of nodus. *CuA* with 3 ends, anterior branch dividing in middle part of membrane. Subapical transverse veins in rather even transverse row from branch of *RP* to posterior branch of *CuA*, only anterior vein (*ir*) slightly shifted proximally. Apical cell *R*₂, compact and dark depression of wing plate present. Marginal cubital cell of membrane wide, in middle crossed by transverse vein. First branching of *CuA* slightly proximal of merging of *Pcu* and *A*₁, also in distal 1/4 of clavus. Vein *ir* also on nodal line and *mcu* before first branching of *M* present. Hindwing as in Fig. 22.

Legs of moderate proportions. Hindtibia with 2 lateral teeth, one on knee and one in distal 1/3 of tibia. Apex of foretibia with 1+5 teeth, beginning at distant margin. Hindtarsi on first 2 segments with 7 (8) teeth each, teeth of second segment except marginal ones have subapical setae.

Ovipositor normally developed, ventrally covered with powerful flat process of sternite VII with two apices.

Acocarinus bipunctatus Emeljanov, sp. n. (Figs. 17, 18, 21, 22).

Brown, with paler carinae on forewings. Brown darkening on forewings not completely even, sometimes along middle lines of cells paler, at costal margin and at some other places darkening deeper, line indefinite spots, veins in distal part of wing almost white. In 2nd apical radial cell, small black eye on low rounded, well outlined protrusion of blade of wing.

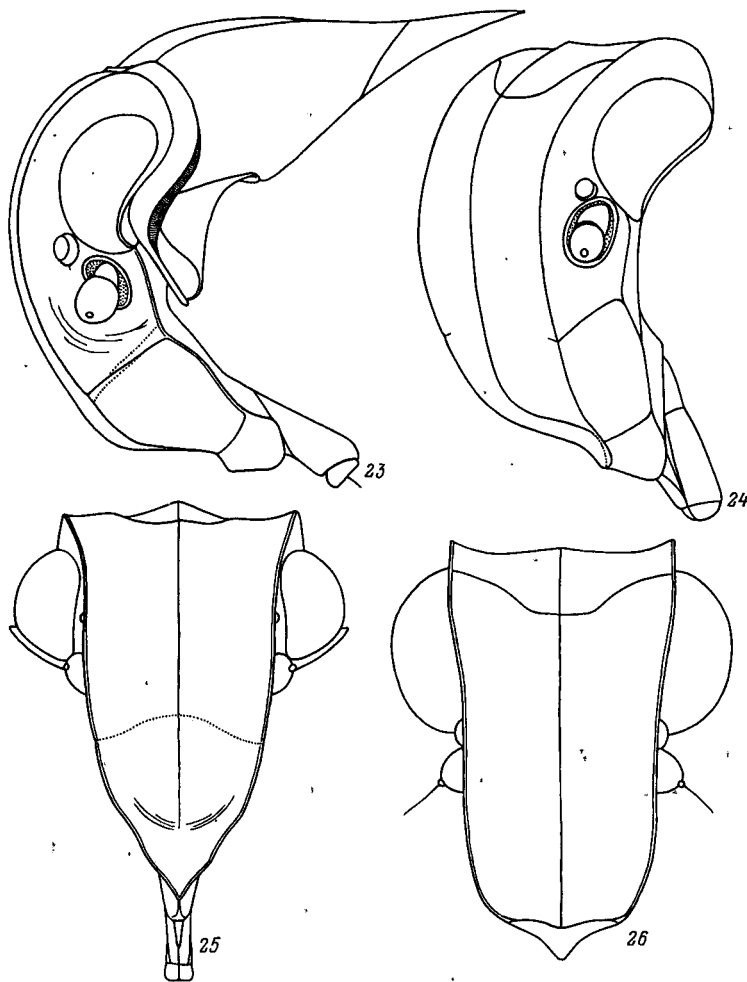
Length of ♀ 7.6 mm.

Material. Madagascar, Tananarive, III. 1932, 1 ♀, holotype (Seyrig).

ACHILLINI Emeljanov, trib. n.

ACHILLA Haglund, 1899

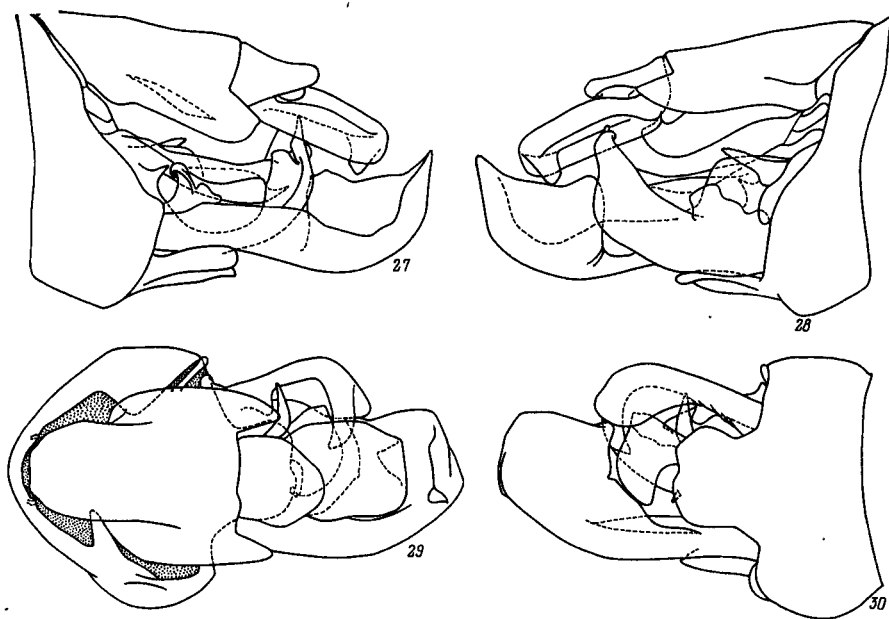
Head rather large, in profile, corypha, metopa, and clypeus forming gradual arch, more strongly curved in area of corypha and clypeus. Metopa parallel-sided, corypha slightly widened to posterior margin. Medial carina of head well developed along entire length. Border of corypha and metopa marked by sharp carina bent forward at obtuse angle. Posterior margin of head dorsally approximately rounded trapezoid-concave. Carinae of cuneate postclypeus continuing onto anteclypeus, distinctly converging at acute angle at middle. Proboscis exceptionally short, barely protruding beyond apex of head, last segment in form of narrow annulus shorter than diameter.



Figs. 23-26. *Achilla hecate* sp. n.: 23) anterior part of body in lateral view, 24) head in anterolateral view, 25) head in anteroventral view, 26) head in anterior view.

Antennae small, genae near antennae slightly concave. Pronotum short, with steep tilted lateral parts of dorsal side almost entirely covered with posterior part of eyes and carinae of occiput; carinae of vertex continuing posteriorad of eyes. Disc of pronotum short, approximately trapezoid, but with obtuse concave posterior wider margin. Meosnotum large, long, with 3 sharp carinae, middle carina in posterior part not developed, lateral processes steeply oblique, posteriorly with oblique carina. Hindtibia with 1 lateral tooth in apical 1/3, on apex with 1+6 teeth; 1st and 3rd segments of hindtarsi with 5 teeth without subapical setae.

Forewing with outline similar to wings *Sevia* and *Ilva*. In basal 1/2, costal margin rather strongly curved and without wide precostal field, costal vein dorsally distinct at distance of 2-3 diameters from wing margin. *R* branching near basal vein little distal of base of *M*. First branching of *RA* little basal of first branching of *CuA* at level of distal 1/3 of clavus, first branching of *M* approximately at level of apex of clavus. *RP* with 3 branches in anterior comb, *MA* with 3 branches in posterior comb, *MP* with 2 ends. *CuA*₁ simple, *CuA*₂ with oblique vein, crossing marginal cubital field. Nodal veins *rm* and *mcu* present, postnodal staircase-like row of transverse veins present, ending in oblique vein in marginal cubital area, and with scattered, but not forming rows, of accessory transverse veins in apical part of membrane. Clavus with veins *Pcu* and *A*₁ fusing not far



Figs. 27-30. *Achilla hecate* sp. n.: 27) genital complex of ♂, sinistral view, 28) same, dextral view, 29) same dorsal view, 30) same ventral view.

from apex of clavus. Tegulae with carina. Proximal plate with obtuse tooth at distal margin. Hindwing with amorphic anastomosing of anal veins typical of Achilini.

♀ with ovipositor of raking-kneading type developed normally, sternite VII enlarged posteriorly, with pair of considerable-sized processes divided by sloped emargination, in middle part with large transverse process. ♂ genitalia asymmetric, right stylus shorter and smaller than left one.

Achilla hecate Emeljanov, sp. n. (Figs. 23-32).

Entire insect matte black. Lateral carinae of head on both sides outlined with thin pale lines. Antennae with pale brown 1st segment and dark brown 2nd segment. Posterior margins of sides of pronotum narrowly marked with white. Ventral side of body from slightly paler to dark brown in area of metathorax.

Length of ♂ 10.6-10.8, ♀ - 11.1 mm.

Material. "HPP" Guinea, vicinity of Kindia, Pastoria, 3.I.1982, 1 ♂, holotype¹ (S. Murzin); vic. Kindia, Tabun River valley, 15-28.VI.1983, 1 ♂ (S. Murzin), 12.XI.1983, 1 ♀ (S. Murzin).

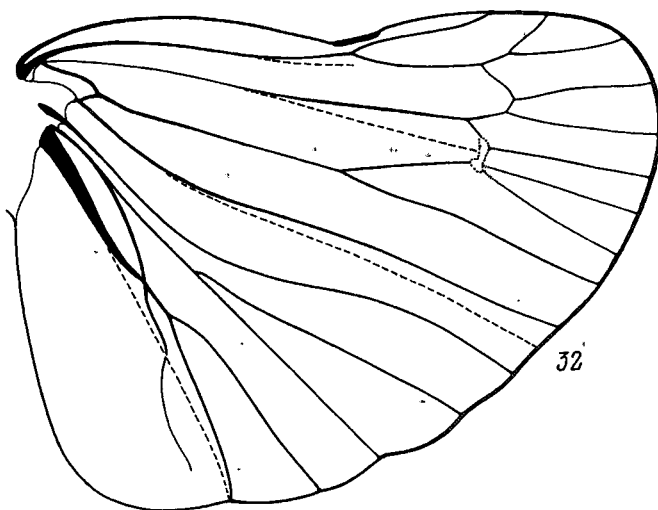
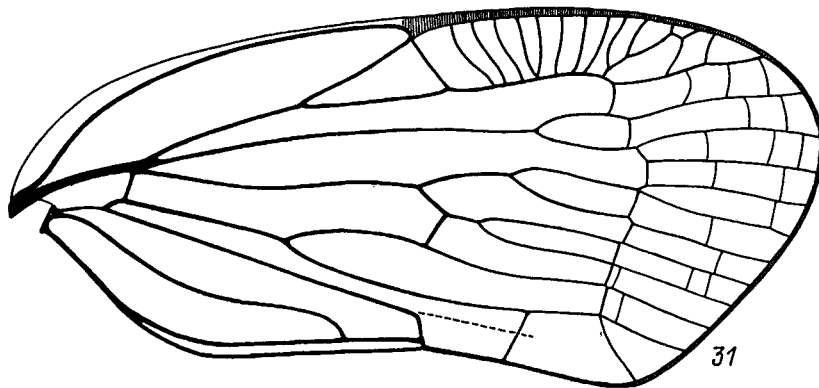
ACHILINI Stål, 1866

PHRADMONICUS Emeljanov, gen. n.

Type species *Phradmonicus fennahi* Emeljanov, sp. n. (Figs. 33, 34).

The new genus is close to the group of genera of Achilini usually designated as a separate tribe Elidipterini, which, however, is not distinctly delimited and the new genus is also marginal in its venational characters.

¹Deposited in Zoological Museum of Moscow State University.



Figs. 31, 32. *Achilla hecate* sp. n.: 31) forewing, 32) hindwing.

Head small, with narrow extended face. Corypha trapezoid, with obtusely concave posterior margin and weakly convex anterior margin, middle longitudinal carina and all marginal carinae well developed. Metopa not less than 4 times as long as maximal width, slightly narrowing upward to corypha, medial carina of metopa below antennae weakened. Ventral margin of metopa obtusely angularly concave, middle part of suture not distinct. Postclypeus with sharp lateral and smoother medial carinae, lateral carinae of postclypeus turn much weaker on anteclypeus. Ocelli small, adjacent to eyes. Antennae moderate in size. Proboscis long, reaching base of abdomen. Pronotum with elevated, anteriorly slightly arrow-like disc, lateral carinae of which in posterior 1/4 curve outward and disappear, medial carina sharp. Lateral margins of dorsal side of pronotum limited by sharp carinae diverging at obtuse angle, horizontal carina of sides weakly developed. Posterior margin of pronotum in middle part sloped, obtusely angularly concave. Pronotum approximately twice as wide as head. Mesonotum with 3 longitudinal carinae.

Folded wings tectate, almost flat, costal margins in basal part strongly convex, resulting in width of folded wings in middle and posterior parts considerably greater than width of pronotum. Costal area very wide, with several prenodal oblique recurrent veins developed in relief as positive folds. *R* and *M* coming off basal cell as short stem. First branching of *R* opposite middle of clavus, both branches on membrane; before submarginal row of transverse veins divided in two, and adja-

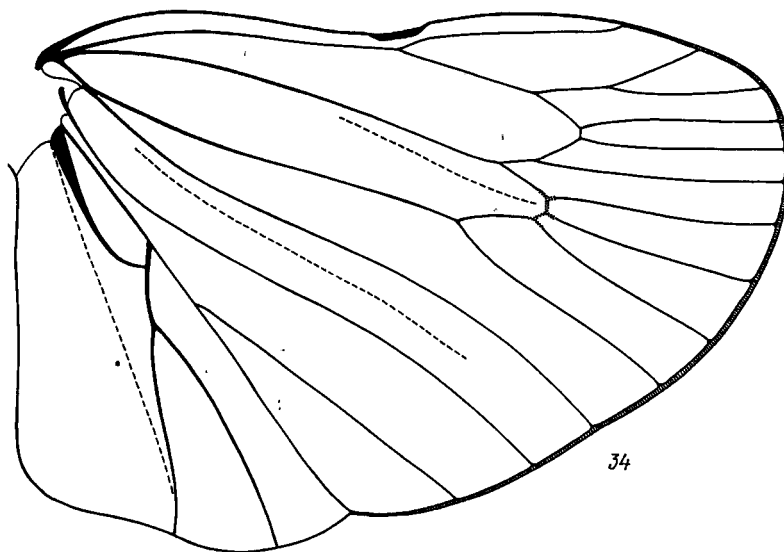
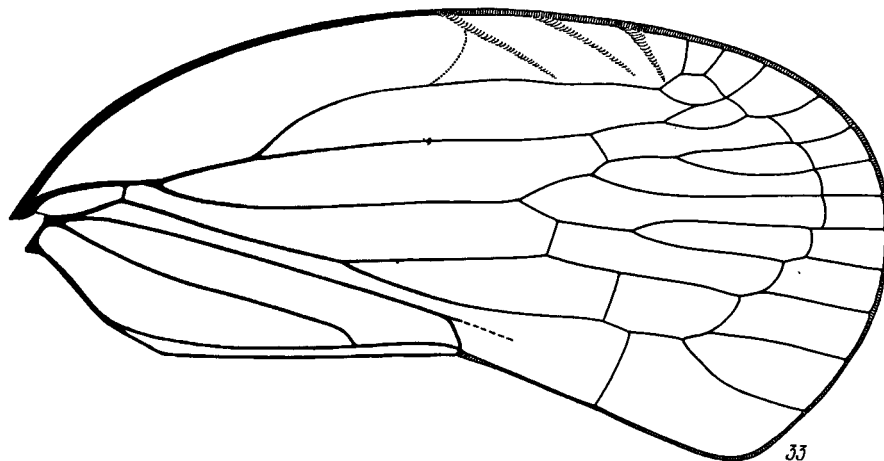
cent branches fuse. Median has 3 branches of *MA* and 2 branches of *MP*. Anterior cubitus with fork in posterior branch. Submarginal row of transverse veins present, transverse *rm* and *mcu* of nodal row and *icua* of intermediate row present. In membrane, transformations of wing surface and complex curvatures of veins absent. In clavus, *Pcu* and *A*₁, fuse in distal 1/4.

Hindwing with simple *RA* and 3-branched *RP*. *M* and *CuA* also 3 branched, adjacent veins of different systems not anastomosing. Medial fold touches weakened vein *mcu* and adjacent part of *CuA*. *A*₂, after anastomosis 2 branched.

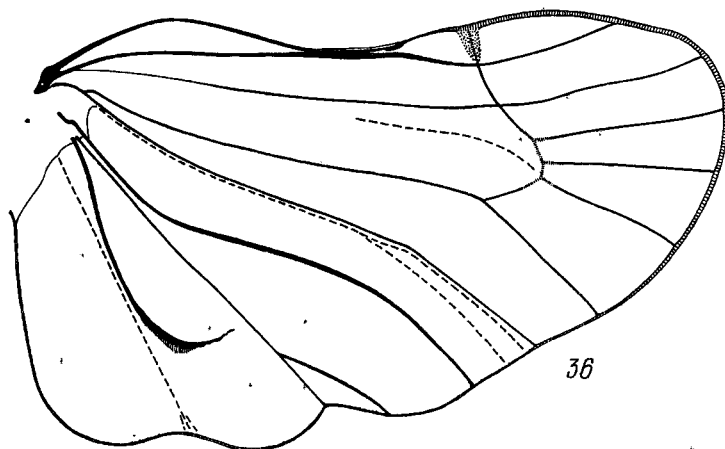
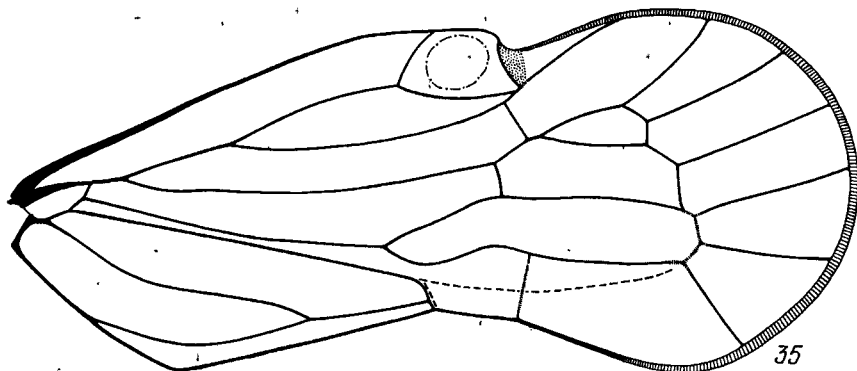
Legs slender, simple. Hindtibia with one lateral tooth distad of middle. Apex of tibia with 8 teeth, distal tooth considerably larger than others, but in distal group, middle tooth in second row. 1st and 2nd segments of hindtarsus, with 7 apical teeth each; teeth of 2nd segment with subapical setae, except marginal teeth. Arculus very close to base of *CuA*.

Phradmonicus fennahi Emeljanov, sp. n. (Figs. 33, 34).

White, with light wax coating, with black spots on head and small amount of not very distinct brown pattern on wings. Head with pair of dark spots in vertexal pits; metopa with 2 rows of



Figs. 33, 34. *Phragmonicus fennahi* gen. and sp. n.: 33) forewing, 34) hindwing.



Figs. 35, 36. *Amphignoma corybas* gen. and sp. n.: 35) forewing, 36) hindwing.

black spots (7 pairs) close to apical margins, lower pair at level of antennae. Preocular area anterior to ocellus, at carina of metopa, with larger dark spot touching metopal spot of 3rd pair, and small lower spot touching 2nd pair (counting from below). Forewings in basal part of corium with barely distinguishable brownish marbled pattern, distinct larger diffuse spot in radial area posterior to first branching of radius. Distal part of costal area with oblique brownish veins, with pale stripes and bead-like widenings (overlapping of pale spots on narrower pale stripe). Marginal cell bordered with branches of *RP*, dark brown to black, following 4 marginal cells (*rm* and 1-3 *im*) with one black dot each, closer to base. Distal to subapical row of white transverse veins, posterior to spots and dots with diffuse, brown stripe as wide as apical cells with scattered white spots along longitudinal veins, 1-2 spots on each.

♂ unknown.

Length of ♀ 9.4 mm.

Material. Holotype: ♀, Mexico, Vera Cruz State, Estación Biológica Las Tuxtlas, 17.IX.1989 (Kerzhner), tropical forest, at light; 1 ♀ paratype, same data.

The new genus differs from close species in elongate narrow face and elongate metopa. It differs from *Elidiptera* Spin., *Messeis* Stål, *Paraphradmon* Fenn., *Prinboessa* Fenn., and

Metaphradmon Fenn. in undistorted venation of blade; from *Parelidiptera* Fenn. in presence of oblique recurrent veins in costal area; and from *Uniptera* Ball. in well developed medial carina of corypha and pronotum and in unthickened dorsal carina of metopa.

AMPHIGNOMINI Emeljanov, trib. n.

AMPHIGNOMA Emeljanov, gen. n.

Type species *A. corybas* sp. n.

Medium-sized, rather wide, distinctly dorsoventrally flattened, with rather flat folded wings (at rest) with slightly deflected membranes. Head moderate; corypha very short, anteriorly straight, posteriorly concave; metopa parallel-sided, with distinct lateral and medial carinae, in profile arcuate, dorsally visible before corypha. Postclypeus without distinct medial carina, considerably wider than metopa, lateral carinae curved outwardly almost to transverse direction, separating genae from widened clypeus, this part of carinae meeting epiclypeal processes of metopa narrowed to end. Anteclypeus with middle carina. Eyes bud-shaped. Antennae of medium size in emargination of ocular margins when seen from above and behind. Ocelli small, contiguous to eyes. Subantennal carina continuing from antenna to outer ends of epiclypeal carinae. Proboscis moderate, protruding half its length beyond apices of forecoxae, ultimate segment twice as long as penultimate segment.

Pronotum rather robust, more than 3 times as wide as head, bent forward at obtuse angle, disc almost triangular, posteriorly wide, anteriorly rounded. All 3 carinae sharp, lateral margins of dorsal part of pronotum straight, carinate. Scutellum with only one middle carina. Forewing typical of family in outline, tough, with weakly raised veins, in area of nodus with membranous elbow to vein *RP*, facilitating bend of membrane. Radius and median with general stem after arcus, latter slightly shorter than basal cell, radius splitting half way to nodus, median with 3 ends. Anterior cubitus splitting before clavus, with 3 ends, middle branch intercalary, from subapical membranous vein. Clavus with 1st anal and its continuation parallel to commissural margin and closer to it. Hindwings with costal area developed only in basal part and dilated; farther from coupling, costa and vein *ScR* shifted to contiguity to each other. Arculus absent. Transverse vein *ir* present, on membranous sinus serving for folding wing. Transverse veins from *ir* to *mcu* and basal part of *MP* together on one sinuous line obliquely crossing wing. Medial and postcubital folds developed, former not extending distally beyond transverse veins, latter splitting in distal part. Second anal vein not reaching to wing margin by considerable distance, curving arcuately forward and ending.

Legs simple, short; foretibia slightly shorter than femora; midtibia approximately as long as femur; hindtibia distinctly longer than femur, with lateral tooth at base and another at middle, apex with 8 teeth, distal tooth longer. First and second segments of hindtarsi with 6 teeth each, without subapical setae.

Ovipositor of raking-kneading type.

This is a rather peculiar representative of the family. Most characteristic and original peculiarities are: wide postclypeus not distinctly separated from frenula; subantennal carina; absence of lateral carinae of scutellum with presence of middle carina; and wings with sharp nodal elbow on both pairs, and position of transverse veins on hindwings.

Amphignoma corybas Emeljanov, sp. n. (Figs. 35, 36).

♀. All cuticle black, dull shiny, at some places with weak wax coating. Legs dark brown,

ventral sclerotization of metathorax brown, membranous parts pale brown. Forewing with costal membranous sinus pale brown, at margin reddish, on membrane with subapical vein *mcu* and postclaval cubital transverse vein pale, desclerotized, ♂ unknown.

Length of ♀ 3.1 mm.

Material. 1 ♀, holotype. Vietnam, Ha Son Binh Prov., Hoa Binh Distr., Mai Chou, in forest, 1.XI.1990 (S. Belokobyl'skiy).

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