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A b s t r a c t: The genus *Lygistorrhina* SKUSE, with a few species in tropical and subtropical regions, has been considered to constitute a separate subfamily or family of fungus gnats, with uncertain affinities. A study of the imaginal morphology, especially the thoracic structure, indicates that the genus represents a specialized branch of the *Keroplatidae*.

The genus *Lygistorrhina* SKUSE (*Lygistorhina* is an incorrect subsequent spelling) was proposed for *L. insignis* SKUSE from New South Wales, Australia (SKUSE 1890, p. 598, pl. 19, fig. 2). Some years later WILLISTON (1896, p. 261, pl. 8, fig. 15, a-c) described a similar insect from the island of St. Vincent, West Indies, as *Probolaeus singularis* WILL. JOHANNSEN (1909, p. 61 – 62) included the two genera in the subfamily *Mycetophilinae*, of *Mycetophilidae*, close to the fossil genus *Palaeognoriste* MEUN., based on the species *P. sciariformis* MEUN. from Baltic amber (MEUNIER 1904, p. 77, pl. 7, figs. 9 – 13).

EDWARDS (1912, p. 203), in spite of some minor differences, did not consider *Probolaeus* WILL. generically distinct from *Lygistorrhina* SKUSE, and later on (1925, p. 530) also synonymized *Palaeognoriste* MEUN. with *Lygistorrhina*.

While the synonymy of *Lygistorrhina* and *Probolaeus* appears plausible, the inclusion of *Palaeognoriste* in the same genus is more questionable. Though obviously related to *Lygistorrhina*, *Palaeognoriste* differs in several points seeming to warrant generic separation. The mouth-parts are shorter, with distinct palpi, the medial fork is almost complete, only its very base being obliterated, and the legs are figured as shorter, without clubbed hind tibiae. In the presence of distinct palpi and in venation *Lygistorrhina asiatica* SEN.-WH. from Ceylon agrees with MEUNIER's fossil species and may well be congeneric. This would be an interesting new case of a member of an amber genus still living in the tropics of the Oriental region. However, the question of possible generic limits within the *Lygistorrhina* group falls outside the scope of the present study and is left for a future monographer to solve. In the following the whole group is therefore treated, for brevity, as a single genus, *Lygistorrhina*.

The genus *Lygistorrhina* (sensu lat.) includes to-day a score of species recorded from the tropics and subtropics (West India, South America, West Africa, Ceylon, Borneo, Japan, and Australia; see the map fig. 16 in HENNIG 1960, p. 286; also from south-eastern North America, according to STONE et al. 1965, p. 204). The genus is highly apomorphic in the structure of the head, especially the elongate mouth-parts, and in the much reduced wing venation as well, and therefore has been difficult to place in the system. At the time when the genus was discovered by SKUSE and WILLISTON, only two families, *Mycetophilidae* and *Sciaridae*, were

generally recognized in the group of fungus gnats. SKUSE, in his original description of *Lygistorrhina*, states that it »reminds one more of the Sciaridae than of the Mycetophilidae». MEUNIER classed his *Palaeognoriste* with the *Sciaridae*, but was inclined to believe that it represents one of the annecting forms between the *Sciaridae* and *Mycetophilidae* (»une des formes de passage reliant les Sciaridae aux Mycetophilinae»). As already mentioned, JOHANNSEN (1909) included the three genera in question in the mycetophilid subfamily *Mycetophilinae*. Later on (JOHANNSEN 1912, p. 258), he united the *Sciaridae* with the *Mycetophilidae* as a subfamily *Sciarinae*, and, while placing *Probolaeus* Will. in the subfamily *Mycetophilinae*, suggested that it should possibly be placed with the *Sciarinae*. EDWARDS (1925) erected a new mycetophilid subfamily for *Lygistorrhina* (including *Probolaeus* and *Palaeognoriste* as synonyms), placing his *Lygistorhininae* between the *Ceroplatinae* and the *Sciarinae*. SHAW & SHAW (1951, p. 16) stated, »Although lacking proper material for a detailed study of the thorax, an examination of some slides indicates that the affinities of *Lygistorhina* are with those of the Sciophilinae, possibly being closest to the Gnoristini. However, the peculiar head structure, the elongate proboscis wholly unlike that of other mycetophilids, and the venation warrant the maintenance of a separate subfamily.» Some subsequent authors, e.g. HENNIG (1954) TOLLET (1959), and ROHDENDORF (1961), treating the mycetophilid subfamilies as units of family rank, speak of a family *Lygistorrhinidae*.

In the present study the *Mycetophilidae* of EDWARDS is considered to be a superfamily *Mycetophiloidea*, consisting of the families *Ditomyiidae, Diadocidiidae, Bolitophilidae, Sciaridae, Keroplatidae*, and *Mycetophilidae*. The *Keroplatidae* include, besides of the *Ceroplatinae* of the older authors, also their *Macrocerinae* and the genus *Arachnocampa;* with the *Mycetophilidae* are united the *Sciophilinae* and *Mycetophilinae* of these authors, and tentatively also the *Manotinae* of EDWARDS.

The study is based mainly on an examination of two specimens of *Lygistorrhina brasiliensis* EDW. (det. JOHN LANE) in the Entomological Museum of the University of Helsinki, but additional material of some species (*L. asiatica* SEN.-WH., *L. brasiliensis* EDW., *L. coxata* (END.), *L. edwardsi* LANE, *L. singularis* (WILL.), and *L. urichi* EDW.) was superficially studied during a visit to the British Museum (N. H.).

Examination of this material showed, first, that the *Sciaridae* are out of the question as near relatives of *Lygistorrhina*. This is proved especially by the structure of the thorax and the insertion of the abdomen.

In *Lygistorrhina* the base of the abdomen is extremely narrow, and the mediotergite strongly convex, its inflexed lower part forming an acute angle with the dorsum of the abdomen; in addition, the pleurotergites are sharply prominent, almost ridged. In the recent *Mycetophilidea* this strong apomorphy of the posterior part of the thorax and of the insertion of the abdomen is found only in the *Kero-*

platidae and *Mycetophilidae*. Accordingly, the families *Ditomyiidae*, *Diadocidiidae*, *Bolitophilidae* and *Sciaridae*, and the genera *Heterotricha* and *Ohakunea* need not be further discussed as possible relatives of *Lygistorrhina*; all of them have a broader insertion of the abdomen, with the thoracic phragma more or less entering into the base of the abdomen (especially in the *Sciaridae*), a more vertical lower part of the mediotergite, and flater pleurotergites. Thus only the *Keroplatidae* and *Mycetophilidae* will be considered in the following.

In the structure of the antennae the *Lygistorrhina* species seem to be more plesiomorphic than most of the *Mycetophilidae*. EDWARDS (1932, p. 139) states that the presence of bristly hairs on the antennal flagellum is very unusual in the fungus gnats, and that their existence in *L. brasiliensis* confirms him in his belief »that *Lygistorhina* cannot be included in any of the subfamilies Mycetophilinae, Sciophilinae or Sciarinae, where such hairs never occur». Strong stiff macrotrichia are absent on the flagellar segments of the antennae in most *Mycetophilidae* (*Mycetophilinae* and *Sciophilinae* of EDWARDS) and in all true *Sciaridae*, and occur in certain *Ditomyiidae*, many *Keroplatidae*, and less conspicuously also in the *Bolitophilidae* and the *Heterotricha* group of genera, but their equivalents are not wholly absent in the *Mycetophilidae* either. What seems important is that, in *Lygistorrhina*, the bristly hairs are concentrated on the dorsal side of the segments, much as in *Burmacrocera minuta* (SEN.-WH.) (*Keroplatidae*).

The elongate mouth-parts of *Lygistorrhina* are peculiar and most characteristic. The maxillary palpi are said to be absent; in any case they are not discernible in dried material. No trace of them could be detected by dissection in *L. brasiliensis*. They are present, however, in *L. asiatica* SEN.-WH., »very small, single-jointed», according to SENIOR-WHITE (1924, p. 196), and in the fossil *Palaeognoriste sciariformis* MEUN. as well (MEUNIER 1904, p. 77: »Dernier article? des palpes lancettiforme», see also his pl. 7, fig. 9). SKUSE and WILLISTON describe and figure the mouth-parts as consisting of five filamentous parts, of which two are shorter and finely hairy; two of the longer bare ones are somewhat thicker and more flexible. My slide of the head of *L. brasiliensis* shows only four filaments. One somewhat shorter hairy part obviously corresponds to the pair of similar parts in the species figured by SKUSE and WILLISTON. It is the most dorsal of the mouth-parts, long and narrow, a little broader at the base and tapering to a sharp point. It can hardly be anything else than the labrum, which, accordingly, must be bipartite in the two other species figured. The two darker, more flexible parts are attached to the apex of the labium, as figured already by WILLISTON, and are obviously the labella. The remaining unpaired filament is parallel-sided, hyaline, and two-pointed at the tip. It arises from the upper side of the labrum and must be the hypopharynx.

An elongate proboscis is known to occur in a few other genera of *Mycetophiloidea*, e.g. *Eugnoriste* COQ. (*Sciaridae*), *Rhynchoheterotricha* FREEM. (of the »*Hetro-*

tricha group» of genera), *Aphrastomyia* COHER & LANE (*Mycetophilidae, Mycomyiinae*), and *Gnoriste* MEIG. (*Mycetophilidae, Gnoristinae*), but in *Rhynchoheterotricha* and *Gnoriste* it is mainly formed by the lower parts of the head, including the clypeus. A proboscis consisting of the mouth-parts themselves as in *Lygistorrhina* is also known in several *Keroplatidae*, e. g. *Antlemon* HAL. and *Rhynchoplatyura* DE MEIJ.

The tibial trichiation in the South American *Lygistorrhina* species consists of rather weak shorter and longer hairs of similar structure, the latter not being stronger and spine-like as in most of the *Keroplatidae* and *Mycetophilidae*. Thus the trichiation is more like that of some »lower» *Mycetophiloidea*, especially *Diadocidia, Heterotricha, Ohakunea*, and some *Ditomyiidae*, but it is to be noted that a similar type is also characteristic of *Macrocera* and other »macrocerine» genera of *Keroplatidae*. *Lygistorrhina asiatica* SEN.-WH. is different in this respect: the fine tibial setulae are arranged in fairly distinct longitudinal rows, and in the middle and hind tibiae there are a couple of rows of small, somewhat spiny bristles, the trichiation thus resembling that of many *Keroplatidae* and some *Mycetophilidae*. This latter type is not known in the other families.

The *Mycetophiloidea* nearly always possess a special structure of differentiated hairs on the anterior surface of the fore tibia near the tip (its presence is, incidentally, one of the best proofs of the monophyletic nature of the superfamily). This »comb» or »brush» is probably used by the insect for cleaning the antennae and palpi. Sometimes, as in the *Ditomyiidae*, many *Bolitophilidae* and *Sciaridae*, and in some *Keroplatidae* (especially in *Macrocera* and allied genera) it consists of a single transverse row of setulae and has been called the »fore tibial comb». In other cases there are two or more such combs on top of one another, or a semicircular or semiovate, sharply delimited field covered with differentiated setulae. When well developed, as in many *Keroplatidae* and most *Mycetophilidae*, this field may be called a »brush» rather than a »comb». In *Lygistorrhina brasiliensis*, and probably also in other species of the genus, the structure is comb-like, thus more like that of some *Keroplatidae*, e. g. *Burmacrocera minuta* (SEN.-WH.) and *Macrocera*, than of the *Mycetophilidae*, but shorter than in *Macrocera*, being confined to an area close to the tibial spur.

In the *Mycetophiloidea* the coxae are usually of about equal length, or the front ones may be shorter than the two posterior pairs. In *Lygistorrhina* the hind coxae are distinctly shorter than the middle ones, corresponding to the exceptional height of the adjacent parts of the metathorax. The same type is found in *Fenderomyia* (*Keroplatidae*) and in lesser degree also in *Macrocera*.

The male abdominal terminalia of *Lygistorrhina* (as studied from dried specimens) are of comparatively simple type, reminiscent of those in *Diadocidia, Bolitophila, Macrocera*, and others. Especially it deserves mention that the claspers of *L. asiatica* possess a bifid tip very similar to that of *Macrocera, Paramacrocera, Fenderomyia*, and some other *Keroplatidae*, e.g. *Isoneuromyia* and *Pyrtaula*.

The above discussed characters seem to bespeak a relationship of *Lygistorrhina* with the *Keroplatidae* and particularly with the »macrocerine» genera of this family, rather than with the *Mycetophilidae*. Further evidence in favour to this view comes from the structure of the thorax. Besides the general features of the structure of the posterior part of the thorax and the nature of the insertion of the abdomen mentioned in the beginning of this paper, *Lygistorrhina* is characterized by a set of features (studied in *L. brasiliensis*): 1) The thorax appears somewhat dorsoventrally compressed; 2) the prothoracic episternum is short and meets the mesothoracic katepisternum unusually high up, in the upper corner close to the horizontal suture between this sclerite and the anepisternum; 3) the mesothoracic anepisternum is low and broad, much broader than high; 4) the mesothoracic epimeron lacks the usual narrow lower part, since the pleurotergite extends to the katepisternum in this region; 5) the metathoracic epimeron and the adjacent posterior part of the metathoracic episternum are exceptionally high. This combination of obviously apomorphic characters *Lygistorrhina* shares with only one genus described in detail in this respect, viz. *Fenderomyia* SHAW.

Fenderomyia SHAW was proposed by SHAW (1948) to accommodate an Oregon species, *F. smithi* SHAW, resembling *Macrocera* but differing from that genus in thoracic structure and wing venation. As stated above, the thoracic structure is much the same as in *Lygistorrhina*. In the venation the following points (according to the figure published by SHAW) may be noted: 1) the vein rs arises unusually far towards the wing base, and is not distinctly connected with r there, 2) the basal portion of the media is rather distinct and ends distally close to the base of cu_{1a}, 3) the vein cu_{1a} is somewhat weak at the base. The last-mentioned character is even more accentuated in some other »macrocerine» *Keroplatidae*.

The venation of *Lygistorrhina* is characterized by a considerable vein reduction. The subcosta is short and in some species incomplete, ending free in the wing membrane, but in other species, including *L. asiatica*, it reaches the costa as in *Fenderomyia*. As in many *Keroplatidae*, the vein sc_2 is absent. The radial sector appears to originate »practically at the base of the wing, below the humeral crossvein» (EDWARDS 1925, p. 531), which is most extraordinary in the whole superfamily. Of the medial vein only the outer parts of the fork remain; the base of the fork and other more basal parts of the media seem to be quite obliterated, as are the base of the vein cu_{1a} and the veins uniting it with m and cu_{1b}. The anal vein is absent. The venation as a whole resembles that of the genus *Ohakunea* (which is usually, and probably correctly, included in the *Sciaridae*). However, in this genus the base of rs is distinct and unusually distal in position. The anal lobe of the wing of *Lygistorrhina* is somewhat square, in the manner of *Macrocera*, in contrast to the more typical »*Ceroplatinae*».

At first sight it may appear almost impossible to derive the venation of *Lygistorrhina* from that of the *Keroplatidae*. Yet the venation of *Fenderomyia* and other »macrocerine» *Keroplatidae* lends some support to this suggestion. The basal origin

of rs in *Lygistorrhina* is perhaps to be understood by assuming that the detached base of this vein in *Fenderomyia* has fused with the basal portion of the medial vein, or in some other way become retracted close to the wing base, in connection with the obliteration of parts of the medial fork, m-cu, and the base of cu_{1a}.

In the *Keroplatidae*, especially in the »macrocerine» genera, there are indications of a vein reduction pointing in the direction of *Lygistorrhina*. The subcosta may be weak or abbreviated, the vein r_4 is sometimes absent, the anal vein often abbreviated to a mere rudiment, and the vein cu_{1a} sometimes detached at the base. To take an example: in *Macrocera pulchra* TONN. the subcosta is very short and ends free, the stem and base of the medial fork are almost obliterated, the vein cu_{1a} appears to be somewhat weak at the base, and the anal vein is very faint, hardly distinguishable except at the base. Similarly, in an unidentified keroplatid species from Burma that appears to be fairly close to *Burmacrocera* all the vein parts that are obliterated in *Lygistorrhina* are weaker than the others, and as in *Lygistorrhina* the wing membrane and the branches of the two forks are bare, and the costa much produced. In some »macrocerine» *Keroplatidae* (*Paramacrocera brevicornis* EDW., according to the fig. 32 in TONNOIR and EDWARDS 1927, *Burmacrocera* COCK., and *Chiasmoneura* DE MEIJ.) the vein cu_{1a} is distinctly detached at the base. Finally, the shape of the short subcosta in *Lygistorrhina asiatica* SEN.-WH. and *Palaeognoriste sciariformis* MEUN. is very similar to that of many *Keroplatidae*, and the much-produced costa characteristic of *Lygistorrhina* and *Palaeognoriste* is found in some smaller *Keroplatidae*.

In the writer's opinion, *Lygistorrhina* cannot be included in any other family than the *Keroplatidae*. It shows most resemblance to certain members of this family, notably to the »macrocerine» genera, the most striking similarity being that between *Lygistorrhina* and *Fenderomyia* in the thoracic structure and shortness of the hind coxae. Further study on the macrocerine *Keroplatidae*, such as *Paramacrocera* EDW. (New Zealand, southernmost South America), *Burmacrocera* COCK. (Burmanese amber, Ceylon, Philippines, see EDWARDS 1929 a), and *Chiasmoneura* DE MEIJ. (Java, New Hebrides, see DE MEIJERE 1913, EDWARDS 1929 b) will probably shed more light on the origin of *Lygistorrhina*. Its proper position has remained obscure simply because the system of the *Mycetophiloidea* has been based too much on the venation which in this case is of little help.

It appears rather unlikely that *Lygistorrhina*, being a small, strongly apomorphic »young» genus with tropical — subtropical distribution, should be completely isolated from the recent families. If treated as a family, it would strongly contrast with the other small families of *Mycetophiloidea* (*Ditomyiidae*, *Diadocidiidae* and *Bolitophilidae*), which are all »old», more plesiomorphic, relict families by no means confined to the tropics but, on the contrary, more concentrated in extratropical regions. It thus seems more likely, from the zoogeographical poily of view as well, that *Lygistorrhina* arose as a specialized group from the famitn *Keroplatidae*, which is comparatively abundantly represented in the tropics.

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