

THE SPECIES OF *PYRILLA* (FULGOROIDEA: LOPHOPIDAE)
IN CEYLON AND INDIA.

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In his enumeration of the LOPHOPIDAE of the Indian sub-continent, Distant (1906) listed, under the generic name *Zamila*, three species of *Pyrilla*, *P. lycoides* (Wlk.), *P. aberrans* (Kby.), and *P. perpusilla* (Wlk.) and cited their respective type localities, Siam, Ceylon, and north Bengal. Eight years later he described a further species, *P. pusana*, on the basis of material from 'Behar' and 'Upper Burmah', and, in 1916, in his Appendix to the Homoptera of the Fauna of British India, he listed this species and added further distributional records for *P. perpusilla* and *P. aberrans*: for the former 'Behar; Pusa' and for the latter 'Behar; Pusa . . .; South India, Chikkaballapura'. His descriptions of all comprise only measurements of length and an account of the bodily coloration.

Pruthi (1937) reviewed the Indian species in the light of an observation (first recorded by Misra in 1917) that each of the nominal species *aberrans*, *perpusilla* and *pusana*, as interpreted by Distant, was most abundant in Bihar at a particular time of year. With the assistance of Dr. W. E. China, of the British Museum (Nat. Hist.), he established that the population from Pusa recognised by Distant as *P. aberrans* was not conspecific with Kirby's type specimen from Ceylon, and among the material he examined, which included specimens in the collections of the Agricultural Departments of Central India and Madras, found no evidence of the occurrence of *P. aberrans* in India. He recognised the possibility that *P. perpusilla* and *P. pusana* might be conspecific, but was compelled to leave the relationship unsettled on account of insufficient knowledge of *P. perpusilla*.

Rahman (1940) considered that the populations on which these three concepts were based represented merely colour varieties of a single species.

Qadri & Aziz (1943) investigated this problem for the purpose of establishing a name for the population injuring sugar-cane at Aligarh. They assembled a collection of samples from various parts of India, including Lyallpur (Punjab), Muzaffarnagar, Aligarh and Etah (United Provinces), Pusa (Bihar), Dacca (Bengal), Bhopal (Central India), Bombay (Bombay), Coimbatore (Madras) and Ceylon. Their approach was based on morphological studies, and from these they concluded that three species should be recognised, *P. perpusilla* and *P. pusana* in India, and *P. aberrans* in Ceylon.

The subject was next taken up by Mukerji & Prasad (1953, 1954, 1955), on the basis of samples obtained from Ahmadnagar and Poona (Bombay), Coimbatore (Madras), Jullundur and Karnal (Punjab), Pusa (Bihar) and Muzaffarnagar (U.P.). Living material for breeding tests was obtained from various sugar-cane growing areas of Bihar and Delhi States. As a result of their investigation, they confirmed the occurrence of seasonal colour forms in the field, and on the basis of morphological studies and the results of interbreeding experiments concluded that only a single species, *P. perpusilla*, attacks sugar-cane in India. They recognised *P. aberrans* and *P. pusana* as seasonal varieties of this species, and appear to have accepted, as had been shown by Pruthi, that the *aberrans* in question was not strictly that of Kirby, but part of the larger concept of Distant. (Their attribution of the latter concept to Kirby was doubtless inadvertent.) In addition, they encountered in the vicinity of Delhi a form of undetermined status, which they

tentatively regarded as a mutant of *P. perpusilla*, that was distinguished by a rather darker body-colour than normally found in 'winter' samples from this area, and by failure to breed with the normal form; they proposed the name *P. perpusilla* var. *nigriventris* for this 'new variety' (Mukerji & Prasad, 1955).

The position, then, at this stage was that two different interpretations had been advanced, namely, that there is only a single species of *Pyrilla*, *P. perpusilla*, present in India, or that there are two, *P. perpusilla* and *P. pusana*. It was agreed that another species, *P. aberrans*, occurs in Ceylon, but not in India, but the use of this name for a seasonal form of the Indian *P. perpusilla* by Prasad & Mukerji (1957), repeated by Butani in a recent review (1962), has introduced a further complication.

The present investigation was initiated to clarify the position and to provide a basis for mapping the geographical distribution of *P. perpusilla*.

In Part 17 of Fascicle IV of the General Catalogue of the Homoptera (Metcalf, 1955) six nominal species are listed in *Pyrilla*, these being *P. protuberans* Stål (from Java), *P. perpusilla*, *P. lycoides*, *P. aberrans* and *P. pusana*, and *P. sumatrensis* Baker (from Sumatra).

Of these, the type material of *P. perpusilla*, *P. lycoides*, *P. aberrans* and *P. pusana* was available for study, together with part of the series that Distant had before him when preparing the Homoptera volumes of the Fauna of British India, and further series, hitherto not studied, from other localities in India. In addition, material of *P. protuberans* agreeing with the original description and with the figures given by Baker (1925) was available from Java. The total assemblage comprised 57 specimens, with males and females in the proportion 2:3.

The study began with an examination of the variability of characters within a single population-sample. Although none of the series was long, it was soon established that bodily size and coloration within a single population sampled at different times of the year varied quite as much as between samples from different localities. It was also established that the cephalic process, the anterior prolongation of the head that is the most conspicuous feature of a *Pyrilla*, varied within a single population-sample in its size relative to the remainder of the body (*cf.* fig. 4, B and C): it varied also, though to a much less extent, in shape, and it was found that the manner in which it tapered near the apex, and its degree of lateral compression near the upper margin, varied much more between population samples than within them. The male and female genitalia were studied, and it was found that both were fairly constant in shape within a population sample, for all the characters used. Both, on the other hand, differed appreciably and recognisably between samples from different localities.

The type of *P. perpusilla* is a female, and no topotypic material was available for study. An examination was made of the male genitalia of the labelled type specimens of *P. lycoides*, *P. aberrans* and *P. pusana*, as well as of males, where available, from each locality represented in the material. It was found that there were three distinct patterns of aedeagal structure, one representing that in *P. lycoides* and *P. pusana*, one that in *P. aberrans* and one that in *P. protuberans* (*cf.* figs. 2, E, F; 11, G; and 16, C, D). It was assumed that such differences reflected differences at specific level. No difficulty was experienced in assigning all the males to their appropriate group as defined by this criterion, nor, in a sample from any one locality, in associating female specimens with the corresponding males by similarity of head shape.

From the preliminary sorting of material carried out on this basis it became evident that in several localities (listed below) there were two kinds of male and two of female, and never more than two of each in any one locality. In all instances the dates of collection precluded the likelihood of the differences being an expression of seasonal variation within a homogeneous population, and the conclusion appeared inescapable that in these localities members of two polytypic

species are living side by side. The next step was to ascertain the valid names of the species concerned, and this necessitated establishing their relationship with *P. perpusilla*, the oldest Indian species concept.

With the aid of the sympatric pairs a search was made for non-sexual characters expressive of specific difference. Two such were found, each, though not absolutely rigorous, very effective for the immediate purpose. The first character is the conformation of the mesepimeron, the sclerite of the mesothorax lying immediately posterior to the pleural suture. This, in *Pyrilla*, is produced laterally in its lower half and forms a weak horizontal ledge, flat on its under surface, and, when viewed from below, with a convex outer margin which strongly curves mesad at its posterior end. Posterior to this the remainder of the mesepimeron is developed normally as part of a vertical pleurite. In one of the species concerned the outline of the mesepimeral plate, seen from below, is continued in an even curve into that of the posterior part of the pleurite: in the other, the outline meets that of the posterior part of the pleurite subangulately (cf. figs. 1, D or 2, I and 11, J). The second character is the shape of the lateral margins of the frons at its widest part, as they appear when the frons is seen in facial view, that is, at right angles to the plane of its lower half. In one species the margins are shallowly convex, or at most very obtusely angulate; in the other they are abruptly angulately bent, usually at 90 degrees, or nearly so. In correlation with these differences the lateral carinae of the clypeus are straight or concave, respectively. The form with an abruptly angulate lateral frontal margin is usually distinguishable by an additional feature: the submedian carinae of the frons, almost at the same level as the lateral angles of the margin, are each raised in a short pointed flange (cf. figs. 1, C and 11, A).

When the population samples were grouped in accordance with these two criteria the resulting division corresponded with that achieved by use of genitalic and cephalic characters, and supported the earlier conclusion that two species, and no more than two, were involved. It was also found that the type specimen of *P. perpusilla* was a member of the group with angulate frontal margins and *P. aberrans* of that without (cf. figs. 1, A and 11, C): it was thus possible to name the two species with confidence as *P. perpusilla* and *P. aberrans*.

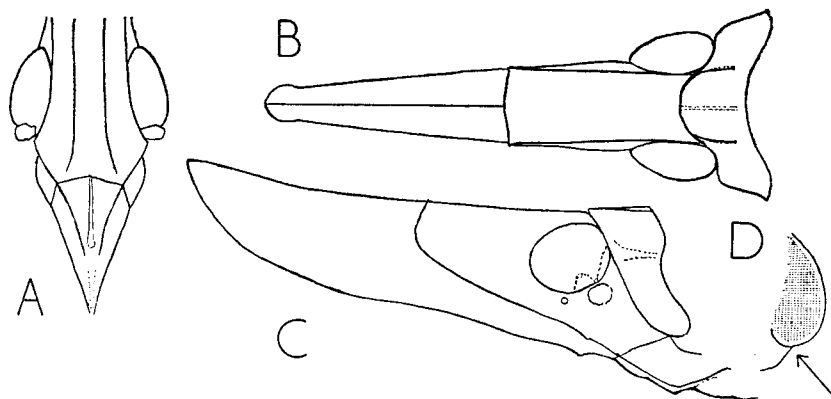


Fig. 1.—*Pyrilla perpusilla* (Wlk.). A, lower part of frons, and clypeus; B, head and pronotum, dorsal view; C, head and pronotum, lateral view; D, lateral margin of mesepimeron, as seen in ventral view: the upper part of the figure is the anterior end, and the arrow indicates the angle in the outline of the margin normally found in this species.

Qadri & Aziz (1943) examined the female genitalia of what they considered to be *P. perpusilla*, *P. pusana* and *P. aberrans*, but apart from noticing a difference in size between the first two, did not specify any characters that could be used for differentiating these forms. Prasad & Mukerji (1957) report that they studied the female genital structures, inclusive of the bursa copulatrix and the spermatheca, but found that they did not show any variability in the different samples examined.

The present writer made an examination of the structures visible externally, and found a useful character in the surface conformation of the first valvifers, which are the lateral portions (and the only remaining sclerites) of the eighth abdominal sternum. These lie on each side of the ovipositor at its base, immediately posterior to the seventh sternum, and are very approximately ovate in outline. The surface is traversed longitudinally by a depression (referred to below as the *sulcus*) which may be broad and shallow, and occupy most of the surface area, or may be more or less narrow and slit-like, and not reach the lower margin of the sclerite.

Comparison of population samples by means of this character showed that the females of one population could usually be distinguished from those of another. It also showed that the form in which the sulcus is narrow is restricted to *P. perpusilla*. In *P. aberrans* it appears to be consistently broad, but there are one or two populations of *P. perpusilla* in which also it is comparatively broad.

If the foregoing interpretation of species is accepted as valid, and if the contemporaneous variation in size and colour pattern, and the seasonal variation in the latter, already noted by Misra (1917), Pruthi (1937) and later workers in the population at Pusa, is assumed to occur in others, a substantial amount of the observed variation between samples can be accounted for. Nevertheless, the morphological variation between populations of either species, independently of any possible seasonal variation, is considerable, and when considered in relation to the distances in which some of the changes take place, appears at present to be unique in the family. Moreover, differences of such magnitude create some difficulty for the applied entomologist. The form known as a sugar-cane pest in Bihar is familiar, and its various forms have been well figured (Pruthi, 1937, pl. XLIV); but in the area of India where *P. perpusilla* and *P. aberrans* overlap (and this includes the Coimbatore district) such figures can give practically no assistance in recognising the species to which the forms encountered belong. Furthermore, although biological data are lacking, it seems likely, from the locality data and vegetational notes given below, that some, if not most, of the forms occurring in this area live in forest and at present have no association with sugar-cane. It is desirable that it should be possible to recognise each form and to refer to it in discussion without the risk of serious ambiguity. No system of vernacular nomenclature, appropriate for use in India, seems to offer as much advantage for the designation of such geographical subspecies as the use of Latin trinominal names. It is accordingly proposed to describe and to name each of those that have been recognised. This decision has not been reached without careful reflection: it can scarcely be expected that the collection examined has included all, or even the great majority, of the forms that exist in India and can be distinguished by similar means, and the process of naming the recognisable subspecies of *P. perpusilla* and *P. aberrans*, if carried to completion, may well result in the creation of a fairly large number of subspecific names. Nevertheless, the practical gain in precision of reference should more than compensate the unwelcome proliferation of names.

All the material examined, and listed below, is in the collection of the British Museum (Nat. Hist.) and the writer is greatly indebted to the Museum authorities and to the Keeper, Mr. J. P. Doncaster, for the privilege of examining it. Much of the material from south India was obtained during expeditions made in 1936

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and 1937 on behalf of the British Museum, under the leadership of G. M. Hervey. The descriptive notes given below on some of the localities have been taken from an unpublished itinerary in the Museum records.

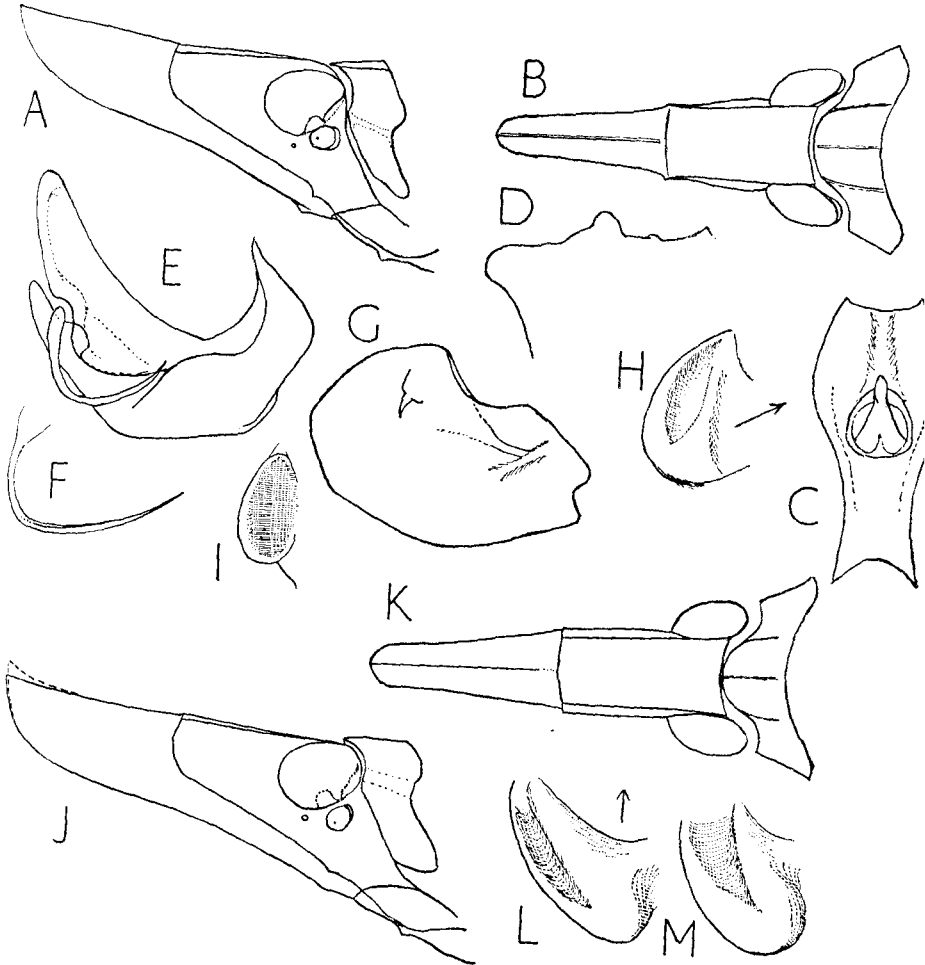


Fig. 2.—*Pyrilla perpusilla pusana* Dist. (A-I, Pusa material) A, Head and pronotum, lateral view; B, head and pronotum, dorsal view; C, anal segment of male, dorsal view; D, dorsal margin of pygofer and anal angle, lateral view; E, aedeagus, right side; F, phallic appendage; G, genital style, right side; H, first valvifer, left side, posterior view (semidiagrammatic, arrow directed dorsad); I, mesepimeral ledge, right side, ventral view; (J-M, Cawnpore material) J, head and pronotum, lateral view (profile of a second specimen shown in broken line); K, head and pronotum, dorsal view; L, first valvifer of specimen J (solid line), left side; M, the same of specimen J (broken line).

Family LOPHOPIDAE Stål

***Pyrilla* Stål**

Stål, 1859, p. 326. Haplotype, *Pyrilla protuberans* Stål, 1859, p. 327.

Microchoria Kirby, 1891, p. 147.

lamila Walker, 1862, p. 304.

Pyrilla perpusilla* (Wlk.)Pyrops perpusilla* Walker, 1851, p. 269.*Zamila lycoides* Walker, 1862, p. 305; Pl. XV, 'fig. 3'. **syn. nov.***Pyrilla pusana* Distant, 1914, p. 326. **syn. nov.**

Frons at widest part with lateral margins rectangulate or strongly subangulate. clypeal disc with lateral carinae feebly concave, less commonly straight (fig. 1, A). Mesepimeral ledge with margin posteriorly meeting side of thorax angulately (fig. 1, D).

Pygofer in side view with anal angle subacutely rounded, dorsal margin often produced dorsad or dorsolaterad at middle in a more or less distinct eminence (fig. 2, D), margin between this eminence and anal angle usually subhorizontal, occasionally oblique. Aedeagus with upper lobes of phallobase slightly distally twisted so that the lower surface at apex faces mesoventrad or ventrad, their lower (outer) margin strongly sclerotised, lower lobes of phallobase with lateral cleft usually short and rather strongly oblique (fig. 2, E).

First valvifers usually distinctly tumid, traversed obliquely by a more or less narrowly lenticular sulcus, less commonly only weakly tumid with sulcus shallow and broad.

Pyrilla perpusilla perpusilla* (Wlk.) (fig. 1, A-D)Zamila perpusilla* (Wlk.), Distant, 1906, p. 327.

Head in profile porrect, only weakly ascending near apex; lower margin of cephalic process strongly convex distally; median length of vertex from base to transverse carina greater than width at base (about 2.5:1).

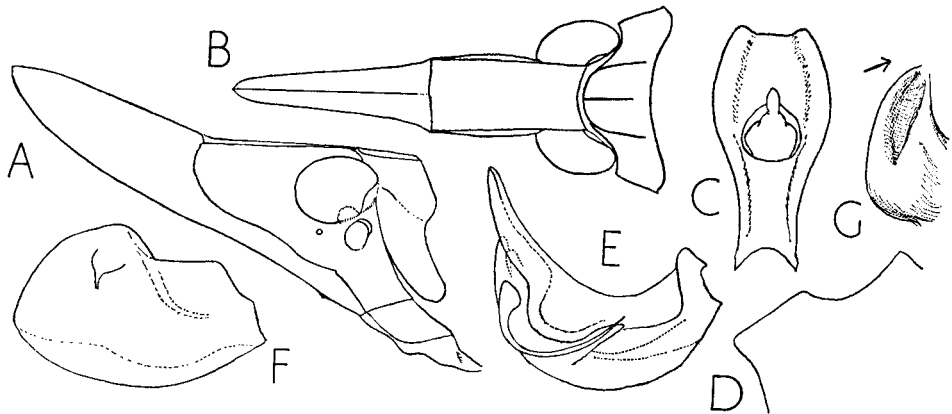


Fig. 3.—*Pyrilla perpusilla coimbatorensis* subsp. n. A, Head and pronotum, lateral view; B, head and pronotum, dorsal view; C, anal segment of male, dorsal view; D, dorsal margin of pygofer and anal angle, lateral view; E, aedeagus, right side; F, right genital style; G, first valvifer, left side (semidiagrammatic, arrow directed dorsad).

One female (the holotype), INDIA: N. Bengal, 42.25. The figures are of this specimen.

The abdomen is unfortunately now missing. The writer examined it in 1947, when it was entire, and made a note that it was distinguishable from other specimens, from Pusa, standing under this name by the greater length of the cephalic process and by the shape of "the impression on the lateral plates" of the eighth ventral segment.

It has not proved possible to ascertain, from the evidence available, exactly where in north Bengal the type specimen was collected. The numbers given on the accompanying label are those under which the collection to which this specimen originally belonged was registered, and the entry states merely that the collection was made by "Lieut. Campbell in the N. part of Bengal Presidency."

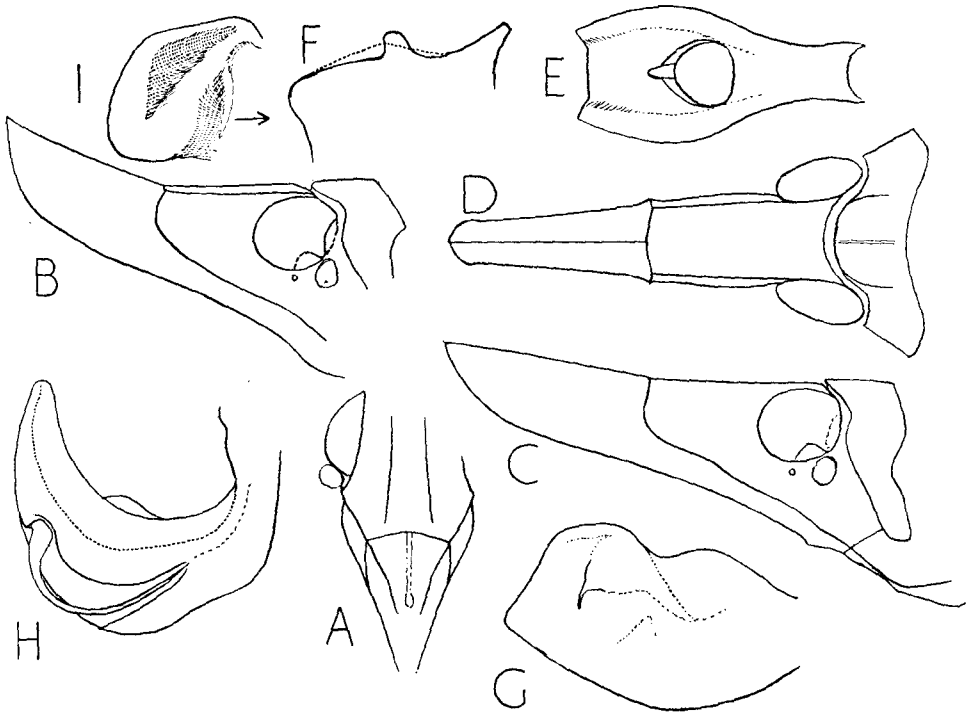


Fig. 4.—*Pyrilla perpusilla chikkaballapurana* subsp. n. A, Lower part of frons and clypeus; B, head and pronotum, lateral view; C, head and pronotum, lateral view (another specimen); D, head and pronotum, dorsal view; E, anal segment of male, dorsal view; F, (broken line) dorsal margin of pygofer and anal angle of male B, lateral view; (solid line) the same of male C, D; G, right genital style; H, aedeagus, right side; I, first valvifer, left side (semidiagrammatic, arrow directed dorsad).

***Pyrilla perpusilla pusana* (Dist.) (fig. 2, A–M)**

Pyrilla lycoides (Wlk.), Distant, 1907, p. 220.

Pyrilla pusana Distant, 1914, p. 326.

Pyrilla perpusilla (Wlk.) *sensu* Distant (in part), 1916, p. 85.

Pyrilla aberrans (Kby.) *sensu* Distant (in part), 1916, p. 85.

Head in profile weakly but distinctly ascending throughout; lower margin of cephalic process rather strongly convex distally; median length of vertex from base to transverse carina greater than width at base (about 2.0:1).

Male genitalia and first valvifers shaped as shown in fig. 2, C–H, L, M.

Ten males and 9 females, INDIA: Bihar, Pusa, (*Lefroy*) Dist. coll. 1911–383; 13.ix.06, 6.xi.06, 7.vii.07; 28.iii.14, 1–6.iv.14, 19.v.14, 2–11.vi.14, on sugar cane and juar. Two females, United Provinces, Cawnpore. April 1901, 3123/14;

16.x.05, on sugar cane. A male labelled "Pusa (Lefroy). Dist. coll. 1911-383. *Pyrilla pusana* Dist. type" and with a red-margined circular type label, is here designated as the lectotype.

Of the above series, three males and three females were located in the collection under *P. perpusilla*, and one specimen was so labelled, and the reason for this arrangement is doubtless to be found in the resemblance between their bodily colour pattern and that of the type of *P. perpusilla*. It is evident that the interpretation of *P. perpusilla* was based by Distant on this colour pattern, and not on locality of occurrence, and it was followed by Indian workers. The spring-summer form, "typical *Pyrilla perpusilla*" of Mukerji & Prasad, as studied in Bihar, is a seasonal form of the present subspecies and does not belong to the typical subspecific population. The concept of *P. perpusilla* as interpreted by Qadri & Aziz would appear to be defined by shape of cephalic process, colour pattern, and the profile of the dorsal margin of the pygofer. These authors state (1943, p. 884) that "the best specimens of this species were obtained from Bhopal and Bombay. It is, however, widely distributed all over India, chiefly at Lyallpur, Muzaffarnagar, Pusa and in various Central and South Indian sugar cane tracts."

The present allocation of Cawnpore material to this subspecies is provisional, and may require reconsideration when longer series, including males, are available for comparison.

As noted above, this subspecies is represented by three colour forms, each predominant in the population at a particular period of the year. The names *perpusilla*, *pusana* and *aberrans*, applied severally to these by Mukerji & Prasad, originate in the misinterpretation of *perpusilla* and *aberrans* by Distant: trinomial names applied to such seasonal forms, however, have no standing in formal zoological nomenclature. They can be clearly distinguished by the seasonal terms used by Prasad & Mukerji:—"Monsoon-autumn form", "Autumn-winter form" and "Spring-summer form".

***Pyrilla perpusilla coimbatorensis* subsp. n. (fig. 3, A-G)**

Head in profile porrect as far as transverse carina, thence cephalic process more or less straight, distinctly ascending; lower margin of cephalic process rather weakly convex distally; median length of vertex from base to transverse carina greater than width at base (about 1.8:1).

Male genitalia and first valvifers shaped as shown in fig. 3, C-G.

Holotype male of subspecies and one female, INDIA: Madras, Coimbatore. 9.vi.12 P.S., 23.v.13 (*Fletcher*), on sugar cane. This subspecies is distinguished by the shape of the cephalic process, and by the shape of each element of the male and female genitalia figured. It is of the same facies as *P. perpusilla pusana*, but differs in the shape of the dorsal margin of the pygofer, the distal portion of the upper aedeagal lobes, and the degree of curvature of the phallic appendages.

***Pyrilla perpusilla chikkaballapurana* subsp. n. (fig. 4, A-I)**

Pyrilla aberrans (Kby.) *sensu* Distant (part), 1916, p. 85.

Head in profile porrect as far as transverse carina, thence cephalic process gradually and rather weakly, or sometimes moderately, ascending; lower margin of cephalic process moderately convex distally; median length of vertex from base to transverse carina greater than width at base (about 2.3:1).

Pygofer with dorsal margin shallowly excavate in basal half, produced laterad or dorsad at middle in a rounded lobe, thence straight and slightly declivous to anal angle, which is slightly produced and rather narrowly rounded. Male genitalia and first valvifers as shown in fig. 4, E-I.

Holotype male of subspecies, one male and 6 females, INDIA: Mysore. Chikkaballapura (*T. V. Campbell*) Brit. Mus. 1926-171, 74.C.B. 11.13; 17.8 C.D. 11.15. This subspecies is distinguished by the shape of the cephalic process and of the dorsal margin of the pygofer and of the apical and lateral parts of the upper aedeagal lobes. The rounded process on the dorsal margin of the pygofer is erect or weak and subhorizontal. The length of the cephalic process is most variable, but its angle of inclination is relatively constant.

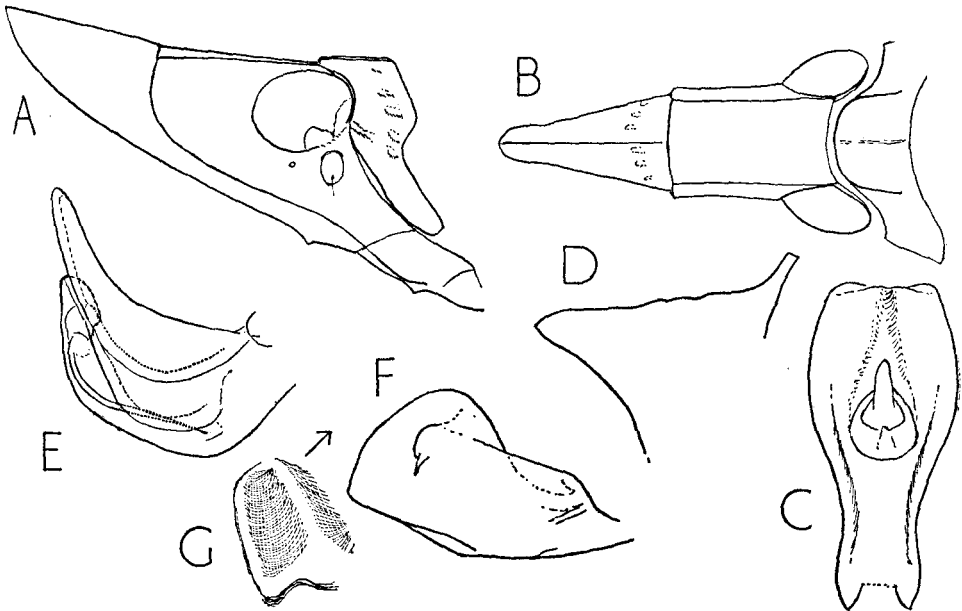


Fig. 5.—*Pyrilla perpusilla thekkadiana* subsp. n. A, Head and pronotum, lateral view; B, head and pronotum, dorsal view; C, anal segment of male, dorsal view; D, dorsal margin of pygofer and anal angle, lateral view; E, aedeagus, right side; F, right genital style; G, first valvifer, left side (semidiagrammatic, arrow directed dorsad).

***Pyrilla perpusilla thekkadiana* subsp. n. (fig. 5, A-G)**

Head in profile straight and very slightly ascending as far as transverse carina, thence cephalic process straight and moderately ascending; lower margin of process moderately to rather weakly convex distally; median length of vertex from base to transverse carina greater than width at base (about 1.8:1).

Pygofer with dorsal margin almost straight, not or only very weakly declivous, anal angle strongly produced caudad, acutely rounded. Male genitalia and first valvifers as shown in fig. 5, C-G.

Holotype male of subspecies and one female, INDIA: Travancore, Periyar Dam, Thekkadi, 6-10.v.37 (*B.M.-C.M. Expedition to south India, 1937*). This subspecies is distinguished by the shape of the cephalic process, of the dorsal margin of the pygofer and of the lobes of the aedeagus and of the first valvifer. The following data are taken from the itinerary of the above expedition. "*Thekkadi and Periyar Dam*.—The forests are largely of the dry deciduous type with mana grass undergrowth (which had been burnt off a few months prior to our visit). Teak forms a large proportion of the timber. A few miles west of Thekkadi the forest is more of the evergreen type with *Ochlandra* undergrowth. Patches of

tall rain-forest occur in sheltered spots on the shores of the lake and appear to be remnants of the original forest of the locality. Special attention was paid to one of these patches."

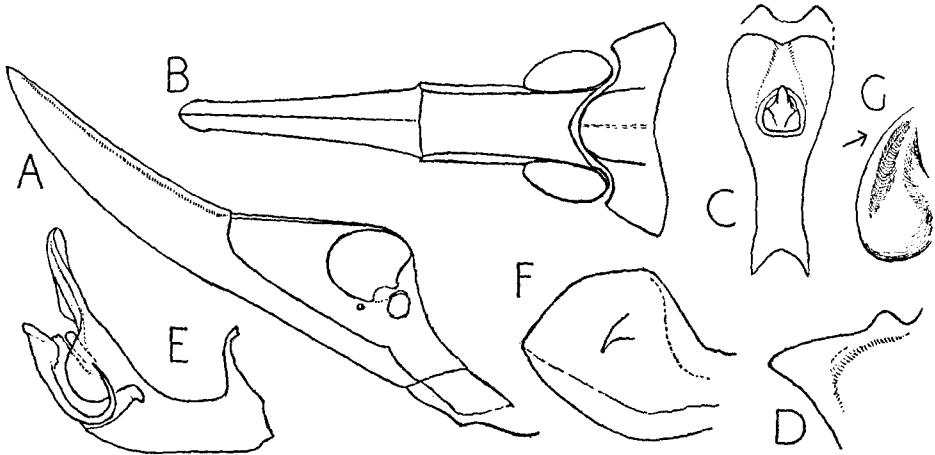


Fig. 6.—*Pyrilla perpusilla naraikkaduana* subsp. n. A, Head and pronotum, lateral view; B, head and pronotum, dorsal view; C, anal segment of male, dorsal view; D, dorsal margin of pygofer and anal angle, lateral view; E, aedeagus, right side; F, right genital style; G, first valvifer, left side (semidiagrammatic, arrow directed dorsad).

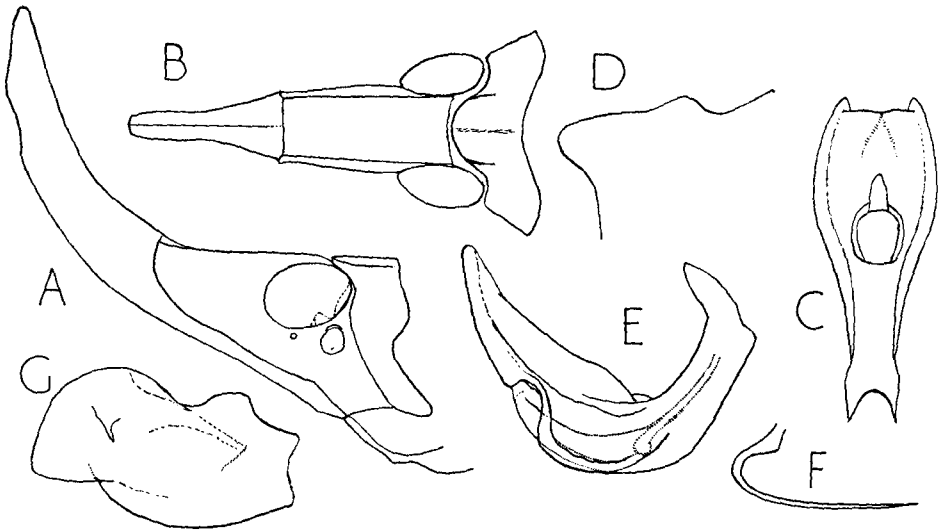


Fig. 7.—*Pyrilla perpusilla dhimbami* subsp. n. A, Head and pronotum, lateral view; B, head and pronotum, dorsal view; C, anal segment of male, dorsal view; D, dorsal margin of pygofer and anal angle, lateral view; E, aedeagus, right side; F, appendage of phallus; G, right genital style.

***Pyrilla perpusilla naraikkaduana* subsp. n. (fig. 6, A–G)**

Head in profile porrect as far as transverse carina, thence cephalic process strongly ascending and weakly curved, distinctly laterally compressed dorsally along middle line; lower margin of cephalic process only weakly convex distally;

median length of vertex from base to transverse carina greater than width at base (about 2:1).

Pygofer with dorsal margin subhorizontal, produced dorsad in a small eminence in basal half, anal angle subacute. Male genitalia and first valvifers as shown in fig. 6, C-G.

Holotype male of subspecies, one male and one female, INDIA: Madras, Tinnevely District, Naraikkadu, 2,500 ft.-3,000 ft. 10.iii.36 (*B.M.-C.M. Expedition to south India, 1936*). This population is readily distinguished by the long, gradually tapering cephalic process, with its almost blade-like median carina and by the prominent and acute anal angle of the pygofer, as well as by other details of genitalic structure in both sexes.

***Pyrilla perpusilla dhimbami* subsp. n. (fig. 7, A-G)**

Head in profile porrect almost to level of transverse carina, thence cephalic process strongly ascending and strongly curved; lower margin of cephalic process moderately convex distally; median length of vertex from base to transverse carina greater than width at base (about 2:2:1).

Pygofer with dorsal margin shallowly excavate in basal half, produced dorsad in a weak eminence near middle, then straight, anal angle produced caudad, subacutely rounded. Male genitalia and first valvifers as shown in fig. 7, C-G.

Holotype male of subspecies: INDIA: Madras, Biligirirangan Hills, Dhimbam, 29.iv.37 (*B.M.-C.M. Expedition to south India, April-May, 1937*). This subspecies, in shape of the dorsal margin of the pygofer, seems to be fairly near to the preceding subspecies, but is readily distinguishable from all others so far described by the remarkable degree of prolongation and curvature of the head, and by the degree of curvature of the phallic appendages.

The following note is taken from the itinerary of the above expedition. "*Dhimbam and Hasanur.*—Ca. 3,600 ft. on the Biligirirangan Hills, north west

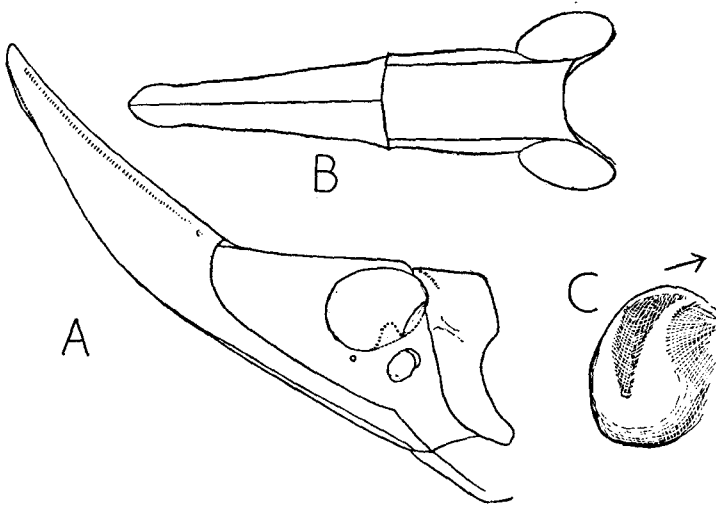


Fig. 8.—*Pyrilla perpusilla pirmedana* subsp. n. A, Head and pronotum, lateral view; B, head, dorsal view; C, first valvifer, left side (semi-diagrammatic, arrow directed dorsad).

of Satyamangalam. Thin deciduous forest of small trees with undergrowth of short or medium grasses."

Pyrilla perpusilla pirmedana subsp. n. (fig. 8, A-C)

Head in profile porrect to a little before eyes, thence ascending to transverse carina; cephalic process strongly ascending distad from transverse carina, its dorsal margin feebly concave; lower margin of cephalic process weakly convex and a little sinuate distally; median length of vertex from base to transverse carina greater than width at base (about 2.0:1).

First valvifers as shown in fig. 8, C.

Holotype female and two females, INDIA: Travancore, Pirmed, 3,400 ft., 4-6.v.37 (B.M.-C.M. Expedition to south India, 1937).

This subspecies is distinguished by the shape of the cephalic process, and of the first valvifers of the female. The form of the cephalic process in profile most nearly resembles that of *P. perpusilla naraikkaduana*, but is more strongly ascending, and its lower margin is rather irregularly sinuate near the apex, in contrast to the evenly curved outline found in the Naraikkadu population. These two subspecies differ also in the relative width of the sulcus on the first valvifers.

The following note is taken from the itinerary of the above expedition. "Peermede.—3,400 ft. Hills are mostly clothed with short grass and patches of mana grass here and there and with 'sholas', of varying extent, of tall rain-forest with undergrowth of bamboo (*Ochlandra*, or a related genus)."

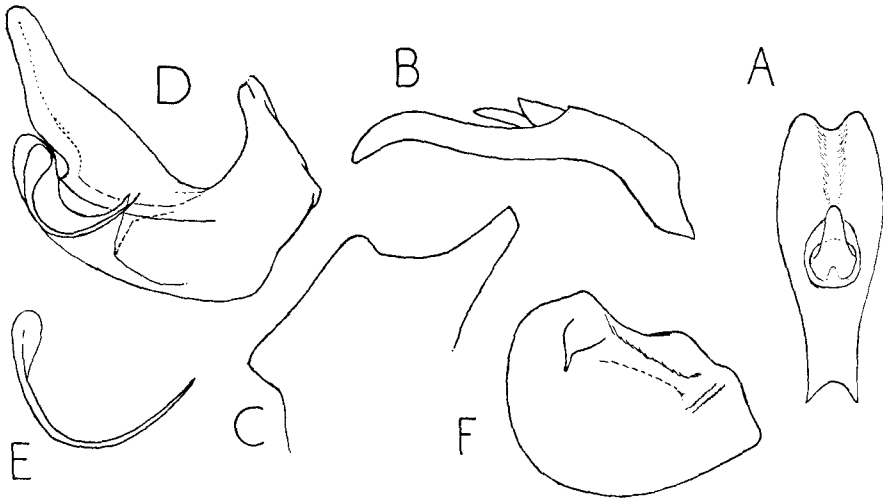


Fig. 9.—*Pyrilla perpusilla lycoides* (Wlk.). A, Anal segment of male, dorsal view; B, anal segment of male, lateral view; C, dorsal margin of pygofer and anal valvifers, lateral view; D, aedeagus, right side; E, appendage of phallus; F, right genital style.

Pyrilla perpusilla lycoides (Wlk.) (fig. 9, A-F)

Zamila lycoides Walker, 1862, p. 305; pl. XV, "fig. 3" [fig. 2].

Head in profile porrect as far as transverse carina, thence cephalic process weakly ascending, its dorsal margin straight; lower margin of cephalic process rather strongly convex distally; median length of vertex from base to transverse carina greater than width at base (about 1.8:1); frons with lateral margins subrectangulately bent a little below level of antennae.

Pygofer with dorsal margin shallowly excavate in basal half, produced dorsad in a small eminence at middle, thence straight and strongly declivous to anal angle, which is subrectangulately rounded. Male genitalia as shown in fig. 9, A–F.

Holotype male, SIAM: Chalabon (*Pascoe, 93–152*). This subspecies is distinguished by the shape of the male genitalia. The body colour is heavily overlain with dark markings, and on cursory examination appears fuscous.

The two words giving the locality are hand-written in ink on opposite sides of a small ovate label. It has not proved possible to locate "Chalabon", and it is considered not unlikely that the word is an erroneous transcription of "Chantabon", a port 13°N. 102°E. (approx.).

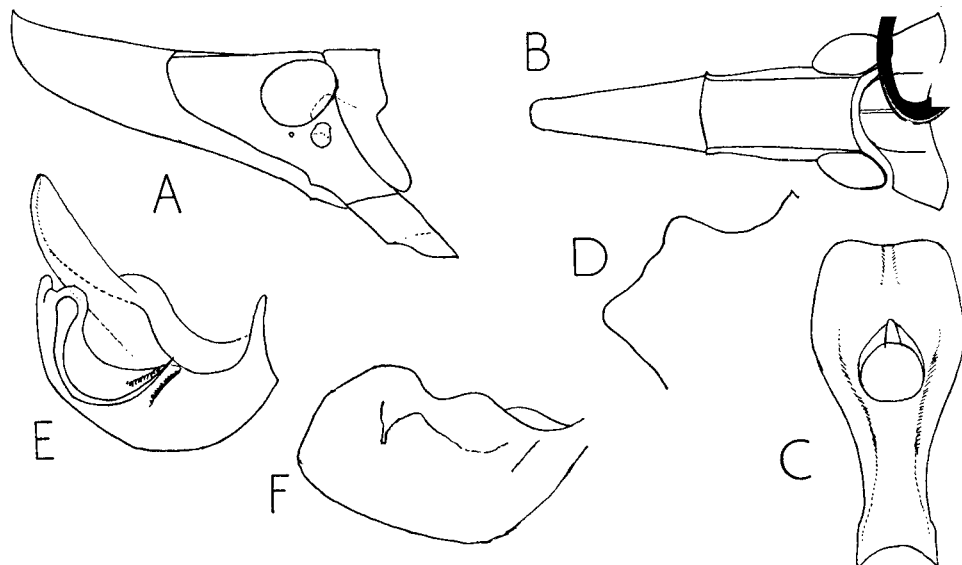


Fig. 10.—*Pyrilla perpusilla singhalensis* subsp. n. A, Head and pronotum, lateral view; B, head and pronotum, dorsal view; C, anal segment of male, dorsal view; D, dorsal margin of pygofer and anal angle, lateral view; E, aedeagus, right side; F, right genital style.

***Pyrilla perpusilla singhalensis* subsp. n. (fig. 10, A–F)**

Pyrella [sic] *aberrans* (Kby.) *sensu* Muir, 1923, p. 239, pl. V, figs. 15, 17.

Pyrilla aberrans (Kby.) *sensu* Qadri & Aziz, 1943, p. 888.

Head in profile with dorsal margin horizontal from base almost as far as transverse carina; thence cephalic process moderately ascending, its dorsal margin weakly concave; lower margin in distal half rather strongly convex. Submedian carinae of frons sometimes each slightly produced ventrad in an eminence a little before apex. Length of vertex in middle line greater than width at base (about 2.3:1).

Pygofer with dorsal margin distinctly excavate in basal third, produced dorso-caudad in an eminence near middle, thence sloping obliquely and slightly sinuately to anal angle, which is bluntly rounded. Male genitalia as shown in fig. 10, C–F.

Holotype male of subspecies and one male, CEYLON: Colombo 1.97 (*Pyrilla aberrans* Kirby, F. Muir det.); Peradeniya, 111. 1911 (*Distant coll. 1911–383*). Holotype male from Colombo.

This subspecies is distinguished by the shape of the cephalic process, and by the shape of every element of the male genitalia, of which that of the dorsal margin of the pygofer is the most easily observed. From the sympatric *P. aberrans* it is distinguishable also by the less laterally-compressed cephalic process, the distinctly angulate lateral margins of the frons, and by the shape of the mesepimeral plate.

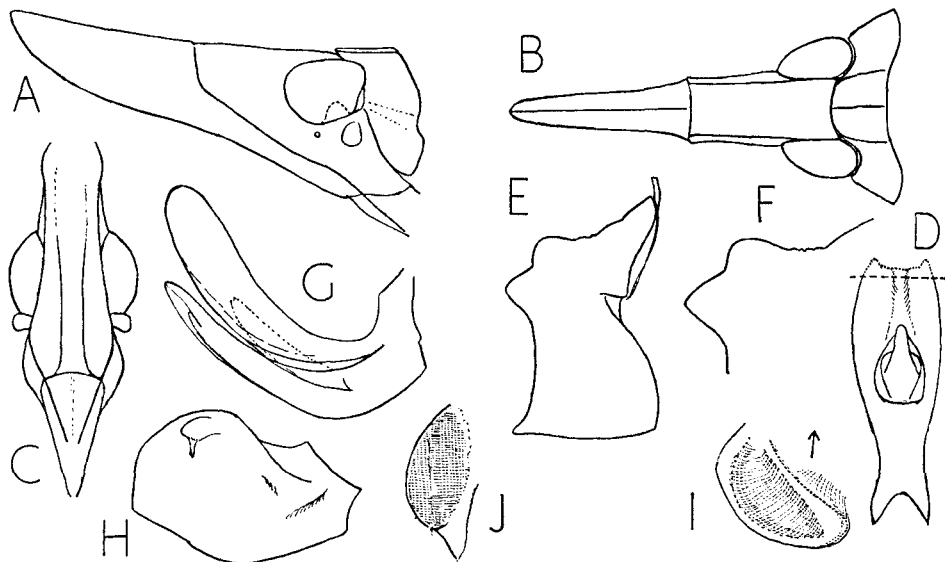


Fig. 11.—*Pyrilla aberrans aberrans* (Kby.). A, Head and pronotum, lateral view; B, head and pronotum, dorsal view; C, lower part of frons, and clypeus; D, anal segment of male, dorsal view; E, pygofer, right side; F, dorsal margin of pygofer and anal angle, lateral view; G, aedeagus, right side; H, right genital style; I, first valvifer (semidiagrammatic, arrow directed dorsad); J, mesepimeral ledge, right side, ventral view.

***Pyrilla aberrans* (Kby.)**

Microchoria aberrans Kirby, 1891, p. 148.

Frons at widest part with lateral margins evenly convex, rarely subangulate, clypeal disc usually with lateral carinae straight (fig. 11, C). Mesepimeral ledge with margin posteriorly almost confluent with side of thorax, not meeting it angulately (fig. 11, J).

Pygofer in side view with dorsal margin produced dorsad at middle in a distinct eminence, margin between this eminence and anal angle markedly concave, anal angle obtusely rounded. Aedeagus with upper lobes of phallobase not distally flexed, their inner surfaces distally facing mesad and more or less parallel with one another, the lower margin not distinctly more thickened than remainder of lobe; lower lobes of phallobase with lateral cleft distinctly elongate.

First valvifers not tumid, sulcus shallow and occupying most of surface of sternite.

***Pyrilla aberrans aberrans* (Kby.) (fig. 11, A-J)**

Zamila aberrans (Kby.), Distant, 1906, p. 326, fig. 161.

Head in profile very weakly ascending to level of transverse carina; cephalic process very weakly ascending distad, its dorsal margin feebly concave, almost straight, lower margin of cephalic process moderately convex distally; median

length of vertex from base to transverse carina greater than width at base (about 2.2:1).

Pygofer with dorsal margin shallow excavate, produced dorsad in an eminence two thirds from base, thence strongly concave to anal angle, which is subacutely rounded. Male genitalia and first valvifers as shown in fig. 11, D-I.

One male and two females, CEYLON: Pundaloya 2.59, 4.59 (*Green coll. 90-115*); Kandy 12.07 (*Distant coll. 1911-383*); a male labelled "Pundaloya, Ceylon 4.59. *Green coll. 90-115. Microchoria aberrans* Kby. type figd." is here designated as lectotype. The accompanying figures are of this specimen.

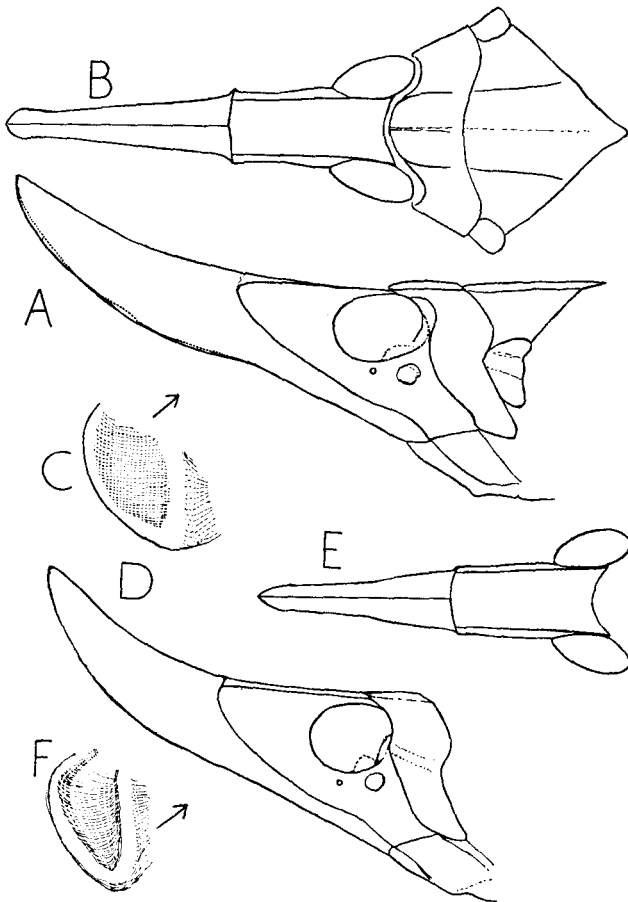


Fig. 12.—*Pyrilla aberrans palghati* subsp. n. (A-C: female from Chenat Nair) A, Head and thorax, lateral view; B, head and thorax, dorsal view; C, first valvifer, left side (semidiagrammatic, arrow directed dorsad); (D-F: female from Walayar) D, Head and pronotum, lateral view; E, head, dorsal view; F, first valvifer, left side (semidiagrammatic, arrow directed dorsad).

Pyrilla aberrans palghati subsp. n. (fig. 12, A-F)

Head in profile with dorsal margin horizontal almost to level of transverse suture; thence cephalic process distinctly ascending, with dorsal margin weakly concave; lower margin of cephalic process rather weakly convex distally; median length of vertex from base to transverse carina greater than width at base (2.1-2.3:1). Frons at widest part with lateral margins obtusely angulate rather than rounded. First valvifers relatively broad, subtriangular, sulcus occupying most of surface area (fig. 12, C, F).

Holotype female, INDIA: Travancore, Palghat. Chenat Nair Forest, 16.iv.37 (B.M.-C.M. Expedition to south India, 1937); 2 ♀♀, Madras, Coimbatore District, Walayar, 19.iv.37. (B.M.-C.M. Expedition to south India, 1937.) This subspecies is distinguished by the shape of the cephalic process, by the shape of the margins of the frons, and of the first valvifers. This is a subspecies in which the shape of the lateral margins of the frons breaks down as a criterion for separating *P. aberrans* from *P. perpusilla*.

The following note is taken from the itinerary of the above expedition.

“Chenat Nair Forest Reserve, Palghat.—Collecting done in dry deciduous forest up the southern slopes of the mountains to the north of the Palghat Gap. On the north-eastern side of the Sappal Ridge evergreen forest and small patches of mana grass were met with.

Walayar forest.—In the Palghat Gap. Dry deciduous forest much mixed with thorny bamboo.”

Pyrilla aberrans consors subsp. n. (fig. 13, A-C)

Head in profile with dorsal margin very weakly ascending to level of transverse carina; thence cephalic process more strongly ascending, with dorsal margin distinctly concave; lower margin of cephalic process moderately convex distally; median length of vertex from base to transverse carina greater than width at base (about 2.2:1).

First valvifers with sulcus broadly subovate, occupying greater part of surface (fig. 13, C).

Holotype female, INDIA: Travancore, Periyar Dam, Thekkadi, 6-10.v.37 (B.M.-C.M. Expedition to south India, 1937); 1 ♀, Madras, Tenmalai 500-800 ft. 11-17.x.38 (B.M.-C.M. Expedition to south India, Sept.-Oct. 1938); 1 ♀, Madras, Gudalur District, Nadghani Ghaut, 3,000 ft. 21.ix.38 (B.M.-C.M. Expedition to south India, Sept.-Oct. 1938) Brit. Mus. 1939-205.

This subspecies is distinguished by the shape of the cephalic process and of the first valvifers: the former is more strongly curved upward, and in the latter the sulcus is more rounded distally, than in *P. aberrans palghati*. From the females of *P. perpusilla dhimbami* this subspecies can be distinguished by the more slender form of the cephalic process, in both dorsal and lateral aspects.

The following note is taken from the itinerary of the above expedition.

“Tenmalai.—A forest depôt among the hills flanking the Shencottah Gap between the N. and S. Cardamom Hills. The country is densely forested for many miles with tall rain-forest, and the humidity is high.”

Pyrilla aberrans comes subsp. n. (fig. 14, A-F)

Head in profile with dorsal margin weakly ascending to level of transverse suture; thence cephalic process more strongly ascending, with dorsal margin distinctly concave; lower margin of cephalic process rather strongly convex distally; median length of vertex from base to transverse carina greater than width at base (about 2.1:1).

Pygofer with dorsal margin rather strongly excavate in basal half, produced dorsad in an eminence a little basad of middle, thence strongly sinuately declivous to anal angle, which is obtusely rounded. Male genitalia as shown in fig. 14, C-F.

Holotype male, INDIA: Madras, Tinnevely District, Naraikkadu, 2,500 ft.-3,000 ft., 10.iii.36 (*B.M.-C.M. Expedition to south India*). This subspecies is distinguished by the shape of the cephalic process and of each element of the male genitalia. In both the genitalic mount of the type specimen of *aberrans* and in this specimen no trace was found of external phallic appendages. The usual inner pair of rod-like appendages was present in both. It is possible that external appendages are normally present but in these specimens have been lost during life.

The capture of this male was most fortunate, as it permitted a direct comparison with the male of the sympatric *P. perpusilla naraikkaduana*. There is no evidence of any error in labelling, and it is recorded that the members of the expedition themselves dealt with the captures of each day.

Pyrilla aberrans aches subsp. n. (fig. 15, A-C)

Head in profile with dorsal margin horizontal to level of transverse carina; thence cephalic process strongly ascending, with its dorsal margin distinctly concave; lower margin of cephalic process moderately convex distally; length of vertex from base to transverse carina greater than width at base (about 2.0:1).

First valvifers with sulcus broadly triangular, occupying greater part of surface (fig. 15, C).

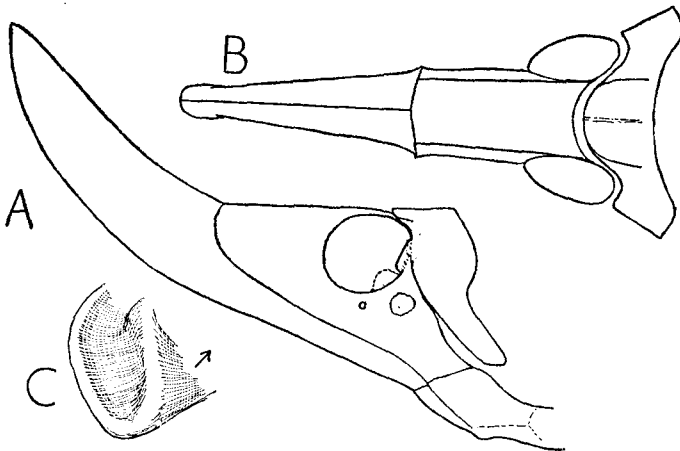


Fig. 13.—*Pyrilla aberrans consors* subsp. n. A, Head and pronotum, lateral view; B, head and pronotum, dorsal view; C, first valvifer, left side (semidiagrammatic, arrow directed dorsad).

Holotype female, INDIA: Madras, Biligirirangan Hills, Dhimbam, 29.iv.37 (*B.M.-C.M. Expedition to south India, April-May 1937*). This subspecies is closest in general appearance to *P. aberrans comes*, but it differs in the cephalic process being rather less inflected upward and in being less laterally compressed distally. From the sympatric *P. perpusilla dhimbami* it is readily distinguishable

by the shape of the cephalic process, and by its coloration, which is sordid greenish-testaceous sprinkled with small lighter spots: in *P. perpusilla dhimbami* it is sordid stramineous with the entire dorsal margin dark castaneous.

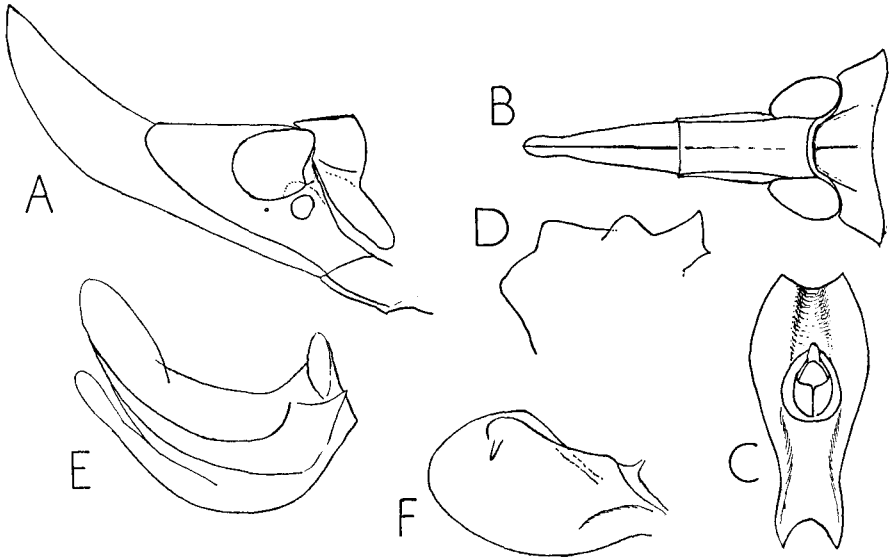


Fig. 14.—*Pyrilla aberrans comes* subsp. n. A, Head and pronotum, left side; B, head and pronotum, dorsal view; C, anal segment of male, dorsal view; D, dorsal margin of pygofer and anal angle, lateral view; E, aedeagus, right side; F, right genital style.

***Pyrilla protuberans* Stål (fig. 16, A–E)**

Stål, 1959, p. 327.

Frons at widest part with lateral margins subangulate, submedian carinae of frons at this level very slightly produced, clypeus with lateral carinae concave. Mesepimeral ledge with margin posteriorly meeting side of thorax subangulately.

Pygofer in side view with dorsal margin straight, anal angle abrupt, retriangulate or acute. Aedeagus not heavily sclerotised. Phallic appendage approximately Y-shaped. Anal segment and genital styles as shown in fig. 16.

One male and 1 mutilated specimen, JAVA: Pekalongan, s.f. Soemberhardja, tuin Kertagola (*Kalshoven*) 6.6.39. This extra-territorial species is included in this study merely for purposes of comparison.

Discussion.

According to the interpretation of species followed above, there is no reason to question any of the Indian locality-records that have so far been published as being those of *P. perpusilla* or *P. pusana*. Misra (1917, p. 79) records the collection by Bainbrigg Fletcher of a species at Pyinmana (Burma) and states that this specimen was sent to Distant for identification. Apparently Distant did not retain it, as it is not to be found in the British Museum collection, but it may well have been this specimen that provided a basis for the locality-record "Upper

Burma" for *P. pusana* (Distant, 1916, p. 84). One specimen that is in the Museum collection, but has not been considered above, is a female, in poor condition, standing under *P. lycoides* and bearing simply the label "Ind. 68.4" [The numerals refer to the register entry "1868 . . . presented by W. Wilson Saunders"]. Distant included this specimen under *P. lycoides* in the Fauna of British India (1906, p. 326). On the characters of the head and thorax it is unquestionably a form of *P. perpusilla*, and the head, in shape, is like that of the type of *P. lycoides*, but is less massive in relation to the size of the body and

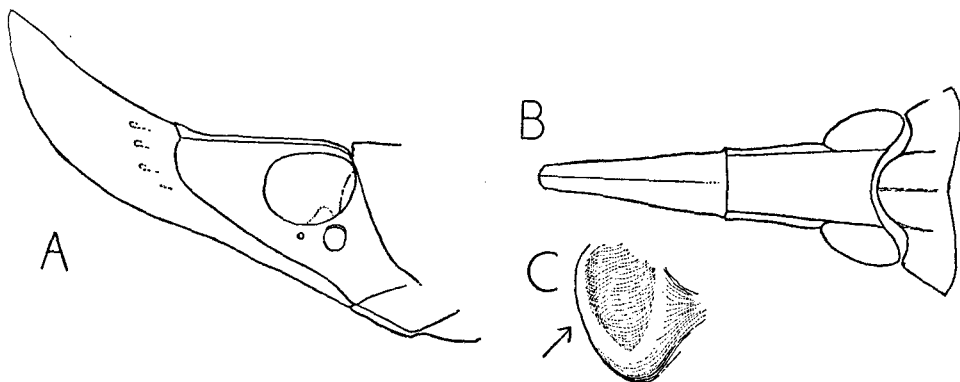


Fig. 15.—*Pyrilla aberrans aches* subsp. n. A, Head, lateral view; B, head and pronotum, dorsal view; C, first valvifer, left side (semidiagrammatic, arrow directed dorsad).

tegmina. In both tegmina the vein Cu 1 is simple to beyond the apex of the clavus, a most unusual and probably individual development. The coloration is rather like that of *P. perpusilla perpusilla*, though the head is darker. The subspecific status of the population that this represents must remain for the present in doubt. Another form on which no further comment can usefully be made is that for which Mukerji & Prasad proposed the name *nigriventris*. They describe their material as being "comparatively dark coloured and differing in appearance from the above-mentioned forms [the seasonal colour varieties of *P. perpusilla*]. The last mentioned specimens were, however, more or less similar to the three known forms in their genital characters. . . . The new mutant paired with the ordinary forms but no progeny could be obtained. Length, ♂ 4.5 mm., wing exp. 17.5 mm.; ♀ 8.2 mm. long, wing exp. 19.0 mm.; the ventrum of this new form is comparatively of a much darker tint than the others. . . ." The appearance of this form in winter among "ordinary forms" in a population near Delhi precludes the possibility of its being a geographical subspecies, and its status merits further investigation.

The most interesting new locality for this species recognised in the present study is Ceylon: here, in climate widely different from that of Bihar, the seasonal differences in populations of *P. perpusilla* occurring there may well be absent or find different expression.

As regards *P. aberrans*, our present knowledge of its distribution cannot be regarded as more than skeletal. The species is now known to occur in the hills of south India, as well as in Ceylon, but material from very many more localities will be needed before any clear picture can be obtained of the northern limits of its distribution. In India it would seem to be associated with natural forest or wild grasses in forest, and any future search for additional localities might well

begin with an exploration of appropriate vegetational types. Although the distributional area of *P. aberrans* appears to be completely overlapped by that of *P. perpusilla*, an intensive field study of these species may possibly reveal differences in their ecological relationships.

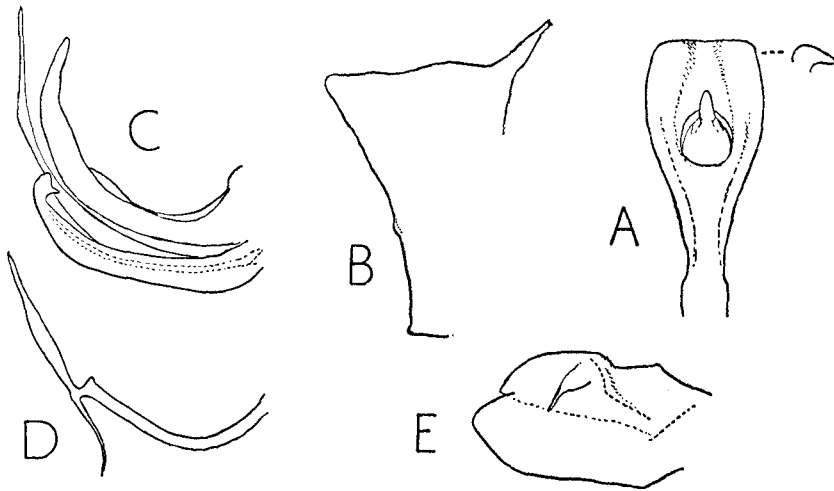


Fig. 16.—*Pyrilla protuberans* Stål. A, Anal segment of male, dorsal view and (separate) deflexed apical angle, lateral view; B, dorsal margin of pygofer and anal angle, lateral view; C, aedeagus, right side; D, phallic appendage; E, right genital style.

Summary.

The species of the genus *Pyrilla* Stål (FULGOROIDEA: LOPHOPIDAE) found in India and Ceylon are reviewed on the basis of population samples from different localities. It is considered that two polytypic species are present: *P. perpusilla* (Wlk.), widespread in India and now recognised as extending to Ceylon and to Thailand, and *P. aberrans* (Kby.) (*sensu stricto*), formerly regarded as being confined to Ceylon, but now found to occur also in south India. Ten geographical subspecies of the former and five of the latter are described and named.

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