

GENERAL DISCUSSION

Consistent with the other groups of insects, the taxonomic position of the non biting midges belonging to the subfamily Orthocladinae is burdened with long history as will be evident in some earlier works namely Van der Wulp (1874), Eaton (1875), Coquillet (1901), Kieffer (1906, '10, '11 and '13), Thienemann (1921, '26, '37 and '44), Sparck (1930), Edwards (1929, '31), Gostchev (1932, '40), Johannsen (1932), Thienemann and Hamish (1932), Tokunaga (1932, '40), Toulbe (1945), Wirth (1947, '49), Strenske (1950), Brundin (1949, '56), Pittken (1962), Freeman (1954-'61), Reiss (1968, '71), Lehmann (1969), Sublette (1960, '64, '66, '67), Sublette and Sublette (1965-'73) and Saether (1969, '71, '74, '75).

These midges though widespread and quite common being abundantly available in India (Table I showing the species-wise population size and distributional pattern) the taxonomic account on them hardly extend beyond Kieffer. Since Kieffer's type are not available intact now and the descriptions and illustrations furnished by him are inadequate, it has become necessary that the taxonomy of the Indian non-biting

ridges be studied afresh basing on cogent, recent works that deal with the exotic species of the different parts of the world satisfactorily. The works of Singh (1958), Kaul (1970) and Singh and Kulkarni (1975) from India in this respect are limited in scope and touch only some species of subfamilies Diamesinae and Tanyptodinae and only a few species of Orthocladinae.

Prior to this study, the position of the Indian forms of Orthocladinae appear to be as follows. Only four species such as anomolus (Kieffer), brunetti Kieffer and spatulicornis Kieffer belonging to the genus Crioceros Van der Wulp and fusiger Kieffer belonging to the genus Parametriceros Goetghebuer were known from India. Two more species such as callinotus Kieffer and grimaldus Kieffer were later placed in the genera, Metriceros Van der Wulp and Trichocladus Kieffer respectively by Sublette and Sublette (1973). The taxonomic status of these forms could not be satisfactorily ascertained due to the nonavailability of the type-specimens intact in the Indian Museum, Calcutta. After Kieffer, Singh (1958) described three valid species

belonging to the genera, Brillia Kieffer and Heterotriacodellus Sparck, of which the species belonging to the genus Heterotriacodellus was later placed in the subgenus Heterotriacodellus of the genus Metriocnemus V.d.Wulp. Recently, this subgenus was again given the status of a distinct genus by Brundin (1956) and Sublette and Sublette (1973). One more species, Triacodellus bisophilus which was described by Singh (1958) was later shifted by Sublette and Sublette (1973) from the subfamily Orthocladinae to the subfamily Dimeosinae.

The valuable works of Edwards (1929, '31), Tokunaga (1932, '40), Townes (1945), Wirth (1947, '49), Brundin (1956), Freeman (1957, '59 and '61), Pittaken (1962), Sublette (1960-'67), Sublette and Sublette (1965 and '73), Reiss (1968), Lehman (1969) and Sæther (1969, '71, '74 and '75) have mainly afforded the essential basis of the investigation. The taxonomic account of the twenty nine species belonging to ten different genera namely, Brillia Kief., Ekiefferiella Thien., Heterotriacodellus Sparck, Limonohyas Est., Metriocnemus V.d.Wulp, Parameetriocnemus Cost., Paraphenocladus Thien., Rheogricotopus Thien. and Hamish, Thienemannia Kief. and

Trichocladus Kief. of the subfamily Orthocladinae form the subject matter of the thesis. The existing valid species of each genus, earlier reported from India has been redescribed in the light of modern generic concept revised or modified from Edwards (1929), Brundin (1956) and Freeman (1959, '61). In this category fall the following species : Brillia kulkia Singh, Heterotrisocladus chandra Singh and Heterotrisocladus kuluensis Singh, Metriocneme callinotus Kief., Parasetriocneme fusiger Kief. and Trichocladus orisalanus Kief.

Simultaneously, the new species which have been collected from the different ecological niches of eastern India during the course of sample survey pertaining to this study, are described in details along with the justification as to their validity made on the basis of their comparison with the forms closely related to them (Vide remarks in the text).

While evaluating the taxonomic status of the different genera/species certain morphological features have been found to bear direct relevance with the taxonomic studies of this group of insects. These features are :

The cibarial pump and tentorium are found to be more or less identical in all individuals of a particular genus. The hind tibial combs are also more or less similar in the number of setae in all individuals of a particular genus while the tibial spurs seem to be more variable even within a genus. The tarsal claws are sometimes toothed, 2 in male and 1 in female which are also important in the taxonomic point of view. Fulvilli being present or absent also have some relevance with the taxonomy. Within limit HV and HR seem to be of both generic and specific value. HV is partly related to the body size as in smaller species are often found to show higher values. The chaetotaxy on the different parts of the body as well as morphometric data which have been found to be of taxonomic importance are mentioned in the tables 2-6.

It is interesting and astonishing that no specimen belonging to the species, Trichocladus oriplanus Kieffer has been found from Darjeeling at any stage of this study.

The shifting of the species, Trichocladus hyrophila described by Singh (1958) from the subfamily Orthocladinae to the subfamily Diamesinae as suggested by Sublette and

Sublette (1973) is found to be fully justified on examining the material left with the Indian Museum, Calcutta.

A glance at the population size (Table 1) reveals the order of dominance of the species as in below.

Rheocricotopus himalayensis n.sp. > Rheocricotopus
neoacrostichalis n.sp. > Rheocricotopus yalau n.sp. >
Limophes montanus n.sp. > Thienemannia fuscithesa n.sp. >
Ekiefferiella debilis n.sp. > Ekiefferiella pentaria n.sp. >
Limophes brevis n.sp. and Limophes mediocris n.sp. >
Metriocnemea longipalpus n.sp. and Parasmetriocnemea pullus n.sp.
Limophes distincticeps n.sp. > Limophes fuscimacri-
nalis n.sp. > Thienemannia lutea n.sp. > Limophes uniformis
n.sp. and Paraphaeocoladus trichialis n.sp. > Limophes
flavus n.sp. and Limophes anotheri n.sp. > Limophes macrus
n.sp. > Limophes puncticellus n.sp. > Paraphaeocoladus
albualetus n.sp. > Parasmetriocnemea subnubilus n.sp.
Paraphaeocoladus proprius n.sp. > Brillia kullia Singh, >
Heterotrissoledius kullensis Singh > Heterotrissoledius
chandra Singh.

A new dichotomous key to the genera under study of the subfamily Orthocleidiinae is proposed in the following, which is expected to serve useful purpose in identifying one genus from the other.

Key to the genera of Subfamily Orthocladinae

1. Eyes pubescent and without dorsal extension. Macro and microtrichia absent. Fulvillus mostly present except Trichocladus Kieffer 2
..... 2

Eyes bare and without dorsal extension. Macro and microtrichia present or absent. Fulvillus absent 3
2. Dorsocentral setae in a row; AR more or less than 1. Anal point with oblique setae. Tergum IX of female with mid dorsal prominence.
Fulvillus present ~~Neopristopus~~
Thiemann and Hamish.

Dorsocentral setae in two or three rows. Anal point with setae. Fulvillus absent
..... Trichocladus Kief.
3. Eyes without dorsal extension. Macrotrichia absent 4

- Eyes with dorsal extension. Macrotrichia present 5
4. Macrotrichia absent. R_{2+3} in contact with R_{4+5} and without separate ending in C. Acrostichal setae absent. Pulvillus very faint ...
..... Ekiefferiella Thiemann.
- Macrotrichia present and prominent. R_{2+3} always separated from R_{4+5} and with separate ending in C. Acrostichal setae occasionally present; few humeral and prescutellar lanceolate setae present Limnophyes Eaton.
5. R_{4+5} ending proximal to M_{3+4} 6
- R_{4+5} ending over or distal to M_{3+4} 7
6. AR 1-3. Scutellum with irregularly arranged setae. Wing with numerous heavily dotted macrotrichia. Anal point short and without setae (naked) Metriocnema van der Wulp
- AR less than 1. Scutellum with setae in a row. Wing with finely dotted macrotrichia. Anal point broad and with setae Parnaphocladia
Thiemann.

7. R_{4+5} ending over M_{3+4} . C strongly elongated beyond R_{4+5} . Anal point broad and with setae
..... Paranetricosmus Thies.

R_{4+5} distal to M_{3+4} 8

8. Anal point absent. Scutellum with more than two rows of setae. Gonostylus bifurcated ..
..... Brillia Kief.

Anal point present. Scutellum with one or two rows of setae. Gonostylus not bifurcated....
..... 9

9. Anal point long and naked. Scutellum with a single row of setae. C strongly elongated beyond R_{4+5} Tricnema Kief.

Anal point broad, conical and with setae.

Scutellum usually with two rows of setae.

C not extended beyond R_{4+5}

..... Heterotrisocladus Spark.

Table 1 : Showing population size and distribution-patterns
(Species wise)

Genus Drillia Kieffer

Localities	species	Male	female	Total	Collecting period
PUNJAB :					
Kullinal	* <u>kullia</u> Singh	1	-	1	June, 1955
WEST BENGAL :					
Darjeeling	<u>kullia</u> Singh	5	-	5	May-June, 1969-70

Genus Ekiefferiella Thienemann

ASSAM STATE :

Cabati peculiaris n.sp. 3 - 3 July, 1975

MEGHALAYA STATE :

Shillong peculiaris n.sp. 7 - 7 September, 1975

* By courtesy of Indian Museum, Calcutta.

Localities	species	Male	female	Total	Collecting period
WEST BENGAL					
STATE :					
<u>District Darjeeling</u>					
Darjeeling	<u>debilis</u> n.sp.	6	5	13	April, 1969, November, 1972
	<u>peculiaris</u> n.sp.	10	-	10	July, 1974
Chun	<u>debilis</u> n.sp.	2	-	2	November, 1976
Kurseong	<u>debilis</u> n.sp.	6	5	13	August-September, 1972
	<u>peculiaris</u> n.sp.	1	-	1	November, 1974
Lebung	<u>debilis</u> n.sp.	3	4	7	April, 1969, July, 1969-70
	<u>peculiaris</u> n.sp.	1	-	1	July, 1973
Parshabari	<u>debilis</u> n.sp.	1	1	2	July, 1972
Rangpo	<u>debilis</u> n.sp.	4	1	5	May-June, 1974
Sukia pikli	<u>peculiaris</u> n.sp.	3	-	3	July, 1975
Tindharia	<u>peculiaris</u> n.sp.	2	-	2	July, 1974

Genus Heterotrisscolopus Spard:

PUNJAB :

Rahala forest	* <u>kuluensis</u> Singh	1	1	2	June, 1956
Lehrai	* <u>chandre</u> Singh	1	-	1	June, 1955

* By courtesy of Indian Museum, Calcutta

Localities	species	Male	Female	Total	Collecting period
WEST BENGAL :					
Darjeeling	<u>kuluensis</u> Singh	3	-	3	September, 1970
Kurseong	do	1	-	1	November, 1969
	<u>chandra</u> Singh	5	-	5	July, 1970, September, 1972

Genus Limonchys Eaton

WEST BENGAL
STATE :

District Darjeeling

Darjeeling	<u>brevis</u> n.sp.	11	-	11	May, 1969
	<u>pedicorria</u> n.sp.	1	1	2	May, 1969
	<u>Auscinnervinialis</u> n.sp.	3	-	3	May-June, 1969
	<u>montana</u> n.sp.	13	-	13	June, 1970
	<u>flava</u> n.sp.	9	3	12	October, 1973
	<u>distinctiventalis</u> n.sp.	1	1	2	May, 1969
	<u>necrus</u> n.sp.	12	-	12	June, 1970, September, '72
	<u>puncticollis</u> n.sp.	5	4	9	June, 1970
	<u>sootheri</u> n.sp.	5	-	5	July, 1971
	<u>uniformis</u> n.sp.	5	-	5	July, 1971

Localities	species	Male	female	Total	Collecting period
Gum	<u>netiocoria</u> n.sp.	9	1	10	May, 1972
	<u>montana</u> n.sp.	8	-	8	October, 1974
Kursong	<u>brevis</u> n.sp.	2	-	2	May, 1972
	<u>netiocoria</u> n.sp.	-	3	3	May, 1972
	<u>montana</u> n.sp.	11	-	11	October, 1973
	<u>flavus</u> n.sp.	-	1	1	May, 1976
	<u>distincticentalis</u> n.sp.	10	1	11	May, 1972, July, 1973
	<u>neotheri</u> n.sp.	12	-	12	September, 1972
Sonoda	<u>flavus</u> n.sp.	3	-	3	October, 1972
	<u>fuscicentalis</u>	2	-	2	June, 1972
Sukia pukri	<u>flavus</u> n.sp.	-	2	2	September, 1972
	<u>distincticentalis</u> n.sp.	3	1	4	September, 1974
Tindharla	<u>parvus</u> n.sp.	2	-	2	October, 1973
	<u>uniformis</u> n.sp.	3	-	3	October, 1973

Genus Heterocneme van der Wulp

INDONESIA STATE :

Aisal	<u>longipalpus</u> n.sp.	3	2	5	May, 1976
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<u>Localities</u>	<u>species</u>	<u>Male</u>	<u>female</u>	<u>Total</u>	<u>Collecting period</u>
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WEST BENGAL
STATE :

District

Darjeeling

Jorbanglow	<u>longipalpus</u> n.sp.	4	3	7	July, 1975
Kalimpong	<u>longipalpus</u> n.sp.	1	1	2	October, 1975
Tung	<u>longipalpus</u> n.sp.	6	1	7	May, 1973

Genus Parasetriconus Goetghebuer

ARUNACHAL STATE :

Dun Dun	<u>subumbilus</u> n.sp.	3	-	3	September, 1972
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MEGHALAYA STATE :

Tura	<u>pallus</u> n.sp.	2	1	3	June, 1973
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WEST BENGAL
STATE :

District

Darjeeling

Darjeeling	<u>pallus</u> n.sp.	3	4	7	May-June, 1973, '75
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Localities	species	Male	female	Total	Collecting period
Jorbanglow	<u>subrubellus</u> n.sp.	3	-	3	September, 1972
Bursong	<u>pullus</u> n.sp.	4	2	6	May, 1973, '76
Lebong	<u>subrubellus</u> n.sp.	6	-	6	May, 1973
Sonada	<u>pullus</u> n.sp.	2	2	4	July, 1975
Tung	<u>pullus</u> n.sp.	6	-	6	July-August, 1974

Genus Paraphascoloides Thioncaem

MANIPUR STATE :

Imphal	<u>albuelatus</u> n.sp.	4	-	4	June, 1976
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MIZORAMA STATE :

Shillong	<u>albuelatus</u> n.sp.	2	-	2	September, 1976
Tura	<u>trichialis</u> n.sp.	2	3	5	September, 1974

SIKIM STATE :

Gangtok	<u>albuelatus</u> n.sp.	5	-	5	September, 1976
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Localities	species	Male	female	Total	Collecting period
WEST BENGAL STATE :					
<u>District -</u>					
<u>Darjeeling</u>					
Darjeeling	<u>albucalatus</u> n.sp.	3	-	3	May, 1973
	<u>trichialis</u> n.sp.	3	2	5	November, 1973
Ceyabari	<u>proprius</u> n.sp.	3	-	3	October, 1973
Gum	<u>albucalatus</u> n.sp.	3	-	3	September, 1970, November, 1974
Kurseong	<u>trichialis</u> n.sp.	5	1	6	May, 1972
Rang Tong	<u>proprius</u> n.sp.	6	-	6	September, 1975
Tung	<u>trichialis</u> n.sp.	2	-	2	November, 1972

Genus Rhiperictorpus Thibodeaux and Harnish

ASSAM STATE :

Cashati	<u>valens</u> n.sp.	1	-	1	July, 1975
Teapur	<u>neonoronchialis</u> n.sp.	2	-	2	October, 1976

Localities	species	Male	female	Total	Collecting period
BIHAR STATE :					
Patna	<u>neopocrostichalis</u> n.sp.	4	-	4	September, 1967
Ranchi	<u>neopocrostichalis</u> n.sp.	7	-	7	September, November, 1974
	<u>valrus</u> n.sp.	2	1	3	November- December, 1972
MIZORAM STATE :					
Shillong	<u>valrus</u> n.sp.	3	-	3	September, 1975
Tura	<u>neopocrostichalis</u> n.sp.	1	-	1	August, 1976
SIKKIM STATE :					
Gangtok	<u>valrus</u> n.sp.	3	1	4	September, 1976
	<u>neopocrostichalis</u> n.sp.	5	-	5	September, 1976
WEST BENGAL STATE :					
<u>District Burdwan</u>					
Burdwan	<u>valrus</u> n.sp.	5	3	8	September-November, 1970, '71
Raniganj	<u>valrus</u> n.sp.	1	2	3	December, 1972

<u>Localities</u>	<u>species</u>	<u>Male</u>	<u>female</u>	<u>Total</u>	<u>Collecting period</u>
<u>District</u>					
<u>Darjeeling</u>					
Darjeeling	<u>yalgus</u> n.sp.	10	5	15	April-May, 1972 November, 1974
	<u>neoacrostichalis</u> n.sp.	25	-	25	October-November, 1969-71
	<u>himalayensis</u> n.sp.	27	-	27	March-May, 1968-71
Cayabari	<u>himalayensis</u> n.sp.	3	-	3	September, 1976
Chun	<u>himalayensis</u> n.sp.	7	-	7	March-April, 1970 August-September, 1968, '69
<u>Kurseong</u>					
Kurseong	<u>yalgus</u> n.sp.	6	2	8	April-May, 1972
	<u>neoacrostichalis</u> n.sp.	10	-	10	May-June, 1967
	<u>himalayensis</u> n.sp.	22	-	22	May, 1975, September-November, 1970-72
<u>Lobong</u>					
Lobong	<u>himalayensis</u> n.sp.	10	-	10	May, 1973, June, '75
<u>Siliguri</u>					
Siliguri	<u>yalgus</u> n.sp.	4	2	6	October, 1970
<u>Sonada</u>					
Sonada	<u>himalayensis</u> n.sp.	3	-	3	March, 1976

<u>Localities</u>	<u>species</u>	<u>Male</u>	<u>female</u>	<u>Total</u>	<u>Collecting period</u>
Suina	<u>valcus</u> n.sp.	1	2	3	December, 1975
Tindbaria	<u>nanocrostitibialis</u> n.sp.	15	-	15	November, 1970
	<u>himalayensis</u> n.sp.	11	-	11	September-October, 1973

District

Murshidabad

Berhampur	<u>valcus</u> n.sp.	2	1	3	November, 1976
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District

24. Purnea

Asokenagar	<u>valcus</u> n.sp.	5	1	6	September-November, 1970-71
Debra	<u>valcus</u> n.sp.	-	2	2	October-November, 1967

Genus Tidionomus Kieffer

WEST BENGAL
STATE :

District

Darjeeling

Darjeeling	<u>fuscitheca</u> n.sp.	6	4	10	September, 1972
	<u>lutea</u> n.sp.	4	3	7	May, 1973

Localities	species	Male	Female	Total	Collecting period
Coyabari	<u>fuscitheca</u> n.sp.	2	1	3	November, 1976
Jorbunglow	<u>lutea</u> n.sp.	1	1	2	June, 1975
Lebong	<u>lutea</u> n.sp.	3	3	6	June, 1973
Dung Tong	<u>fuscitheca</u> n.sp.	9	3	12	September, 1972
Sukia Pukri	<u>fuscitheca</u> n.sp.	7	5	12	May-June, 1973
<u>District</u>					
<u>Burdwan</u>					
Reniganj	<u>fuscitheca</u> n.sp.	3	2	5	August, 1974-75
	<u>lutea</u> n.sp.	1	1	2	November, 1975
<u>District</u>					
<u>Malda</u>					
Malda	<u>lutea</u> n.sp.	2	1	3	November, 1972

Genus Trichocladus Kieffer

WEST BENGAL
SRANI :

Tonglu	* <u>oxinotus</u> Kieffer	1	-	1	1911
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* By courtesy of Indian Museum, Calcutta