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Significance of Morphological Structures in the Classification of Indian Encyrtidae (Chalcidoidea : Hymenoptera)*

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The subdivision of the family Encyrtidae into subfamilies and tribes as adopted by various earlier authors is discussed. Three subfamilies (Arrhenophaginae, Tetracneminae and Encyrtinae) and six tribes (Arrhenophagini, Anthemini, Tetracnemini, Aenasiini, Encyrtini and Bothriothoracini) are considered practicable. Detailed comparative study of pronotum, eighth and tenth terga, paratergites, subgenital plate and female external genitalia has been done on Indian genera of Encyrtidae. Presence or absence of paratergites is taken as distinct subfamily character. Immovably fused and movably articulated conditions of third valvulae with second valvifers are regarded as stable characters for separating most of the tribes. Differing shapes of pronotum, paratergites, tenth tergum, subgenital plate, first and second valvifers are suggested as useful generic characters. These characters along with already recognised conventional characters have made the identification of genera more stable and practicable. Separate workable keys for subfamilies, tribes and genera are proposed.

Key Words: Significance of structures, Classification, Encyrtidae

Introduction

The family Encyrtidae was erected by Walker (1837) with *Encyrtus* as its type. He credited the authorship of the genus to Dalman instead of Latreille. Ashmead (1899) divided the family Encyrtidae into three subfamilies: Encyrtinae, Eupelminae and Signiphorinae. He (1900) further divided the subfamily Encyrtinae into four tribes: Ectromini, Mirini, Encyrtini and Arrhenophagini, principally based on the dentition of mandibles, number of tarsal segments and the condition of hypopygium. Girault (1915) broadened the scope of the family Encyrtidae by shifting the subfamily Aphelininae from Eulophidae to it. He further raised the tribe Tanaostigmini of the subfamily Eupelminae to the subfamily level (Tanaostigminae) and included it in the family Encyrtidae. Also he split the subfamily

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Ecyrtinae, into five tribes: Amirini, Eucomyni, Ectromini, Encyrtini and Arrhenophagini. Mercet (1921) took out the subfamilies Eupelminae, Signiphorinae, Aphelininae and Tanaostigminae from the family Encyrtidae and reconstituted the family so as to retain only two subfamilies: Arrhenophaginos (Arrhenophaginae) with solitary genus *Arrhenophagus* Aurivillius and Encyrtinos (Encyrtinae) with ninety-two genera. He arranged the genera of the subfamily Encyrtinae into twelve groups: Rhopus, Leptomastix, Ectroma, Mira, Aphycus, Encyrtus, Metallon, Copidosoma, Tetracladia, Eucomys, Bothriothorax and Habrolepis. This grouping of the genera is specially based on the dentition of mandibles, number of antennal segments, number of segments on maxillary and labial palpi, metallic and non-metallic condition of body, hyaline or smoky condition of fore wings, width of costal cell of hind wings and normal or triangularly expanded condition of the apical portion of the submarginal vein. Later on, Mercet (1922) added a third subfamily Antheminae to the family Encyrtidae in order to accommodate the genus *Anthemus* Howard.

Ishii (1928) divided the subfamily Encyrtinae into three tribes: Ectromini, Mirini and Encyrtini. Nikol'skaya (1952) discarded Ashmead's (1900) and Mercet's (1921, 1922) systems of classifying Encyrtidae into tribes and subfamilies respectively. Ferrière (1953) added the subfamily Signiphorinae, thereby, putting four subfamilies within the family Encyrtidae (Arrhenophaginae, Antheminae, Signiphorinae and Encyrtinae). He grouped the genera of the subfamily Encyrtinae into fifteen artificial groups as is evident from his statement "*Il faut cependant reconnaître que les caractères choisis pour séparer les genres n'ont souvent qu'une valeur relative et que les genres ainsi groupés n'ont pas nécessairement une affinité naturelle. Certains genres se retrouveront dans plusieurs groupes.*"

Hoffer (1955) agreed with Mercet's (1921, 1922) division of the family Encyrtidae into three subfamilies: Encyrtinae, Arrhenophaginae and Antheminae. Nevertheless, he did not seem to uphold Mercet's subdivision of the subfamily Encyrtinae into twelve groups. Instead, he laid emphasis on the status of the tribes by adding sixteen tribes (Anomalicornini, Anagyrini, Quadrencyrtini, Prionomasticini, Microteryni, Cheiloneurini, Aphycini, Homalotylini, Ericydnini, Discodini, Cerapterocerini, Habrolepini, Copidosomini, Ageniaspidini, Trechnitini and Cercobelini) to the already existing four tribes (Ectromini, Mirini, Encyrtini and Bothriothoracini). Simultaneously, Erdös and Novicky (1955) also considered it correct to subdivide the subfamily Encyrtinae into fifteen tribes: Tetracnemini, Bothriothoracini, Ectromini, Mirini, Encyrtini, Quadrencyrtini, Homalotylini, Aphycini, Pseudorhopini, Leptomastidini, Microteryni, Trechnitini, Copidosomini, Habrolepini and Cercobelini. The last seven tribes were contributed by Erdös and Novicky themselves.

Alam (1957) emphasized for the first time the generic importance of the pronotum, subgenital plate, outer plate (quadrate plate or 9th tergum), valvifers and valvulae of the genitalia. These characters have been later used by Sugonjaev (1960, 1964, 1968), Trjapitzin (1965); and upheld by Agarwal (1965), Shafee (1972), Shafee et al. (1975) and Hayat et al. (1975). In this respect his work may be taken as a new approach to the classification of the genera giving them more stability.

Ghesquière (1958) proposed a new tribe Psyllechthrini in the subfamily Arrhenophaginae in order to accommodate his new genus *Psyllechthrus*. We consider it unwise to minimize the significance of 4-segmented tarsi of the subfamily Arrhenophaginae and suggest Ghesquière to reconsider inclusion of the new genus in it.

Compere and Annecke (1960) upheld Ashmead (1900) in dividing the subfamily Encyrtinae into three tribes: Ectromini, Mirini

and Encyrtini. Further, they gave more stability to these tribes by proposing two new tribal characters: presence or absence of paratergites, presence or absence of third valvulae (styli). The second character, as a matter of fact, was earlier recorded as a new generic character by Alam (1957). This system of tribes was followed by Tachikawa (1963) who also added an additional character based on broad or narrow condition of the costal cell of hind wing. Kerrich (1964) renamed the tribes Ectromini and Mirini as Anagyrini and Bothriothoracini respectively. He (1967) gave an expanded version of the tribal keys provided by Compere and Annecke (1960) and Tachikawa (1963) for the purpose of making the generic identification more convenient and practical. Further, he divided the tribe Anagyrini into five subtribes: Anagyrina, Ericydnina, Aenasiina, Dinocarsiina and Aphycina on the basis of the characters of tenth tergum, paratergites, third valvulae (styli), and sclerotization and punctation of the head, etc. Very likely these characters may prove to be reliable subtribal characters even in Encyrtini and Bothriothoracini when studied in all the genera of these tribes.

A critical analysis on the distribution of 50 genera included in the present work reveals that one-third of them are cosmopolitan, viz., *Adelencyrtus* Ashmead, *Anagyrus* Howard, *Anicetus* Howard, *Aphidencyrtus* Ashmead, *Cerchysius* Westwood, *Cerapterocerus* Westwood, *Cheiloneurus* Westwood, *Comperiella* Howard, *Encyrtus* Latreille, *Euaphycus* Mercet, *Homalotylus* Mayr, *Leptomastix* Foerster, *Metaphycus* Mercet, *Microterys* Thomson, *Ooencyrtus* Ashmead, *Prochiloneurus* Silvestri, *Protyndarichus* Mercet, *Psyllaephagus* Ashmead, *Rhopus* Foerster, *Xanthoencyrtus* Ashmead and *Zaomma* Ashmead.

The second largest number of genera are reported from the Indian subcontinent of the Oriental region, e.g., *Cheilonicetus* Shafee *et al.*, *Mashhoodia* Shafee, *Mashhoodiella* Hayat, *Neoaenasioidea* Agarwal, *Neodusmetia* Kerrich, *Neoplatycerus* Subba Rao, *Neoxanthoencyrtus* Avasthi & Shafee, *Praleurocerus* Agarwal, *Proleuroceroides* Shafee et al., *Proleurocerus* Ferrière and *Pseudmicroterys* Shafee et al.

The remaining 18 genera are distributed in isolated groups in five regions almost in the following manner:

1. Oriental and Palearctic regions: *Doliphoceras* Mercet, Eugahania Mercet, *Leiocyrtus* Erdös & Novicky, *Tachardiaephagus* Ashmead and *Thomsonisca* Ghesquière.
2. Oriental, Palearctic and Nearctic regions: *Plagiomerus* Crawford, *Trechnites* Thomson and *Trichomasthus* Thomson.
3. Oriental and Ethiopian regions: *Alamella* Agarwal and *Gyranusoidea* Compere.
4. Oriental, Nearctic and Neotropical regions: *Aenasius* Walker and *Euryrhopalus* Howard.
5. Nearctic region: *Apoanagyrus* Compere and *Erythraphycus* Compere.
6. Oriental, Palearctic and Ethiopian regions: *Neodiscodes* Compere.
7. Oriental and Neotropical regions: *Leptanusia* De Santis.
8. Palearctic and Neotropical regions: *Gyranusa* Mercet.
9. Ethiopian region: *Tropidophryne* Compere.

It is, thus, suggested that the distribution of the 50 genera included in this paper is not uniform. It can further be assumed that there exists some form of conspicuous regional confinement among these 50 genera.

Discussion

The subdivision of the family Encyrtidae into subsequent subfamilies is a matter for discussion. The present authors have made a

effort to resolve it. Trjapitzin in his recent studies (1973 a, b) has conspicuously, devalued the tarsal character while reconstituting the subfamilies of Encyrtidae. According to him there are two subfamilies : Tetracneminae and Encyrtinae. Their separation is based on characters other than the number of tarsal segments. We are not prepared to minimize the value of tarsal character. We are, thus, in agreement with the earlier workers (Ashmead 1900, Mercet 1921, Ferrière 1953, Hoffer 1955, Tachikawa 1963, Kerrich 1967) in giving full recognition to this character. They are further inclined to divide the family Encyrtidae into three subfamilies and a key to these subfamilies is proposed:

1. Key to Subfamilies of Encyrtidae Walker, Based on Indian Specimens

1. Tarsi 5-segmented; fore wings with all or any of the marginal, postmarginal and stigmal veins long; labial palpi 2 to 3-segmented... 2

— Tarsi 4-segmented; fore wings with marginal, postmarginal and stigmal veins very short; labial palpi mono-segmented ... ... **Arrhenophaginae** Ashmead

2. Paratergites present (figures 1-7); subgenital plate usually reaching apex of abdomen; third valvulae in most genera fused with second valvifers; mandibles generally bidentate, rarely tridentate ... ... **Tetracneminae** Howard

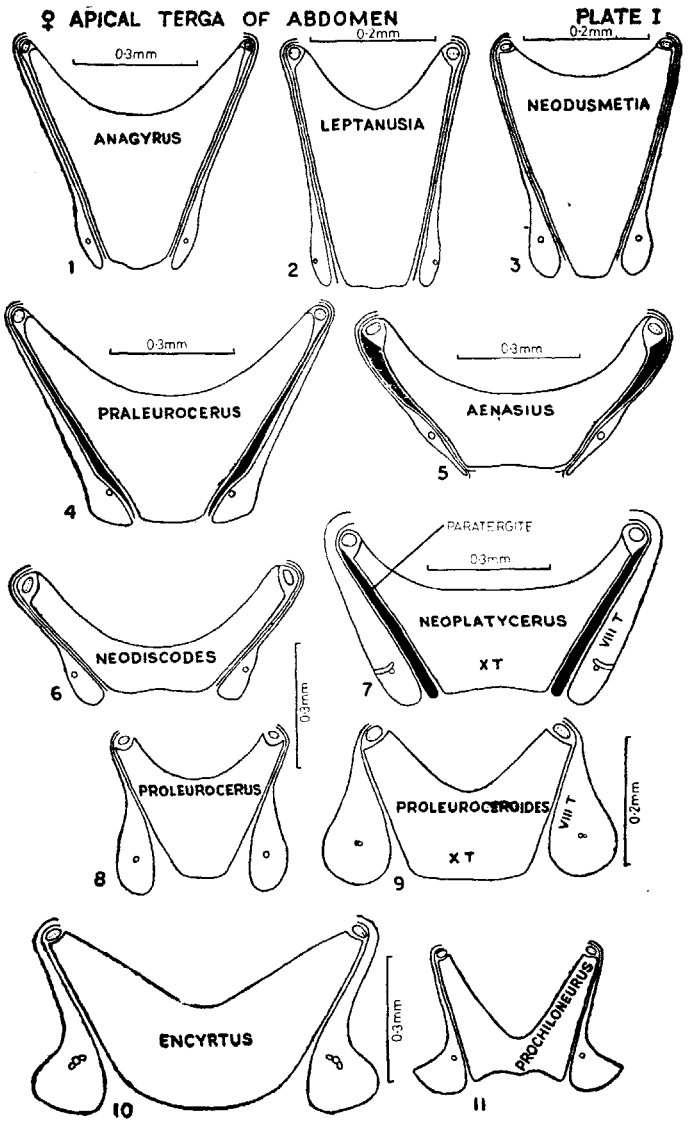
— Paratergites absent (figures 8-24); subgenital plate usually not reaching apex of abdomen; third valvulae in most genera movably articulated with second valvifers; mandibles generally tridentate, frequently with two sharp teeth and a truncation, rarely bidentate or entirely truncated apically ... ... **Encyrtinae** Walker

Kerrich (1967) has proposed the break up of the tribe Anagyrini into five subtribes (Anagyrina, Ericydnina, Dinocarsiina, Aenasiina and Aphycina). However, a close study of the characters given by him in key to the tribes of Encyrtinae and the details on the characters of the five subtribes of Anagyrini do give an impression that there are certain characters (presence or absence of third valvulae, varying width of costal cell of hind wing) whose true significance has escaped Kerrich's observation. These have been utilized by us in final reconstruction of the tribes of the subfamilies Tetracneminae and Encyrtinae. This proposed reconstitution will give tribal status to the subtribe Aenasiina of Kerrich (1967). If such reconstitution of tribes is, ultimately, accepted, then the family Encyrtidae will have six tribes (subfam. Arrhenophaginae: Arrhenophagini, Anthemini; subfam. Tetracneminae: Tetracnemini, Aenasiini; subfam. Encyrtinae: Encyrtini, Bothriothoracini). Efforts have been made to prepare a workable key for the tribes of each subfamily.

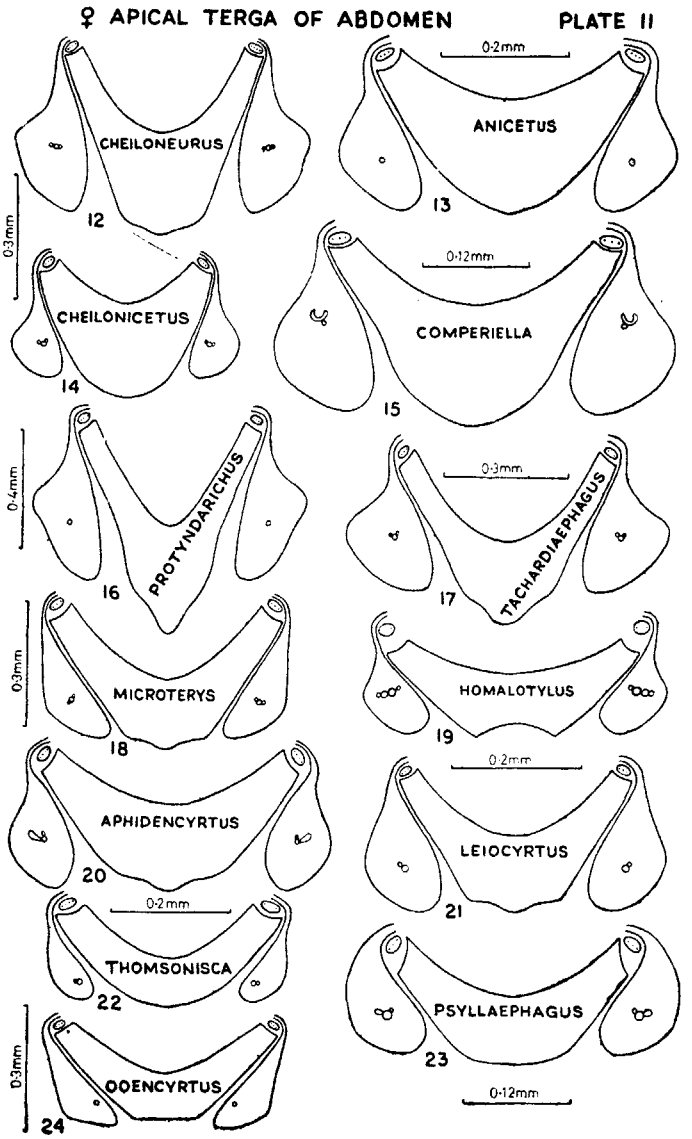
2. Key to Tribes of the Subfamily Arrhenophaginae Ashmead

1. Antennae with 2 ring-like funicle segments; club long; fore wings broad; mandibles pointed ... ... **Arrhenophagini** Ashmead

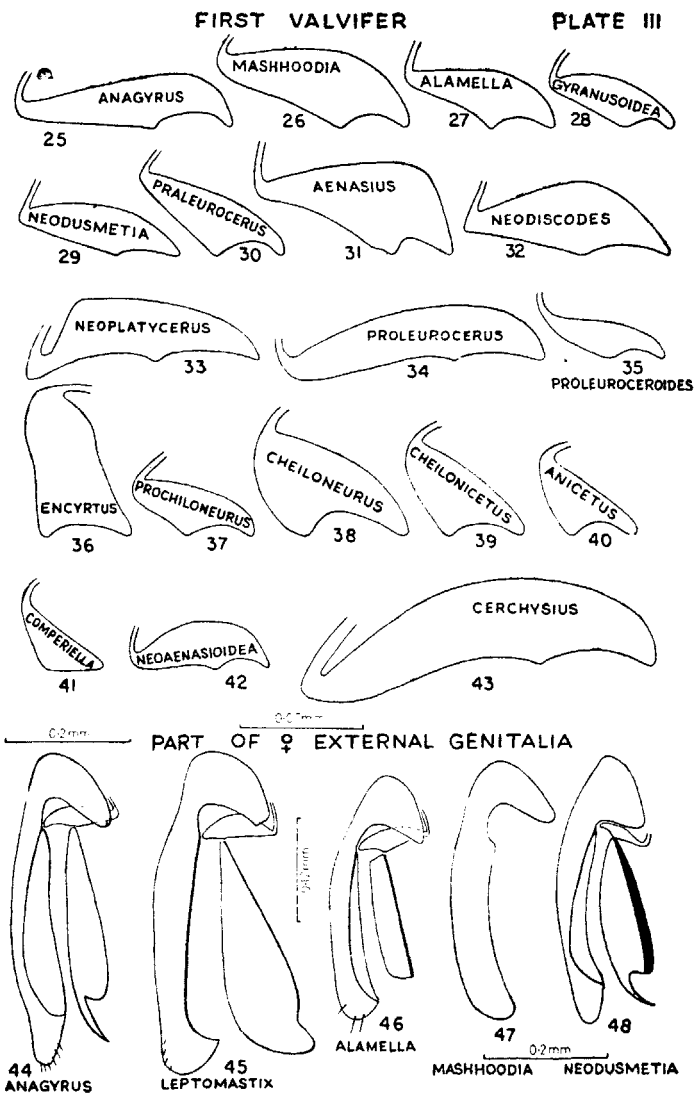
— Antennae with 5 or 6 funicle segments; club short; fore wings narrow; mandibles broad and dentate ... ... **Anthemini** Mercet



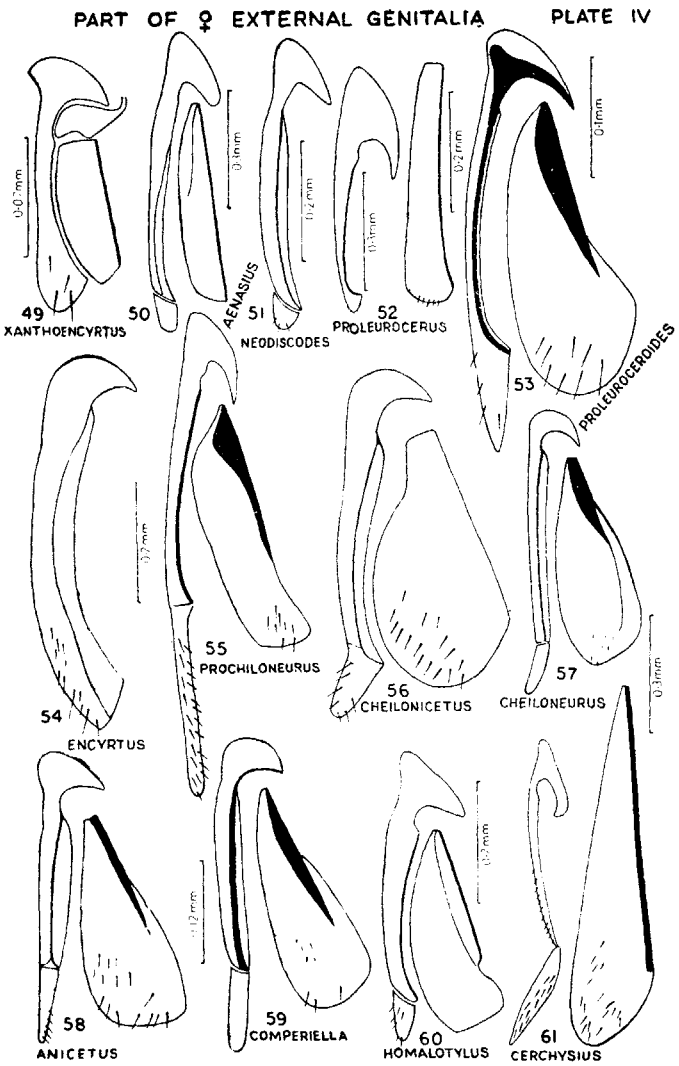
Figures 1–11. Female apical terga of abdomen: (*1*) *Anagyrus nigricorpus* Shafee et al.; (*2*) *Leptanusia indica* Hayat et al.; (*3*) *Neodusmetia sangwani* (Subba Rao); (*4*) *Praleurocerus viridis* (Agarwal); (*5*) *Aenasius advena* Compere; (*6*) *Neodiscodes indicus* Narayanan and Subba Rao; (*7*) *Neoplatycerus tachikawai* Subba Rao; (*8*) *Proleurocerus fulgoridis* Ferriere; (*9*) *Proleuroceroides pyrillae* Shafee et al.; (*10*) *Encyrtus lecaniorum* (Mayr); (*11*) *Prochiloneurus testaceus* (Agarwal)



Figures 12–24. Female apical terga of abdomen: (*12*) *Cheiloneurus kerrichi* Hayat et al.; (*13*) *Anicetus ceylonensis* Howard; (*14*) *Cheilonicetus daulai* Shafee et al.; (*15*) *Comperiella bifasciata* Howard; (*16*) *Protyndarichus nigriclavatus* shafee et al; (*17*) *Tachardiaephagus tachardiae* (Howard); (*18*) *Microterys mirzai* Shafee et al.; (*19*) *Homalotylus flaminius* (Dalman); (*20*) *Aphidencyrtus aligarhensis* Shafee et al.; (*21*) *Leiocyrtus aphidivorus* Shafee et al.; (*22*) *Thomsonisca desantisiellus* Shafee et al.; (*23*) *Psyllaephagus aligarhensis* Shafee et al.; (*24*) *Ooencyrtus ferrierei* Shafee et al.



Figures 25–48. 25–43, First valvifer: (*25*) *Anagyrus nigricorpus* Shafee et al.; (*26*) *Mashhoodia indica* Shafee; (*27*) *Alamella flava* Agarwal; (*28*) *Gyranusoideal flava* Shafee et al.; (*29*) *Neodusmetia sangwani* (Subba Rao); (*30*) *Praleurocerus viridis* (Agarwal); (*31*) *Aenasius advena* Compere; (*32*) *Neodiscodes indicus* Narayanan and Subba Rao; (*33*) *Neoplatycerus tachikawai* Subba Rao; (*34*) *Proleurocerus fulgoridis* Ferriere; (*35*) *Proleuroceroides pyrillae* Shafee et al.; (*36*) *Encyrtus lecaniorum* (Mayr); (*37*) *Prochiloneurus testaceus* (Agarwal); (*38*) *Cheiloneurus kerrichi* Hayat et al.; (*39*) *Cheilonicetus daulai* Shafee et al.; (*40*) *Anicetus ceylonensis* Howard; (*41*) *Comperiella bifasciata* Howard; (*42*) *Neoaenasioidea indica* Agarwal; (*43*) *Cerchysius laticeps* Kerrich. **44–48.** Part of female external genitalia; (*44*) *Anogyrus nigricorpus* Shafee et al.; (*45*) *Leptomastix gunturiensis* Shafee; (*46*) *Alamella flava* Agarwal; (*47*) *Mashhoodia indica* Shafee; (*48*) *Neodusmetia sangwani* (Subba Rao)



Figures 49–61. Part of female external genitalia; (*49*) *Xanthoencyrtus qadrii* Shafee et al.; (*50*) *Aenasius advena* Compere; (*51*) *Neodiscodes indicus* Narayanan and Subba Rao; (*52*) *Proleurocerus fulgoridis* Ferriere; (*53*) *Proleuroceroides pyrillae* Shafee et al.; (*54*) *Encyrtus lecaniorum* (Mayr); (*55*) *Prochiloneurus testaceus* (Agarwal); (*56*) *Cheilonicetus daulai* Shafee et al.; (*57*) *Cheiloneurus kerrichi* Hayat et al.; (*58*) *Anicetus ceylonensis* Howard; (59) *Comperiella bifasciata* Howard; (*60*) *Homalotylus flaminius* (Dalman); (*61*) *Cerchysius laticeps* Kerrich

3. Key to Tribes of the Subfamily Tetracneminae Howard

1. Third valvulae fused with second valvifers (figures 44-49); costal cell of hind wing usually narrow; body usually delicate... ... ... **Tetracnemini** Howard

— Third valvulae movably articulated with second valvifers (figures 50,51); costal cell of hind wings usually broad; body usually stout ... ... **Aenasiini** Kerrich

4. Key to Tribes of the Subfamily Encyrtinae Walker

1. Third valvulae fused with second valvifers (figures 52-54); marginal vein usually punctiform and detached from the costal margin; mandibles bidentate, tridentate or truncated ... ... **Encyrtini** Walker

— Third valvulae movably articulated with second valvifers (figures 55-71); marginal vein distinctly developed and usually attached to the costal margin; mandibles generally tridentate... ... ... **Bothriothoracini** Howard

Much has been already discussed on the subdivision of the family Encyrtidae into subfamilies, groups, tribes and subtribes. Recently, Trjapitzin has divided the family into two subfamilies (Tetracneminae and Encyrtinae), forty-eight tribes (Grandoriellini, Allocerellini, Acroaspidini, Ericydnini, Neodiscodini, Proleurocerini, Comperiini, Eugahaniini, Astymachini, Aethognathini, Neocladiini, etc.) and thirty-eight subtribes (Leptomastideina, Arhopoideina, Trechnitina, Coelopencyrtina, Aphycoideina, Platencyrtina, Syrphophagina, Pseudencyrtina, Ooencyrtina, etc.). If this work is read in continuity with the earlier works (already discussed) of Mercet (1921), Ishii (1928), Nikol'skaya (1952), Ferrière (1953), Hoffer (1955), Erdös and Novicky (1955), Compere and Annecke (1960), Tachikawa (1963), Kerrich (1967), the present authors get the impression of some confusion creeping rapidly into the classification of the already unwieldy family Encyrtidae. Actually the subdivisions into tribes and subtribes are considered quite useful in the classification of the genera. A deep insight into the works which lay emphasis on the creation of several tribes, groups and subtribes of the family Encyrtidae, normally makes the further classification at generic level rather difficult and impracticable. It is, therefore, suggested that concentrated effort be made to classify the family Encyrtidae into a few cogent, stable and practicable tribes instead of increased number of loose tribes, unnatural groups and volatile subtribes. The senior author (1957) has not supported such subdivision of the family Encyrtidae. The present authors, therefore, feel convinced that the six tribes (Arrhenophagini, Anthemini, Tetracnemini, Aenasiini, Encyrtini, Bothriothoracini) can, conveniently, take within their folds 50 genera, mostly Indian, included in this paper as is evident from the following generic keys:

5. Key to Some Indian Genera of the Tribe Tetracnemini Howard, Based on Females

1. Head prognathous; frontovertex very broad; maxillary palpi 2-segmented: labial palpi mono-segmented; pronotum narrow with marked constriction in middle (figure 74)...2

— Head hypognathous; frontovertex not very broad; maxillary palpi 3 to 4-segmented; labial palpi 2 to 3-segmented; pronotum usually normal, sometimes broad (figures 72, 73, 75) 4

2. Club 2-segmented 3

— Club 3-segmented; marginal fringe of fore wing short... ... ...**Rhopus** Foerster

3. Fore wings densely ciliate and with a well-defined speculum; marginal fringe of fore wings short, less than one-fourth of wing width; second valvifers narrow in middle with imperceptible third valvulae (figure 49); outer plate of genitalia of uniform width with thickened dorsal margin (figure 49) ... ... **Xanthoencyrtus** Ashmead

— Fore wings sparsely, indistinctly ciliate and without speculum; marginal fringe of fore wings one-half of wing width ... ... **Neoxanthencyrtus** Avasthi & Shafee

4. Antennae normal; club 2 to 3-segmented; paratergites long and uniformly narrow (figures 1-3); first valvifers usually semi-circular with variable basal margin (figures 25-29) ... 5

— Antennae compressed; club entire; paratergites widened in apical half with tapering apex (figure 4); first valvifers almost subtriangular with basal margin concave (figure 30); pronotum broad, posterior margin convex (figure 75); fore wings infuscated; subgenital plate with anterior margin conically produced in middle (figure 100) ... ... **Praleurocerus** Agarwal

5. Funicle 6-segmented 6

— Funicle 7-segmented; club 2-segmented; pedicel much shorter than first funicle segment; stigmal vein longer than marginal and postmarginal veins combined; first valvifers with basal margin deeply concave (figure 27); second valvifers, more or less, of uniform width (figure 46); outer plates of genitalia of uniform width with thickened dorsal margin (figure 46); subgenital plate almost semicircular (figure 98) **Alamella** Agarwal

6. Wings well developed; pronotum normal with posterior margin convex (figure 72); first valvifers with basal margin usually deeply concave (figures 25, 26, 28) ... 7

— Wings rudimentary; pronotum almost of uniform width with anterior margin slightly concave in middle, posterior margin straight (figure 73); first valvifers with basal margin slightly curved (figure 29); pedicel longer than following two funicle segments combined; eyes small; axillae narrow and widely separated; tenth tergum with posterior margin narrowly rounded (figure 3); second valvifers narrow in middle (figure 48); basal three-fourths of outer plate of genitalia with thickened dorsal margin, apical one-fourth sickle-shaped (figure 48) ... ... **Neodusmetia** Kerrich

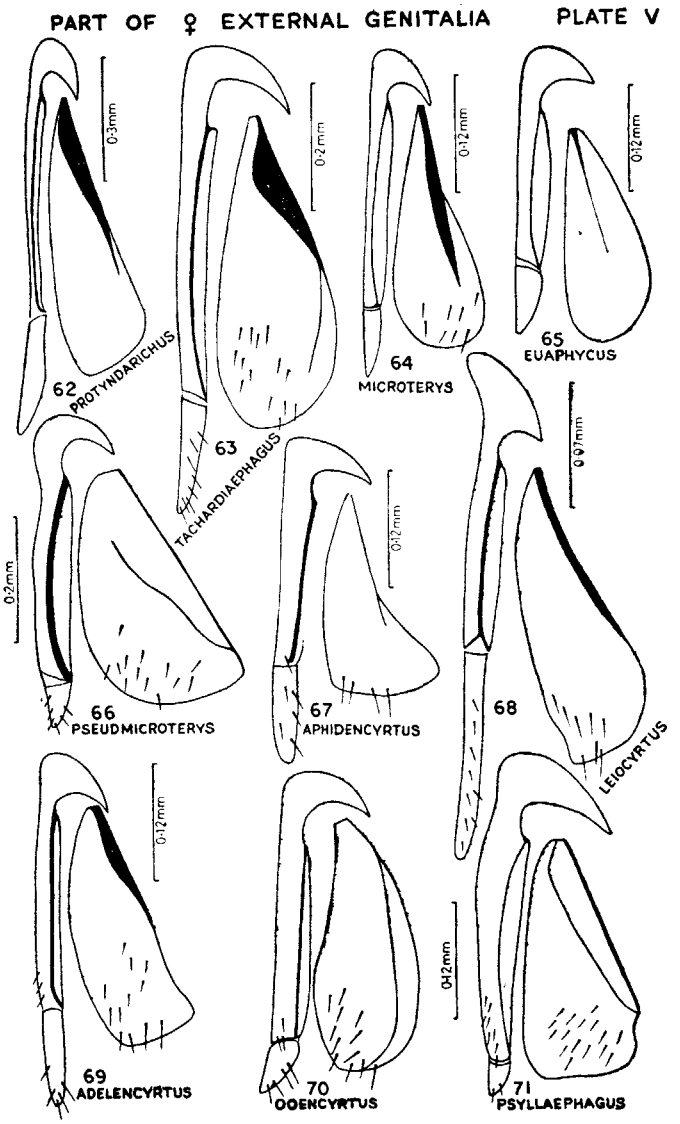
7. Scape distinctly expanded below 8

— Scape cylindrical or slightly flattened 12

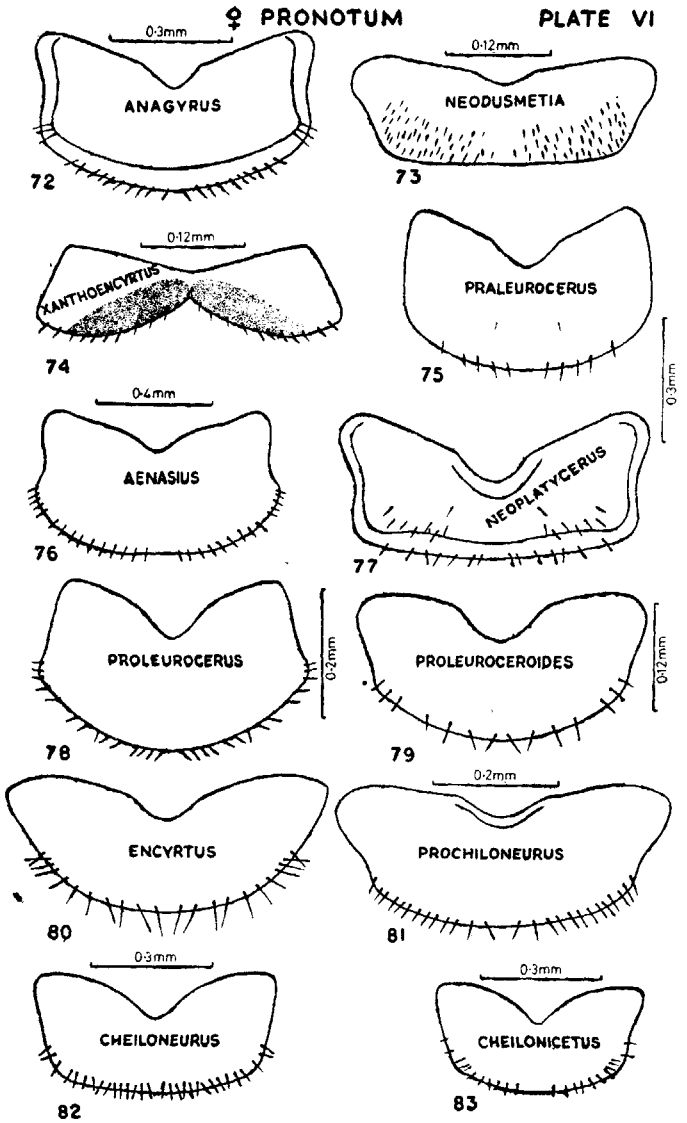
8. Frontovertex impunctate 9

— Frontovertex finely punctate 10

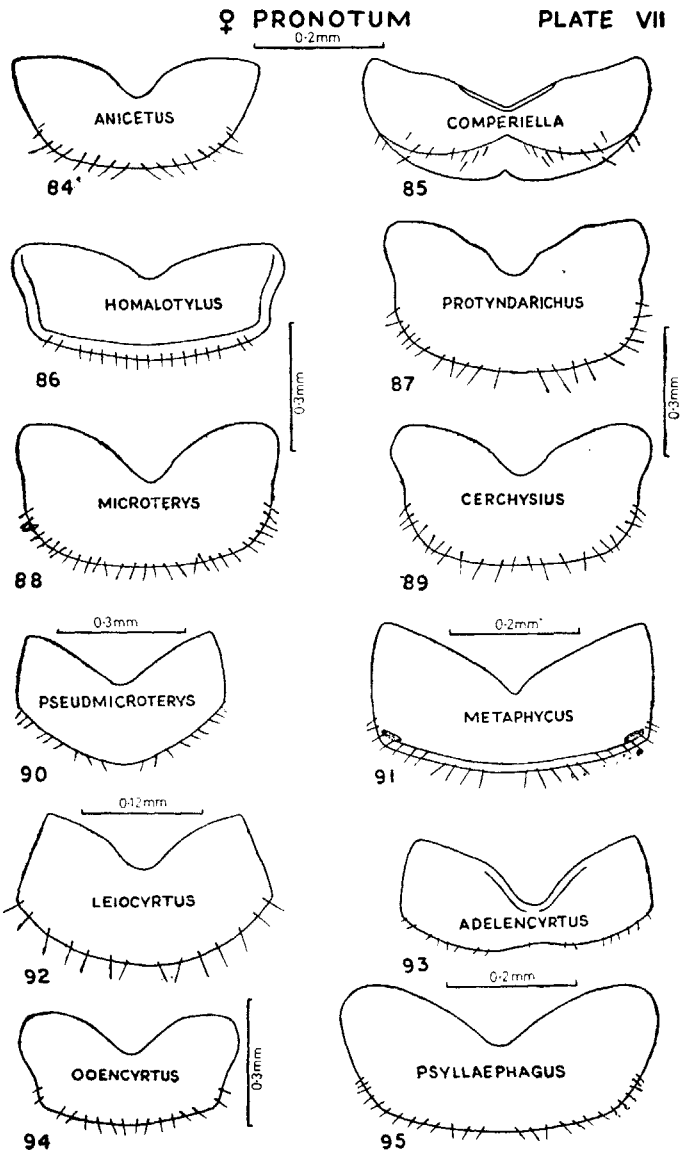
9. Fore wings hyaline; tenth tergum moderately broad with broadly rounded posterior margin (figure 1); second valvifers of usual width, third valvulae like immovable short protruberance (figure 44); outer plates of genitalia gradually broadened on basal three-fourths with thin dorsal margin, apical one-fourth very thin and pointed (figure 44);



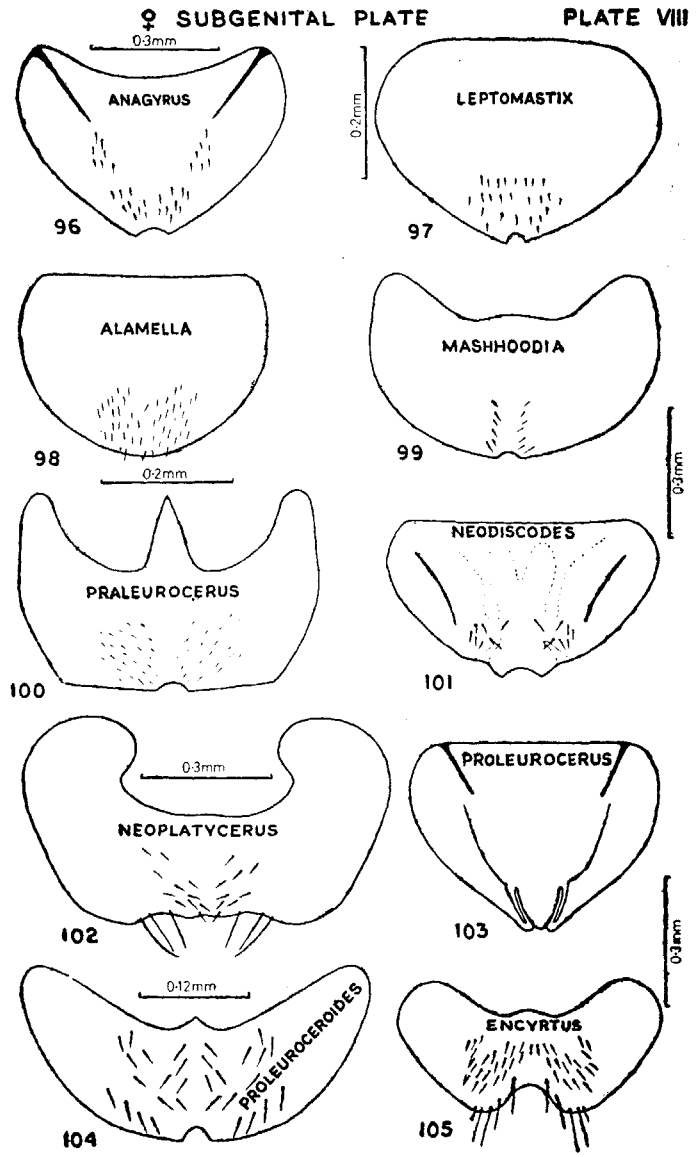
Figures 62–71. Part of female external genitalia: (*62*) *Protyndarichus nigriclavatus* Shafee et al.; (*63*) *Tachardiaephagus tachardiae* (Howard); (*64*) *Microterys mirzai* Shafee et al.; (*65*) *Euaphycus cerococci* Shafee et al.; (*66*) *Pseudmicroterys burksi* Shafee et al.; (*67*) *Aphidencyrtus aligarhensis* Shafee et al.; (*68*) *Leiocyrtus aphidivorus* Shafee et al.; (*69*) *Adelencyrtus bimaculatus* Alam; (*70*) *Ooencyrtus ferrierei* Shafee et al.; (*71*) *Psyllaephagus aligarhensis* Shafee et al.



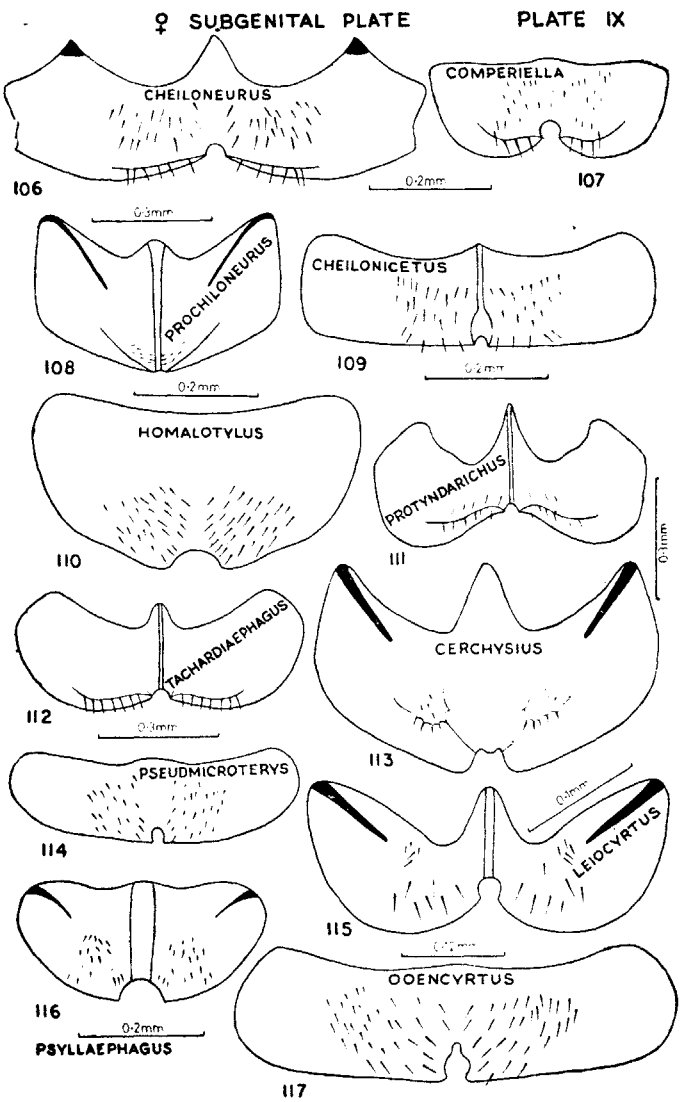
Figures 72–83. Female pronotum: (72) *Anagyrus nigricorpus* Shafee et al.; (73) *Neodusmetia sangwani* (Subba Rao); (74) *Xanthoencyrtus qadrii* Shafee et al.; (75) *Praleurocerus viridis* (Agarwal); (76) *Aenasius advena* Compere; (77) *Neoplatycerus tachikawai* Subba Rao; (78) *Proleurocerus fulgoridis* Ferrière; (79) *Proleuroceroides pyrillae* Shafee et al.; (80) *Encyrtus lecaniorum* (Mayr); (81) *Prochiloneurus testaceus* (Agarwal); (82) *Cheiloneurus kerrichi* Hayat et al.; (83) *Cheilonicetus daulai* Shafee et al.



Figures 84–95. Female pronotum: (*84*) *Anicetus ceylonensis* Howard; (*85*) *Comperiella bifasciata* Howard; (*86*) *Homalotylus flaminius* (Dalman); (*87*) *Protyndarichus nigriclavatus* Shafee et al.; (*88*) *Microterys mirzai* Shafee et al.; (*89*) *Cerchysius laticeps* Kerrich; (*90*) *Pseudmicroterys burksi* Shafee et al.; (*91*) *Metaphycus indicus* Shafee et al.; (*92*) *Leiocyrtus aphidivorus* Shafee et al.; (*93*) *Adelencyrtus bimaculatus* Alam; (*94*) *Ooencyrtus ferrierei* Shafee et al.; (*95*) *Psyllaephagus aligarhensis* Shafee et al.



Figures 96–105. Female subgenital plate: (*96*) *Anagyrus nigricorpus* Shafee et al.; (*97*) *Leptomastix gnturiensis* Shafee; (*98*) *Alamella flava* Agarwal; (*99*) *Mashoodia indica* Shafee; (*100*) *Praleurocerus viridis* (Agarwal); (*101*) *Neodiscodes indicus* Narayanan and Subba Rao; (*102*) *Neoplatycerus tachikawai* Subba Rao; (*103*) *Proleurocerus fulgoridis* Ferriere; (*104*) *Proleuroceroides pyrillae* Shafee et al.; (*105*) *Encyrtus lecaniorum* (Mayr)



Figures 106-117. Female subgenital plate: (*106*) *Cheiloneurus kerrichi* Hayat et al.; (*107*) *Comperiella bifasciatal* Howard; (*108*) *Prochiloneurus testaceus* (Agarwal); (*109*) *Cheilonicetus daulai* Shafee et al.; (*110*) *Homalotylus flaminius* (Dalman); (*111*) *Protyndarichus nigriclavatus* Shafee et al.; (*112*) *Tachardiaephagus tachardiae* (Howard); (*113*) *Cerchysius laticeps* Kerrich; (*114*) *Pseudmicroterys burksi* Shafee et al.; (*115*) *Leiocyrtus aphidivorus* Shafee et al.; (*116*) *Psyllaephagus aligarhensis* Shafee et al.; (*117*) *Ooencyrtus ferrierei* Shafee et al.

subgenital plate cup-shaped with well developed anterolateral apodemes and posterior margin distinctly notched in middle (figure 96) ... ... **Anagyrus** Howard

— Fore wings with infuscated transverse bands; tenth tergum with posterior margin truncated (figure 2); second valvifers slightly broadened in middle with thickened dorsal margin (Hayat et al. 1975: figure 14); subgenital plate semicircular without antero-lateral apodemes (Hayat et al. 1975: figure 13) ... **Leptanusia** De Santis

10. Costal cell normal 11

— Costal cell very narrow and almost, if not actually, supressed apically; scape not so widely expanded as in *Anagyrus* and the antennae longer; head, thorax and abdomen with numerous flattened white hairs; marginal, postmarginal and stigmal veins subequal; general colour orange or yellow; non-metallic; wings hyaline or longitudinally infuscated ... ... **Guranusa** Mercet*

11. Body yellow non-metallic, small in size; scape moderately expanded, about as in *Gyranusa*; face with a slight, inconspicuous, punctate convexity between the scrobes; scrobes separated above; anterior ocellus almost in the centre of the frontovertex; postmarginal vein plainly longer than stigmal vein ... ... **Gyranusoidea** Compere

— Body blackish, partly metallic, moderate in size; scape widely expanded about as in *Anagyrus;* face with a smooth, rounded convexity between the scrobes, about as prominent as that in *Leptomastix*, scrobes meeting above, almost smooth, and shining; lower part of face, mesoscutum, collar of pronotum, sides of propodeum, and basal corners of abdomen with flattened whitish hairs; marginal, postmarginal and stigmal veins subequal; wings hyaline ... ... **Apoanagyrus** Compere*

12. Pedicel at least as long as first funicle segment; face without elevated ridge between antennal sockets 13

— Pedicel shorter than first funicle segment: face with strongly elevated ridge between antennal sockets; tenth tergum much enlarged with truncated posterior margin (Zinna 1959: Pl. VII, figure 2); cerci present near base of abdomen; outer plates of genitalia narrow at base broad at apex (figure 45); subgenital plate with anterior margin straight, posterior margin with a notch in middle (figure 97) ... **Leptomastix** Foerster

13. Maxillary and labial palpi 3 and 2-segmented respectively; head and thorax with scattered punctures; fore wings with uniform setae; first valvifers with basal and apical angles, more or less, in one plane and basal margin almost straight (Alam 1957: figure 59B); second valvifers long and narrow with third valvulae as long finger-like prolongation (Alam 1957: figure 59C); basal half of outer plates of genitalia with thickened dorsal margin, apex of distal half reflected upwards (Alam 1957: figure 59A); subgenital plate V-shaped with greatly reduced posterior margin, antero-lateral apodemes distinct (Alam 1957: figure 57) ... ... **Doliphoceras** Mercet

— Maxillary and labial palpi 4 and 3-segmented respectively; head and thorax smooth and impunctate; fore wings with distinct areas of black and transparent setae; first valvifers with basal and apical angles at different levels and basal margin concave (figure 26); second valvifers moderately long and uniformly broad with imperceptible third valvulae (figure 47); subgenital plate normal with broadly rounded posterior margin, antero-lateral apodemes absent (figure 99) ... ... **Mashhoodia** Shafee

*Genera marked with asterisk have not been reported from India.

6. Key to Indian Genera of the Tribe Aenasiini Kerrich, Based on Females

1. Head coarsely punctate; club 3-segmented; pronotum broad with convex posterior margin (figure 76); tenth tergum narrow to very narrow (figures 5, 6); first valvifers with basal and apical angles at different planes (figures 31, 32); subgenital plate cup-shape with anterior margin straight and posterior margin notched in middle (figure 101) ...

— Head impunctate; club entire, obliquely truncated at apex; tenth tergum moderately broad (figure 7); paratergites and lateral lobes of eighth tergum, more or less, of uniform width (figure 7; Kerrich 1967: Plate 2, figure 2) 4

2. Frontovertex nearly always less than one-sixth total head width; none but fine punctures descend between eyes and facial impression 3

— Frontovertex of moderate width, one-third to one-sixth total head width; reticulate punctations descending at least some of the way between eyes and facial impression; paratergites broad at base, tapers posteriorly with slight curvature in apical half (figure 5; Kerrich 1967: plate 2, figure 1); first valvifers with basal margin deeply concave (figure 31) ... ... **Aenasius** Walker

3. Antennal scape strongly dilated below, 2 to 2½ times length of its greatest width; postmarginal and stigmal veins both rather long, the postmarginal slightly the longer, the stigmal emitted at a very acute angle with it; frontovertex with punctations rather coarse and deep, stronger before than behind median ocellus, and often in large part reticulate; scutellum except at side, about as shining as the mesoscutum; tenth tergum very narrow and almost of uniform width (figure 6); first valvifers with basal margin slightly concave (figure 32); paratergites uniformly narrow and hair-like (figure 6) ... ... **Neodiscodes** Compere

— Antennal scape weakly dilated below, 3½ to 6½ times length of its greatest width; postmarginal vein generally considerably longer than stigmal vein, the latter emitted at a less acute angle with it and also relatively shorter than in alternate; frontovertex with punctations shallow to moderate, stronger behind than before median ocellus, and seldom reticulate; scutellum generally decidedly less shining than the mesoscutum ... ... **Euryrhopalus** Howard

4. Marginal vein absent (Kerrich 1978: figures 35, 36); antennal scape curved above and with a broad outer fold; pedicel and flagellum moderately compressed; funicle 3 to 5-segmented ... ... **Tropidophryne** Compere*

— Marginal vein present, punctiform (Kerrich 1978: figure 39); antennal scape with a narrow fold; pedicel and flagellum strongly compressed; funicle 6-segmented; pronotum broad with posterior margin almost straight, submarginal ridge incompletely present (figure 77); first valvifer with basal and apical angles almost in one plane (figure 33); subgenital plate of uniform width with distinctly lobular antero-lateral angles, posterior margin truncated in middle (figure 102) ... ... **Neoplatycerus** Subba Rao

7. Key to Indian Genera of the Tribe Encyrtini Walker based on Females

1. Funicle 6-segmented; mesoscutum without parapsidal furrows; maxillary palpi 4-segmented, labial palpi 3-segmented 2

— Funicle 5-segmented; mesoscutum with parapsidal furrows; maxillary and labial palpi each 3-segmented; marginal vein punctiform, not touching wing margin; postmarginal vein absent; second valvifer of uniform width (Hayat et al. 1975 : figure 224) ... ... **Trechnites** Thomson

2. Costal cell of hind wings broad; body large; second valvifer of uniform width; first valvifers like elongated triangle (figure 36) 3

— Costal cell of hind wings narrow; body small; second valvifer with knob or finger-like prolongation 4

3. Mandibles apically truncate; fore wings with costal margin never notched at base of marginal vein; scutellum with a brush of hair ... ... **Encyrtus** Latreille

— Mandibles apically bidentate; fore wings with costal margin deeply notched at base of marginal vein; scutellum without brush of hair ... ... **Eugahania** Mercet

4. Head punctate; mandibles tridentate; club entire and obliquely truncated at apex; pronotum broad with acute postero-lateral angles (figure 78); tenth tergum V-shaped with posterior margin narrowly truncated (figure 8); first valvifer semicircular with basal and apical angles in one plane (figure 34); second valvifer without apical prolongation, lacks submarginal ridge (figure 52); outer plate of genitalia of uniform width (figure 52); subgenital plate cup-shaped with distinct antero-lateral apodemes, anterior margin straight, posterior margin notched in middle (figure 103) ... **Proleurocerus** Ferrière

— Head impunctate; mandibles bidentate; club 3-segmented, apex normal; pronotum with obtuse posterolateral angles (figure 79); tenth tergum with posterior margin broadly truncated (figure 9); first valvifer like an elongated triangle with basal and apical angles at different levels (figure 35); second valvifer with finger-like contiguous apical prolongation, complete and thick submarginal ridge present (figure 53); outer plate of genitalia narrow at base, broad at apex (figure 53); subgenital plate without antero-lateral apodemes, posterior margin broadly rounded (figure 104) ... ... **Proleuroceroides** Shafee et al.

8. Key to Some Indian Genera of the Tribe Bothriothoracini Howard Based on Females

1. Funicle 6-segmented 2

— Funicle 4-segmented; pedicel distinctly longer than first two funicle segments combined; club distinctly longer than funicle; mandibles with four acute teeth; scutellum with a group of long scales at apex; marginal vein longer than postmarginal and stigmal veins combined. ... ... **Plagiomerus** Crawford

2. Antennae distinctly compressed; frontovertex angularly separated from face; postero-lateral margins of pronotum without separate entities and lacks posterolateral angles (figures 84, 85) 3

— Antennae normal; frontovertex usually having gradual merger with face; posterolateral margins of pronotum with separate entities and posterolateral angles present (figures 81–83, 86–94) 5

3. Wings maculated with radiating bands; body dark and metallic 4

— Wings, more or less, completely infuscated; body yellow and non-metallic; anterior margin of tenth tergum slightly concave, posterior margin rounded (figure 13); first valvifer triangular with basal margin deeply concave (figure 40); outer plate of genitalia with a broad marginal ridge along basal half of dorsal margin (figure 58) ... ... **Anicetus** Howard

4. Thoracic dorsum flattened; fore wings with only two longitudinal diverging infuscated bands on apical half; pronotum with posterior margin angularly notched in middle and with a complete submarginal ridge (figure 85); first valvifer almost triangular with all margins, more or less, straight (figure 41); second valvifer of uniform width with complete and thick submarginal ridge (figure 59); subgenital plate with anterior margin straight, posterior margin convex with almost circular notch in middle (figure 107) ... ... **Comperiella** Howard

— Thoracic dorsum normal; fore wings maculated; pronotum with posterior margin lacking in angular notch and submarginal ridge ... ...**Cerapterocerus** Westwood

5. Scutellum with a cluster of thick setae or scales on apical half 6

— Scutellum without such cluster on apical half 9

6. Ovipositor concealed; club normal; tenth tergum with anterior margin concave, posterior margin convex (figures 12, 14); third valvulae usually short (figures 56, 57) 7

— Ovipositor greatly exserted measuring almost half or more the length of abdomen; club obliquely truncated at apex; tenth tergum with anterior margin V-shaped, posterior margin broad and wavy (figure 11); third valvulae long (figure 55); pronotum with obtuse posterolateral angles (figure 81); first valvifer triangular with basal margin moderately concave (figure 37); second valvifer very narrow with thickened dorsal margin (figure 55); subgenital plate with midlongitudinal groove and distinct antero-lateral apodemes (figure 108) ... ... **Prochiloneurus** Silvestri

7. Fore wings infuscated; central notch of posterior margin of subgenital plate without laterally directed ridges; second valvifer with distinct and complete midlongitudinal ridge 8

— Fore wings hyaline; sides of central notch of posterior margin of subgenital plate followed by laterally directed ridges (Alam 1957: figure 26); first valvifer triangular with basal margin concave (Alam 1957: figure 28B) ... **Zaomma** Ashmead

8. Scutellum with a cluster of long setae on apical half; marginal vein very long; postmarginal and stigmal veins very short; tenth tergum with anterior margin deeply concave, posterior margin short with a protrusion in its middle (figure 12); first valvifer triangular with basal margin deeply concave (figure 38); second valvifer narrow and of uniform width (figure 57); subgenital plate narrow with anterior margin cone-shaped in middle, posterior margin with a wide notch in middle, knobs on sides of the notch followed by incomplete and faint laterally directed ridges, anterolateral apodemes distinct (figure 106) ... ... **Cheiloneurus** Westwood

— Scutellum with a cluster of scales on apical half; marginal and stigmal veins subequal; tenth tergum with anterior margin slightly concave, posterior margin broadly rounded

(figure 14); first valvifer triangular with basal margin slightly concave (figure 39); second valvifer moderately broad (figure 56); subgenital plate of uniform width with straight posterior margin whose central notch is connected with the anterior margin through faint midlongitudinal groove, anterolateral apodemes absent (figure 109) ... ... **Cheilonicetus** Shafee et al.

9. Legs long, slender and flattened; middle tibial spur long and slender; fore wings with broad infuscated patch beneath the stigmal vein 10

— Legs and middle tibial spur normal; fore wings usually without infuscation ... 12

10. Parapsidal furrows well developed; club not wider than preceding segment; marginal vein punctiform; postmarginal vein well developed; second valvifer narrow in middle...11

— Parapsidal furrows absent; club wider than preceding segment; marginal vein distinctly longer than wide; postmarginal vein rudimentary; subgenital plate moderately broad and of uniform width having anterior and posterior margins, more-or-less, straight (Hayat 1972: figure 15) ... ... **Mashhoodiella** Hayat

11. Ovipositor concealed; club entire; first valvifer triangular with basal and apical angles at different levels (figure 60); third valvulae short (figure 60); lateral and posterior margins of pronotum with complete submarginal ridge (figure 86); tenth tergum with posterior margin concave (figure 19); subgenital plate with anterior margin slightly concave, posterior margin with a semicircular notch in middle (figure 110); second valvifer with complete and thick dorsal marginal ridge which extends as broad plate on its proximal portion ... ... **Homalotylus** Mayr

— Ovipositor distinctly exserted; club indistinctly 3-segmented; first valvifer semicircular with basal and apical angles almost in one plane (figure 42); third valvulae long and narrow (Agarwal 1966 : figure 19); lateral and posterior margins of pronotum without submarginal ridge (Agarwal 1966, figure 13) ... ... **Neoaenasioidea** Agarwal

12. Ovipositor concealed 13

— Ovipositor much exserted; body metallic; fore wings hyaline; marginal vein short, distinctly shorter than postmarginal and stigmal veins separately; first valvifer semicircular with basal and apical angles in one plane (figure 43); second valvifer long and very narrow, third valvulae finger-like (figure 61); outer plate of genitalia long, gradually broadening in antero-posterior direction with complete thick dorsal marginal ridge (figure 61); middle of anterior margin of subgenital plate drawn out into a long cone, anterolateral apodemes well developed (figure 113) ... ... **Cerchysius** Westwood

13. Submarginal vein normal 14

— Submarginal vein with a triangular expansion; funicle segments subquadrate; tenth tergum V-shaped with anterior margin acutely concave and posterior margin distinctly protruded in middle (figure 16); first valvifer semicircular with basal margin slightly curved; second valvifer long and uniformly narrow with complete thick midlongitudinal ridge (figure 62); outer plate of genitalia with one-fourth basal dorsal margin broadly inflected followed by submarginal ridge up to middle (figure 62); subgenital plate with anterior margin produced conically in middle (figure 111) ... **Protyndarichus** Mercet

14. Mandibles tridentate or quadridentate 15
— Mandibles with one tooth and a truncation 25
15. Marginal vein punctiform; pedicel distinctly longer than first two funicle segments combined; body non-metallic 16
— Marginal vein distinctly longer than wide 18
16. Fore wings with normal ciliation and without cross bands of whitish hairs; tenth tergum usually narrow, sometimes slightly broad 17
— Fore wings with densely crowded coarse, blackish hairs, interrupted by two cross bands of whitish hairs; tenth tergum broad with posterior margin, more-or-less, truncated (Compere 1947: figure 3) ... ... **Erythraphycus** Compere*
17. Maxillary palpi 3 to 4-segmented; labial palpi 3-segmented; scutum with traces of parapsidal furrows; knobs, on sides of central notch of subgenital plate without laterally directed ridges, anterolateral apodemes mesally directed (Alam 1957: figure 5); outer plate of genitalia with narrow submarginal ridge along basal two-thirds of dorsal margin (Alam 1957 : figure 2) ... ... **Metaphycus** Mercet
— Maxillary and labial palpi each 2-segmented; scutum entire; knobs, on sides of central notch of posterior margin of subgenital plate with laterally directed ridges, anterolateral apodemes broad and anteriorly directed (Alam 1957: figure 11); major portion of midlongitudinal area of outer plate of genitalia greatly thickened (Alam 1957: figure 15) ... ... **Euaphycus** Mercet
18. Maxillary palpi 4-segmented; labial palpi 3-segmented; pedicel usually subequal or longer than first funicle segment 19
— Maxillary palpi 3-segmented; labial palpi 2-segmented; pedicel distinctly shorter than first funicle segment; stigmal vein short and subequal to marginal vein in length; pronotum moderately broad with narrow middle region (Alam 1957 : figure 49); tenth tergum narrow and uniformly wide with anterior and posterior margins concave and convex respectively (figure 22); first valvifer like an elongated triangle (Alam 1957 : figure 53B); subgenital plate uniformly broad with very wide midlongitudinal groove, knobs on sides of notch of posterior margin, followed by laterally directed ridges (Alam 1957: figure 52) ... ... **Thomsonisca** Ghesquière
19. Pedicel not longer than basal two funicle segments combined; basal funicle segments much longer than wide; first valvifer like an elongated triangle 20
— Pedicel distinctly longer than basal two funicle segments combined; basal funicle segments transverse or monoliform; body usually metallic; pronotum usually with postero-lateral angles (figures 92, 93) 23
20. Funicle of uniform coloration; fore wings hyaline 21
— Funicle with blackish and whitish segments; fore wings infuscated with one or two transverse hyaline bands; pronotum broad and without postero-lateral angles (figure 88); central notch of posterior margin of subgenital plate with laterally directed ridges; second valvifer moderately narrow with thin complete midlongitudinal ridge (figure 64); third valvulae short and narrow (figure 64); outer plate of genitalia narrow at base,

rounded at apex with marginal inflection along basal third of dorsal margin followed by submarginal ridge along its mid-third (figure 64) ... ... **Microterys** Thomson

21. Body metallic; middle of anterior margin of subgenital plate cone-like and connected with the central notch of posterior margin by longitudinal groove (figure 112: Alam 1957: figure 48) 22

— Body yellowish and non-metallic; subgenital plate very narrow and of uniform width with anterior and posterior margins almost straight, midlongitudinal groove absent (figure 114); pronotum moderately broad with posterolateral angles (figure 90); second valvifer moderately broad with complete thick midlongitudinal ridge (figure 66); outer plate of genitalia very broad with oblique ridge commencing near postero-dorsal angle runs in postero-anterior direction (figure 66) ... ... **Pseudmicroterys** Shafee et al.

22. Frontovertex with large punctures; pedicel slightly shorter than first funicle segment; distal funicle segments depressed and much wider than basal segments; thorax metallic; knobs on sides of central notch of posterior margin of subgenital plate followed by short ridges (Alam 1957: figure 48) ... ... **Trichomasthus** Thomson

— Frontovertex without punctures; pedicel longer than first funicle segment; funicle segments cylindrical; thorax non-metallic, yellow; knobs on sides of central notch of posterior margin of subgenital plate followed by well developed laterally directed ridges (Shafee 1972 : figure 9) ... ... **Tachardiaephagus** Ashmead

23. Mandibles tridentate or with two teeth and a truncation; pronotum usually broad (figure 92); tenth tergum moderately broad with posterior margin slightly protruded in middle (figures 20, 21); third valvulae long and lanceolate; parasites of Aphids ... 24

— Mandibles quadridentate; pronotum narrow with anterior margin deeply concave in middle (figure 93); second valvifer moderately broad with complete thick midlongitudinal ridge (figure 69); outer plate of genitalia with thickened dorsal marginal inflection at basal half (figure 69) ... ... **Adelencyrtus** Ashmead

24. Mandibles with two acute teeth and a truncation; basal funicle segments longer than wide; club shorter than funicle; anterior margin of tenth tergum slightly concave, posterior margin ill defined (figure 20); subgenital plate broad with anterior margin straight and lacking in midlongitudinal groove and anterolateral apodemes (Alam 1961: figure 5); outer plate of genitalia with oblique ridge starting from basal one-third of dorsal margin and extending up to three-fourths length of the plate (Alam 1961 : figure 6); second valvifer long, slender and devoid of midlongitudinal ridge (Alam 1961 : figure 8) ... ... **Aphidencyrtus** Ashmead

— Mandibles with three acute teeth; funicle segments transverse; club longer than funicle; anterior margin of tenth tergum deeply concave, posterior margin well defined (figure 21); subgenital plate narrow, middle of anterior margin thrown out into a long cone and connected with the central notch of posterior margin by midlongitudinal groove, anterolateral apodemes well developed (figure 115); outer plate of genitalia with thickened dorsal marginal inflection at its basal two-thirds (figure 68); second valvifer broad with camplete midlongitudinal ridge ending by apical bifurcation (figure 68) ... ... **Leiocyrtus** Erdös & Novicky

25. Marginal vien longer than wide; postmarginal vein rudimentary; antennae attached near oral margin; pronotum with posterolateral angles (figure 94); first valvifer subtriangular (figure 70); tenth tergum narrow (figure 24); lateral lobes of eighth tergum subtriangular (figure 24); subgenital plate of uniform width and lacks in midlongitudinal groove and anterolateral apodemes (figure 117); parasites of eggs ... **Ooencyrtus** Ashmead

— Marginal vein punctiform; postmarginal vein developed; antennae attached away from oral margin; pronotum without posterolateral angles (figure 95); first valvifer almost semicircular (figure 71); tenth tergum moderately broad (figure 23); lateral lobes of eighth tergum broadly rounded at apex (figure 23); subgenital plate with broadly rounded posterior margin and bearing midlongitudinal groove and anterolateral apodemes (figure 116) ... ... **Psyllaephagus** Ashmead

References

Agarwal M M 1965 Taxonomy of Encyrtid parasites (Hymenoptera: Chalcidoidea) of Indian Coccoidea; *Acta Hymenopt.* **2** 37–97

_____ 1966 Three undescribed genera and species of Encyrtidae (Hymenoptera: Chalcidoidea) parasitic on coccids; *Proc. Indian Acad. Sci.* **63** 67–79

Alam S M 1957 The taxonomy of some British Encyrtid parasites (Hymenoptera) of scale insects (Coccidoidea); *Trans. R. ent. soc. Lond.* **109** 421–466

_____ 1961 Undescribed Encyrtid parasites of Homopterous insects (Hymenoptera : Chalcidoidea); *Beitr. Ent.* **11** 803–812

Ashmead W H 1899 Classification of the old family Chalcididae; *Proc. ent. Soc. Wash.* **4** 242–249

_____ 1900 on the genera of Chalcid-flies belonging to the subfamily Encyrtinae; *Proc. U.S. nat. Mus.* **22** 323–412

Compere H 1947 A report on collection of Encyrtidae with descriptions of new genera and species; *Univ. Calif. Publs. Ent.* **8** 1–24

_____ and Annecke D P 1960 A reappraisal of *Aphycus* Mayr, *Metaphycus* Mercet and related genera (Encyrtidae); *J. ent. Soc. sth Afr.* **23** 375–389

Erdös J and Novicky S 1955 Genera *Encyrtidarum regionis* palaearctidae; *Beitr. Ent.* **5** 165–202

Ferrière C 1953 Encyrtides palearctiques (Hym. Chalcidoidea) Nouvelle table des genres avec notes et synonymies; *Mitt. schweiz. ent. Ges.* **26** 1–45

Ghesquière J 1958 Le premier oviparasite de psylle et son hote Trioze erythreae (Del Guercio) au Congo Belge; *Proc. Xth Int. Congr. Ent. Montreal* 1956 **1** 275–280

Girault A A 1915 Australian Hymenoptera Chalcidoidea VII; *Mem. Queensl. Mus.* 41–184

Hayat M 1972 Descriptions of two new genera and species of Encyrtidae (Hymenoptera, Chalcidoidea) with notes on some described species; *Acta ent. bohemoslov.* **69** 207–214

_____, Alam S M and Agarwal M M 1975 Taxonomic survey of Encyrtid parasites (Hymenoptera : Encyrtidae) in India; *Alig. Musl. Univ. Publ. (Zool. Ser.) Indian Ins. Typ.* **9** 1–112

Hoffer A 1955 The phylogeny and taxonomy of the family Encyrtidae (Hym., Chalcidoidea); *Acta Mus. nat. prague B11* 1–22

Ishii T 1928 The Encyrtidae of Japan. I, *Bull. Imp. agric. Exp. stn. Japan* **3** 79–160

Kerrich GJ 1964 Comment on the proposed replacement of *Mirini* Ashmead; 1900; *Bull. Zool. Nom,* **21** 267

_____ 1967 on the classification of the Anagyrine Encyrtidae with a revision of some of the genera (Hymenoptera: Chalcidoidea); *Bull. Br. Mus. (nat. hist.) Ent.* **20** 141–250

_____ 1978 A revision of the dinocarsiine Encyrtidae with a study of the genus *Pelmatencyrtus* De Santis (Hymenoptera: Chalcidoidea); *Zool. J. Linn. Soc.,* **62** 109–159

Mercet R G 1921 Himenopteros, fam. Encyrtidos. *Trab. Mus. nac. Cienc. nat. Madr.* 1–732

_____1922 Una subfamilia nueva de Himenopteros Chalcidoideos; *Bol. R. Soc. Esp. Hist. Nat.* **22** 363–370

Nikol'skaya M N 1952 The Chalcid fauna of the USSR; *Opred. Fauna SSSR. Moscow* **44** 1-575

Shafee S A 1972 A new genus of Encyrtidae (Hymenoptera) from India; *J. Ent.* **41** 159–162

_____, Alam S M and Agarwal M M 1975 Taxonomic survey of *Encyrtid parasites* (Hymenoptera : Encyrtidae) in India; *Alig. Musl. Univ. Publ. (Zool. Ser.) Indian Ins. Typ.* **10** 1–125

Sugonjaev E S 1960 on the species of the genera allied to *Aphycus* Mayr (Hymenoptera, Chalcidoidea) from the European part of the USSR; *Ent. Obozr.* **37** 308–318

_____ 1964 Palaearctic species of the genus *Blastothrix* Mayr (Hymenoptera, Chalcidoidea) with remarks on their biology and economic importance Part I; *Ent. Obozr*, **43** 368–390

_____ 1968 New species of *Chalcides* (Hymenoptera, Chalcidoidea) parasites of psyllids and scale insects (Homoptera, Psylloidea and Coccoidea), from deserts and semi-deserts of Middle Asia and Kazakhastan. I; *Ent. Obozr.* **47** 589–604

Tachikawa T 1963 Revisional studies on the Encyrtidae of Japan (Hymenoptera : Chalcidoidea); *Mem. Ehime Univ.*, VI, **9** 1–264

Trjapitzin V A 1965 New *Encyrtid* species (Hymenoptera, Encyrtidae) in the primorye territory of the USSR; *Ent. Obozr.* **44** 885–906.

_____ 1973a Classification of parasitic Hymenoptera of the family Encyrtidae (Chalcidoidea). Part I. Review of systems of classifications, the subfamily Tetracneminae Howard, 1892; *Ent. Obozr.* **52** 163–175

_____ 1973b Classification of parasitic Hymenoptera of the family Encyrtidae (Chalcidoidea). Part II. The subfamily Encyrtinae Walker 1837; *Ent. Obozr.* **52** 416–429

Walker F 1837 Monographia Chalciditum; *Ent. Mag. Lond.* **4** 439–461

Zinna G 1959 Specializzazione entomoparassitica negli Encyrtidae studio morfologico, etologico e fisiologico del *Leptomastix dactylopii* Howard; *Bull. Lab. Ent. Agr. Portici*, **18** 1–150