

Monograph of Malcinae, with reconsideration of morphology and phylogeny of related groups (Heteroptera, Malcidae)

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CONTENTS

| | |
|--|-----|
| I. Introduction | 352 |
| II. Acknowledgements | 354 |
| III. Abbreviations and lettering of figures | 355 |
| IV. Morphology | 357 |
| a) Introduction | 357 |
| b) History | 358 |
| c) Morphology of Malcinae | 358 |
| 1. Adults | 358 |
| 2. Nymphs | 358 |
| 3. Eggs | 384 |
| d) Morphology of Chauliopiniae | 384 |
| 1. Adults | 384 |
| 2. Nymphs | 397 |
| e) Discussion of morphology etc. of Malcinae, Chauliopiniae and related groups | 397 |
| 1. Adults | 397 |
| 2. Nymphs | 416 |
| 3. Eggs | 418 |
| 4. Anatomy and cytology | 418 |
| 5. Zoogeography | 420 |
| V. Phylogeny and rank of Malcinae, Chauliopiniae and related groups | 420 |
| a) History | 420 |
| b) Phylogeny | 421 |
| c) Rank | 425 |
| VI. Malcidae — diagnosis | 427 |
| VII. Chauliopiniae — diagnosis | 428 |
| VIII. Malcinae — references and diagnosis | 429 |
| IX. Revision of the genus <i>Malcus</i> Stål | 430 |
| | 351 |

| | |
|---|-----|
| a) References and history | 430 |
| b) Systematic characters | 431 |
| c) Biometrics | 434 |
| d) Keys | 450 |
| e) Descriptive part | 462 |
| Remarks | 462 |
| 1. <i>Malcus auriculatus</i> , n. sp. | 463 |
| 2. <i>Malcus dentatus</i> , n. sp. | 464 |
| 3. <i>Malcus elongatus</i> , n. sp. | 466 |
| 4. <i>Malcus flavidipes</i> Stål | 467 |
| 4a. <i>Malcus flavidipes asper</i> , n. subsp. | 468 |
| 4b. <i>Malcus flavidipes flavidipes</i> Stål | 470 |
| 4c. <i>Malcus flavidipes kumaunensis</i> , n. subsp. | 477 |
| 5. <i>Malcus furcatus</i> , n. sp. | 479 |
| 6. <i>Malcus idoneus</i> Horváth | 481 |
| 7. <i>Malcus inconspicuus</i> , n. sp. | 483 |
| 8. <i>Malcus indicus</i> , n. sp. | 485 |
| 9. <i>Malcus insularis</i> , n. sp. | 487 |
| 10. <i>Malcus japonicus</i> Ishihara et Hasegawa | 489 |
| 11. <i>Malcus mishmi</i> , n. sp. | 491 |
| 12. <i>Malcus nigrescens</i> , n. sp. | 492 |
| 13. <i>Malcus nigrofasciatus</i> , n. sp. | 494 |
| 14. <i>Malcus pallidus</i> , n. sp. | 496 |
| 15. <i>Malcus setosus</i> , n. sp. | 498 |
| 16. <i>Malcus similis</i> , n. sp. | 499 |
| 17. <i>Malcus sinicus</i> , n. sp. | 501 |
| 18. <i>Malcus thoracicus</i> , n. sp. | 503 |
| 19. <i>Malcus tuberculatus</i> , n. sp. | 504 |
| X. Zoogeography and speciation of Maleinae | 508 |
| XI. Remarks on ecology of Maleinae | 509 |
| XII. Summary | 510 |
| XIII. References | 511 |

I. Introduction

This paper has several purposes: 1. to describe the morphology of Maleinae and Chauliopininae (previously classified as subfamilies of Lygaeidae), 2. to compare these groups with related bugs, to ascertain their phylogenetic relationship and to establish their position in hierarchical classification, 3. to review the present knowledge of Maleinae, and to revise their taxonomy and distribution.

In the discussion many new data on the morphology of Berytidae and Colobathristidae are given, and since the preliminary checking of the morphology of Maleinae and Chauliopininae pointed always to the mentioned families as well as to lygaeid subfamily Cyminae, practically only these groups are disc-

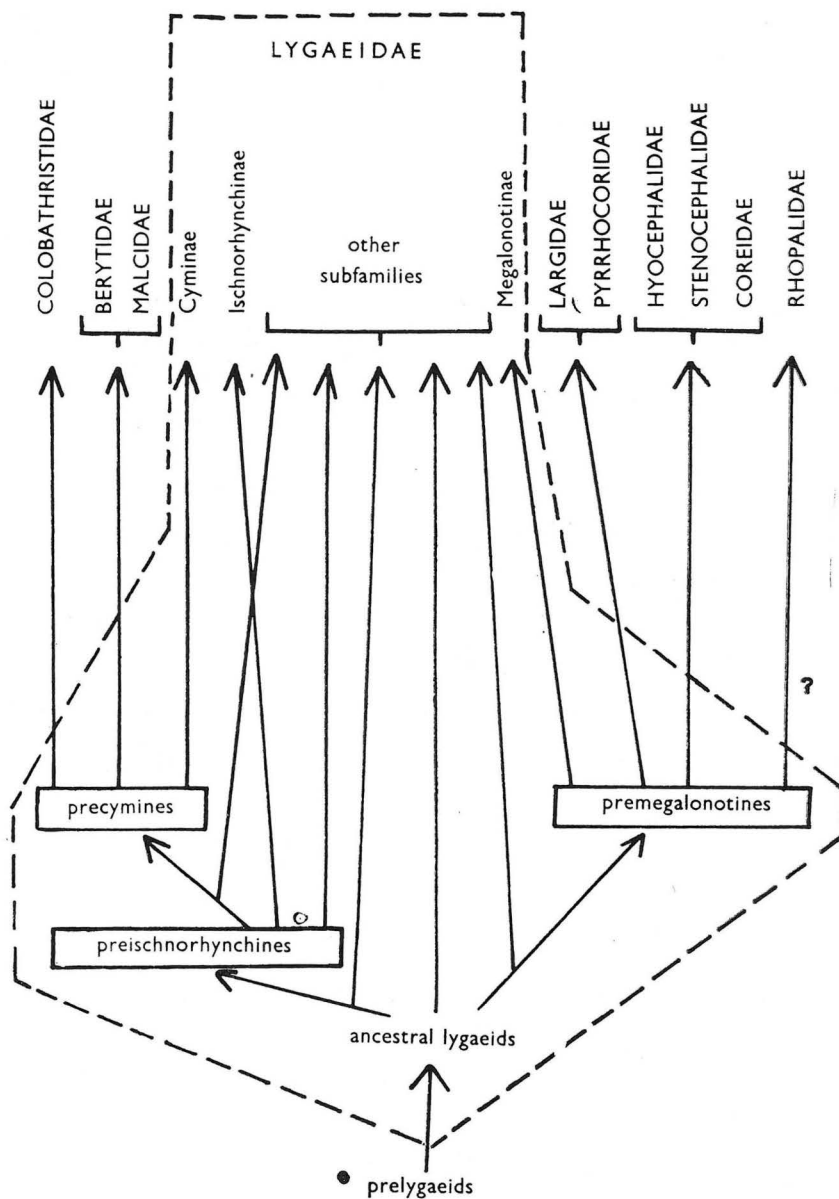


Fig. 1. Scheme showing phylogenetic relations within Coreoidea. Explanation in text.
Morphology of *Malcus furcatus*, n. sp.

ssed. This paper can be regarded as a monograph of Malcinae, the subfamily Chauliopininae having been studied only from the morphological and phylogenetic points of view.

Two difficulties were experienced in the preparation of this paper. The first one was the placing of ascertained morphological facts into a phylogenetic context, and to draw some conclusion as to the hierarchical rank of studied groups. It has been found (as in a similar case in Hyocephalidae — Štys 1964) that it is not possible to mix the higher taxonomy of any group with its phylogeny, and that in the study of phylogeny one cannot rely only on stable characters invariably occurring in given groups but that much more important is a complex of trends connecting the taxa of a respective evolutionary line. Some theoretical opinions had to be discussed in the chapter devoted to the phylogeny and rank of Malcinae and Chauliopininae.

The next difficulty is invariably connected with the study of tropical material: large areas are unexplored, in many species adequate series showing individual variability are not at hand, in many species only unique specimens are known, and, therefore, it is often uncertain whether species or geographic subspecies are involved. This is all applicable to Malcinae. Most of the species are extraordinarily similar, and for their discrimination a large complex of characters had to be used. The biometrical analysis of the studied material has been found very useful in preliminary sampling. Only the taxa sharing essentially the same biometric and morphological patterns (including very similar genitalia) were regarded as subspecies provided that their distribution fitted such a solution, the other taxa were regarded as distinct species. Filling gaps in the distribution of Malcinae may, of course, considerably modify my conclusions in future.

The peculiar distributional patterns of Malcinae, considered together with the fact that nearly every character of this subfamily (incl. biometrical ones) indicated different relationships among the species of Malcinae, suggested that the speciation patterns of this group should have been at least preliminarily discussed. Such discussion is certainly premature at present, but the ideas presented may stimulate progress in research of this neglected group.

The usual taxonomic and morphological methods have been applied. Morphology has been studied mostly in specimens cleared by KOH, the phallus has been inflated by the method described by Ashlock (1957). Some special methods of observing and figuring characters of taxonomic importance are described in the chapter "Systematic characters", the methods of mensuration are described in the chapter on biometrics. The figures were made by the aid of an Abbé drawing apparatus, or by a squared eye-piece; the scales are given in fig. 300. Some figures are hand-drawn or schematic and were made without an exact scale (figs. 25, 31, 33, 39, 42, 47—60, 77, 90, 102, 105, 197—199). In most morphological figures the dotted regions represent membranous or desclerotized areas.

II. Acknowledgements

I am especially indebted to Dr W. E. China (British Museum) and to Dr J. A. Slater (University of Connecticut) for considerable help in search for materi-

al and for much stimulating advice. Many other persons helped me in my work by enabling me to study material in their custody, by assistance in search for literature, by help in identification of geographical data, or by some advice, hints or helpful criticism. They were as follows: Drs P. D. Ashlock, J. Carayon, M. Chvála, J. P. Doncaster, V. Hanák, L. Hoberlandt, I. Hrdý, K. Hůrka, V. Ionescu, R. J. Izzard, S. v. Kéler, I. Kerzhner, A. N. Kiritschenko, E. Kjellander, V. Mazák, S. Miyamoto, V. Mojdl, J. Roubal, H. Sachtleben, C. Schaefer, I. Sienkiewicz, A. Soós, J. Stehlík, J. R. Štusák, R. L. Usinger, A. Villiers, E. Wagner, H. Weidner and K. Yasumatsu. To all of them I express my sincere gratitude. For some technical help I am indebted to Miss H. Marešová and Mr J. Trakal.

III. Abbreviations and lettering of figures

The numbers 1—11 indicate correlation of structures to their respective abdominal segments; the numbers 1 and 2 in the figures of female genitalia distinguish the 1st and 2nd valvifers and valvulae; the numbers 1—3 indicate the respective phragmata in the figures of the pterothorax. The names of veins are indicated by the usual symbols Sc, R, Rs, M, Cu, Pcu, 1An and 2An. The symbol → means direction.

| | | | |
|------|---|-------|---|
| a | = arolium | bsg | = basis of gonostylus |
| ac | = anteclypeus | ci | = cicatrical impression |
| acuf | = anterior branch of cubital furrow | cj | = conjunctiva |
| aep | = anterior part of mesepisternum covered by proepimeron | cl | = connexival line |
| ag | = anterior groove of the peritreme of metapleural gland | col | = collum |
| al | = anal lobe | cr | = callar region |
| ama | = articular membrane of antenna | ct | = corial tubercle |
| an | = anteriorly | cuf | = cubital furrow |
| ang | = anterior branch of gonangulum | d | = dorsally |
| ant | = anterior tubercle of gonostylus | da | = dorsal angle of gonostylus |
| ap | = smooth apex of the peritreme of metapleural gland | de | = dorsal elevation |
| as | = antennal sclerite | df | = ductifer |
| at | = antenniferous tubercle | dfl | = distal flange of spermatheca |
| ax | = apex of gonostylus | dg | = dorsal groove of the peritreme of metapleural gland |
| b | = buccula | dm | = distal margin |
| bg | = buccular groove | dn | = tooth |
| blg | = blade of gonostylus | ds | = ductus spermathecae |
| bo | = body of endophallic sperm reservoir | dsc | = ductus seminis conjunctivae |
| bs | = bulb of spermatheca | dsv | = ductus seminis vesicae |
| | | dVLTG | = dorsal part of ventral laterotergite |
| | | ea | = evaporatorium |
| | | eDLTG | = external dorsal laterotergite |
| | | f | = connected fibula of the 1 st valvula with fibular part of the 2 nd valvifer |

| | | | |
|-------|---|------|---|
| fp | = free, at repose non- retracted part of the 8 th urite in male | mtsc | = metascutum |
| fr | = frons | mtsl | = metascutellum |
| fVF | = fibular part of the 2 nd valvifer | n | = neck of endophallic sperm reservoir |
| g | = gonostylus | og | = ocellar groove |
| gng | = gonangulum | os | = ocellar sulcus |
| h | = hamus | osg | = ostiolar groove |
| hel | = hypocostal lamina | ot | = ocellar tubercle |
| hy | = hypandrium | p | = peritreme of the metapleural gland |
| i | = impression | pa | = pseudarolium |
| iDLTG | = internal dorsal laterotergite | pad | = promotor apodeme |
| il | = indication of a laterotergite | pap | = preantennal plate |
| ip | = inferior process of male genital chamber | pc | = paraclypeus |
| itl | = intertubercular line | pet | = proctiger region |
| itm | = intertergal membrane | peuf | = posterior branch of cubital furrow |
| iV | = inner surface of the ventrite | pex | = precoxale |
| iZS | = impression of zygosternum (situated in fact in the ventral part of ventral laterotergite) | pf | = parafrontal sulcus |
| | | pfl | = proximal flange of spermatheca |
| l | = line limiting anteriorly the part of head retracted into pronotum at repose | pg | = processus gonopori |
| la | = lateral angle | phl | = phallus |
| lb | = labium | php | = phragma-like apodeme |
| lo | = lateral outline | phr | = phragma |
| lpg | = lateroposterior branch of gonangulum | pl | = pleural line |
| lpp | = lateral process of phallotheca | pll | = posterior lobulus of pronotum |
| lr | = labrum | plt | = posterolateral tubercle of pronotum |
| lt | = lateral tubercle | pm | = posterior margin |
| lZS | = lobes of the 7 th zygosternum | pmt | = posteromedial tubercle of pronotum |
| m | = median | pnl | = pronotal lobe |
| ma | = medial angle | pp | = proximal part of 8 th urite in male |
| mf | = medial fracture | pps | = parapsidal sulcus |
| mp | = maxillary plate | pra | = parandrium |
| mpc | = membranous process of conjunctiva | pt | = posterior tubercle of gonostylus |
| mpg | = medioposterior branch of gonangulum | ptc | = postclypeus |
| mpr | = micropylar process | pth | = phallotheca |
| mvpn | = mesopostnotum | pZS | = process of zygosternum |
| msse | = mesoscutum | r | = part of head retracted into pronotum at repose |
| mssl | = mesoscutellum | ra | = ring apodeme of the 8 th ventral laterotergite in female |
| mTG | = mediotergite | | |
| mtpn | = metapostnotum | | |

| | | | |
|------|---|-------|--|
| rg | = ridge dividing sclerotized and desclerotized parts of the 1st valvifer | T | = tergum (or dorsal tergite) |
| rp | = retracted, externally non-visible part of the 8 th urite in male | t | = trichobothrium |
| rs | = remnant of splitting of the 7 th zygosternum in female | ta | = transverse apodeme of the 2 nd valvifer |
| s | = spiracle | tg | = tongue-and-groove mechanism of valvulae |
| scxl | = supracoxal lobe | ti | = transverse impression |
| sg | = sternal groove | ts | = tomentose spot |
| sgp | = secondary gonopore | U | = urite |
| shg | = shank of gonostylus | ut | = unguitractor |
| slm | = sublateral margin | V | = ventrite |
| sp | = superior process of pygophore | VF | = valvifer |
| spe | = sclerotized process of conjunctiva | vl | = valvula |
| spcx | = swollen part of precoxale | VLTG | = ventral laterotergite |
| sra | = semi-ring apodeme of the 2 nd valvifer | vp | = ventrally turned part of the tergum |
| st | = stapes | vs | = vesica |
| sv | = secondary vein | vsl | = vesicula |
| | | vVLTG | = ventral part of the ventral laterotergite |
| | | w | = wing of endophallic sperm reservoir |
| | | ZS | = zygosternum |

IV. Morphology

a) Introduction

In the first section of this chapter the morphology of *Malcinae* is described. It has been studied in the species *Malcus furcatus*, n. sp. The male (No. 102) and female (No. 114) (both paratypes) were dissected and figured. All figures excepting those of the female genital structures were made from male specimens, but the sexes do not differ in external morphology (exc. the structure of 7th ventrite). Only the characters of general morphological importance are described. The variability at species level is discussed in the systematic part of this paper, but as far as it concerns some more important structures, it is also mentioned here. All the characters of *M. furcatus* described in this chapter occur in other *Malcinae*, unless otherwise stated. All the characters were checked on every species of the genus, the female genitalia were, however, compared with *Malcus flavidipes flavidipes* Stål only — their important features are identical in both species. The descriptions of general shape, colour, hairs and sculpture of cuticle are based on all species of the genus, the description of distribution of tomentose spots is based on *M. flavidipes flavidipes*, but it occurs in other species of the subfamily in an only slightly modified form.

In the second section the morphology of *Chauliopininae* is described; it has been studied in a less detailed way. All species of the subfamily were studied, most of the figures were made according to *Chauliops* sp. (probably n. sp.) from South India ("Chikkaballapura", coll. British Museum), some figures were

made according to *Chauliops nigrescens* Distant, *C. rutherfordi* Distant and *Neochauliops laciniata* (Bergroth). The general remarks concerning this section are the same as the above mentioned remarks on Malcinae.

In the 3rd section of this chapter the homology of some structures of Malcinae and Chauliopinae is discussed, and the morphology of these groups is compared with other similar or related higher taxa (the zoogeography is also briefly mentioned). Generally only the morphology of Cymini, Ninini (or Lygaeidae as a whole), Berytidae and Colobathristidae is compared. Only in this section the opinions of other authors on the morphology and anatomy of Malcinae and Chauliopinae are discussed. Each character (or organ) is considered separately, and the expression e.g. "the wing venation of Malcinae is derivable from the venation of Cyminae" has there only the morphological meaning and is not to be understood as author's opinion on phylogeny.

b) History

Some points of the morphology of Malcinae and Chauliopinae were noted in various diagnoses of these groups and in keys; the respective papers are mentioned in paragraph 4 of chapter IXa (p. 430). The morphology of the abdomen in these groups was briefly studied by Breddin (1907), the phallus of Chauliopinae was described and figured by Pruthi (1925), the phallus of both groups was studied, and some characters common to both Malcinae and Chauliopinae were reviewed by Ashlock (1957). The metathoracic wing venation of both groups was described and figured by Slater and Hurlbutt (1957), the morphology of the ovipositor in Malcinae was briefly mentioned by Scudder (1957), and the morphology of the clavus in Chauliopinae was described by Štys (1963). The alimentary tract and salivary glands were studied in both subfamilies by Miyamoto (1961), the number of ovarioles in Chauliopinae also by Miyamoto (1957), the presence of 3 dorsal abdominal glands in Malcinae was mentioned by Slater, Woodward and Sweet (1962). Some characters of the abdomen of Malcinae and Chauliopinae are described or are apparent from the key by Scudder (1963).

c) Morphology of Malcinae

1. Adults

a. General shape

Dorsally rather flat, ventrally normally convex, small to medium-sized (total length 2.79—5.04 mm), more or less elongate, subparallel bugs. The ratio length of body: minimal width of combined hemelytra ranges from 3.28 to 4.77. Extremities generally very long and thin.

b. Colour (figs. 56—60)

Only the cuticular pigmentose colouring occurs. General ground colour variously shaded yellow or brown, some parts of body always dark brown to black. Nearly always the 1st and 4th antennal segments (exc. the pedunculate base of the 4th), callar region of pronotum, pterothoracic pleurae (exc. supra-

coxal lobes) and sterna, corial tubercles and abdomen much darker than other parts of the body; the legs and the 2nd and 3rd antennal segments are the lightest parts. In most species a distinct tendency to melanism occurs. In some species the distinction between the dark and light parts of pronotum is very contrasting, in some species these parts are gradually connected by intermediately coloured parts. A hypothetic scheme of a general eunomy of distribution of the dark pigment in Malcinae is given in figs. 56—60.

c. Hairs, sculpture and other cuticular structures (figs. 6, 18, 19, 61, 62)

Several types of hairs occur:

1. Semierect or erect setae, longer than other hairs and generally not arising from deep punctures. Various distributed (see descriptions of species).
2. Very minute, short and dense adpressed hairs (microtrichia?), present especially on 4th antennal segment and on legs.
3. Various long, more or less adpressed, generally strongly curved glandular hairs (figs. 18, 19) arising from deep pores (at best developed on head, pronotum, scutellum, clavus, supracoxal lobes and abdominal ventrites). Structure of the pores is best seen on hemelytra observed in transmitted light: each pore seems to be composed of several concentric rings, a small duct to the base of the hair is easily seen (these ducts are well developed also at base of marginal curved hairs on Sc on hemelytra, usually not arising from deep pores). The pores of some individuals are filled with wax-like matter and differ from the empty pores of other individuals of the same species.
4. The straight, very oblique setae present on dentes of lateral margin of ventral laterotergites and on hind margins of abdominal ventrites are obviously only modified glandular hairs, since intermediate hairs between these types occur.

Sculpture: very rough (esp. on head and pronotum), the pores bearing the glandular hairs very dense. Pleurae (exc. supracoxal lobes), callar region of pronotum, thoracic sterna and 1st antennal segment rather smooth; the 2nd — 4th antennal segments, legs and labium very smooth. Sculpture of pronotal lobe very variable at species level (described in the chapter IXe). In species with developed median and/or posteromedial and/or posterolateral pronotal tubercles, some absolutely smooth areas often occur on these structures.

On many parts of the body yellow-whitish tomentose spots (figs. 6, 61, 62) occur in all species. In some places they are very sparse and inconspicuous, in others very dense and striking. Under high magnification they look like a densely intermixed mass of more or less curled hair structures resembling sheep wool. These structures do not change when briefly treated by the usual dissolvent agents for fats, they are resistant to KOH and do not change in boiling water. In some species they are non-resistant when touched by a hot wire, and they are easily mechanically removable (e.g. *Malcus flavidipes* Stål), in others they are resistant and removable with difficulty (e.g. *M. furcatus*, n. sp.). The removability of these structures may be different on various parts of the body. No specific external sculptural structures occur under the tomentose spots, but porose structures of the inner surface of cuticle (different from other parts of cuticle) appear under these spots on the zygosterna. In most species

there is great individual variability in intensity of the development of tomentose spots (although it is fairly constant in other species) — it is unknown whether infraspecific individual variability or ontogenetic changes are involved, or if some specimens are only mechanically rubbed off. The general distribution of the tomentose spots can be seen in figs. 61 and 62. They are most developed on head, base of mesoscutellum, distal part of pronotum, all pleurae and coxae, on 2nd ventrite, on the medial part of 3rd zygosternum and in the lateral parts of 3rd—7th zygosterna, and on the ventral parts of the 2nd—7th ventral laterotergites. There exist certain interspecific differences in the distribution of these spots, but they are slight, and have not been studied in detail.

d. Head (figs. 2, 3, 4)

Narrower than pronotum, the short posterior part retracted into pronotum (at repose) and distinguished from the anterior part by absence of deep punctures. The posterior dorsal part of head horizontal, medial part slightly convex, distal part saddle-like, concave; the clypeal part of head vertical. The shape of head in lateral view nearly cubic.

Ocelli situated far behind the eyes on a common medial tubercle, close (at repose) to the anterior margin of pronotum. Ocellar tubercle laterally limited by a pair of long, longitudinal ocellar grooves. Ocellar tubercle anteriorly prolonged into a medial longitudinal ridge, changing anteriorly into an impression. Ocellar grooves anteriorly divergent and less distinct. Compound eyes large, indistinctly substylate, posteriorly and anteriorly encircled by hardly distinct ocular sulci.

Frons saddle-like, concave, its anterior margin distinctly limited from postclypeus. The oblique dorsal parts of parafrontal sulci (appearing at level of anterior ends of ocellar grooves) limit medially the peduncles of eyes. The indistinct anterior parts of parafrontal sulci situated on the anterior wall of head capsule and meeting the dorsal margins of lunulate antennal sclerites, encircling dorsally, medially and laterally the large antennal sockets. These sockets (together with the very proximal part of 1st antennal segment) covered by large preantennal plates, these are free dorsally, connected with the wall of head on other sides, but only ventrally firmly attached to the head capsule. Preantennal plates vertical, on all sides sharply limited, distinguished from other parts of the head also by colouring; they may be easily broken off. Antenniferous tubercles in their typical form are lacking. Antennae inserted close to anteroventral margins of eyes, their insertion (visible distinctly only after the removal of preantennal plates) distinctly supericorn.

The horizontal narrow proximal part of postclypeus distinctly limited from frons, the anterior part of postclypeus vertical, and laterally limited by the inner margins of preantennal plates. Anteclypeus large, parallel-sided, distally slightly widened and distinctly surpassing the paraclypei, its lateral outline undulate. Paraclypei laterally sharply limited from maxillary plates by the sulci meeting posteriorly (dorsally) the ventral margins of preantennal plates. Maxillary plates posteriorly fused with genae and gula, posteroventrally some remnants of posterior sulci of these plates distinguishable.

Bucculae well developed, posteroventral parts free and slightly postero-

ventrally produced, reaching behind the posterior margins of eyes. Ventral part of head without peculiarities.

e. Antennae (fig. 5)

Four-segmented, without intercalary segments, the 1st segment cylindrical, much thicker than the 2nd and 3rd segments. These segments stick-shaped, the 2nd much longer than the 1st, the 3rd longer than 4th, the ratio length of the 3rd segment: length of the 2nd ranges from 1.14 to 2.07. The 4th segment fusiform with pedunculate base. The 1st—3rd segments with short oblique hairs, the 4th segment with more erect, sparser and longer hairs, and (exc. its pedunculate base) densely covered by dense minute hairs. Ratio length of body: length of antenna ranges from 0.79 to 1.50 within the subfamily.

f. Mouthparts (fig. 3)

The laterally serrate labrum reaching behind the base of 2nd labial segment. Labium 4-segmented, the 1st segment reaches to slightly behind the anterior margin of prosternum, its anterior third covered by bucculae. Dorsal parts (morphologically ventral) of 1st and 3rd segments swollen. Labial formula (the segments arranged according to diminishing length, the longest first): 4, 1, 2, 3. The length of labium variable at species level, labium reaching slightly before the middle coxae up to the anterior margin of 3rd ventrite.

g. Thorax (figs. 6, 8—14)

Pronotum (fig. 6) slightly declivent (nearly horizontal in some species), lateral margin sinuate, the lateral edge not sharp. Collum distinct, callar region narrow, distinctly delimited from large pronotal lobe (indistinctly delimited in some species). The limits of callar region correspond to the limits of inner prothoracic cavity. Shallow cicatrical impressions present. Pronotal lobe with narrow and keel-like mid-line (=median), anteriorly changing in a groove (median absent or different in other species), posteriorly ending with a small posteromedial tubercle (lacking in some species). Lateral margins of pronotal lobe and of callar region slightly dentate. Posterolateral angles of pronotal lobe with indicated posterolateral tubercles (lacking in some species). Flat posterior lobuli, laterally and posteriorly distinctly margined, present behind posterolateral tubercles.

Pteronotum (figs. 8, 11): The 1st phragma small, lunulate, visible in anterior view only. Mesoscutum large, as well as the 1st phragma with medial longitudinal sulcus; traces of parapsidal sulci recognizable. The anterior part of mesoscutellum oblique, the free posterior part elevated above the level of hemelytra and deeply punctured, proximally triangular, distally nearly parallel-sided, slightly pointed and produced posteriorly, grooved medially, its most apical part with keel-like margins, apex ventrally declivent. The proximal part of the visible part of the mesoscutellum with semicircular impression, the visible part of mesoscutellum subequal (or slightly longer or shorter) to the length of claval commissure. Strong scutellar ridges and grooves present, their posterior part covered by produced apical part of mesoscutellum. Mesopostnotum narrow, medially reduced, with very strong 2nd phragma.

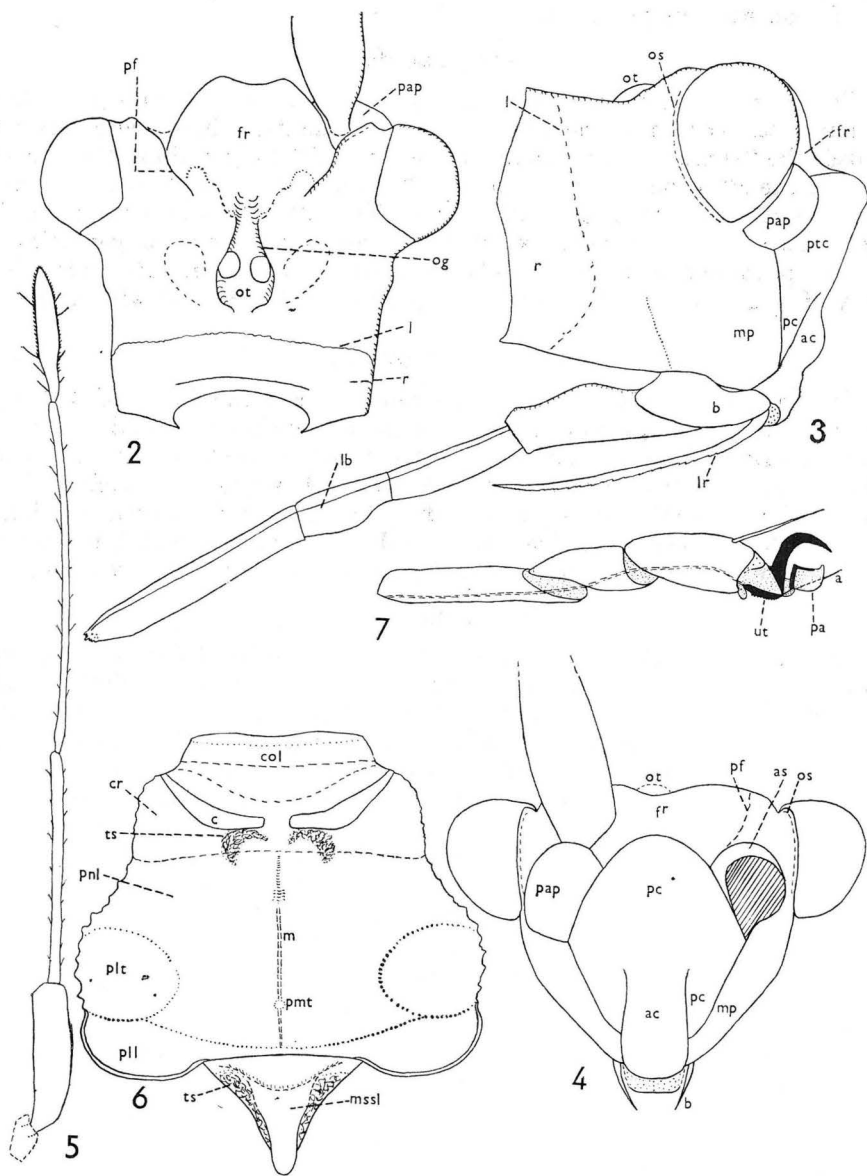


Fig. 2. Head, dorsal view. Fig. 3. Head and mouthparts, lateral view, antenna removed. Fig. 4. Head, anterior view, left antenna and preantennal plate removed. Fig. 5. Right antenna, lateral view (the outline of preantennal plate indicated by dashed line). Fig. 6. Pronotum and mesoscutellum. Fig. 7. Middle tarsus and pretarsus, the cover hairs omitted.

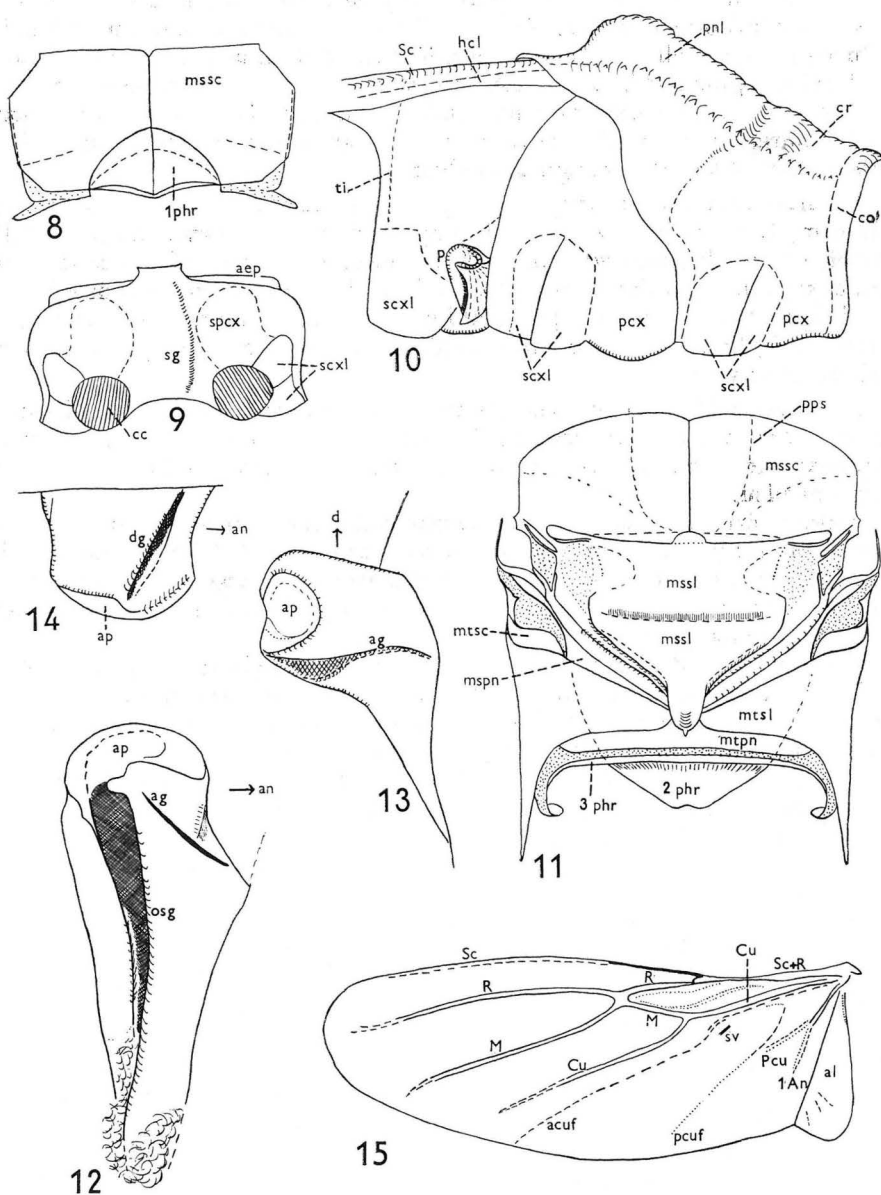
Morphology of *Malcus fureatus*, n. sp.

Fig. 8 Mesonotum, anterior view, schematized. Fig. 9. Mesothorax, ventral view, schematized. Fig. 10. Pleural region, lateral view. Fig. 11. Pterothorax, cleared, dorsal view. Fig. 12. Peritreme of metapleural gland, ventral view. Fig. 13. Peritreme, anterior view. Fig. 14. Peritreme, dorsal view. Fig. 15. Metathoracic wing.

Metascutum very reduced, visible only as a pair of small plates near the bases of metathoracic wings. Metascutellum and metapostnotum divided by produced mesoscutellum into 2 halves. Metascutellum large, laterally widened, its lateral margins continuous with the lateral margins of metepisternum. Both structures are posterolaterally spinously produced. Metapostnotum narrow. The 3rd phragma recognizable as a narrow bar, ventrally with 2 lateral apophyses: most of the 3rd phragma amalgamated with the 2nd phragma.

Pleurae and sterna (figs. 9, 10). Propleura indistinctly divided from pronotum, the lateral row of teeth may represent its dorsal margin. Collum distinct, precoxale fused with prosternum, swollen in front of supracoxal lobes. Supracoxal lobe well developed, distinctly delimited, the commissure between its epimeral and episternal parts oblique. Posterior margin of proepimeron sinuate, a slight line on epimeron indicates the posterior margin of the inner prothoracic cavity.

A considerable part of mesepisternum covered by proepimeron. Precoxale broadly fused with mesosternum, its part before the supracoxal lobe swollen. Supracoxal lobe as on prothorax, its epimeral part reaching the ventral margin of pleura.

Metepisternum with normal supracoxal lobe, precoxale divided from metasternum by the peritreme of metapleural gland. The supracoxal lobe formed by metepisternum only, metepimeron not visible externally. The posterolateral part of metepisternum spinously produced, its posterior margin with a transverse impression.

All sterna fused with precoxale. Postcoxale strongly developed on prothorax, poorly on pterothorax, always fused with sternum and always not visible externally. Therefore, all coxal cavities seem to be placed on hind margins of segments and to be open posteriorly. The distances between the coxae variable at species level (see chapter IXe). Medial parts of all sterna concave (exc. metasternum of *Malcus elongatus*, n. sp.), and forming a groove. Meso- and metasternum fused, but intersegmental sulcus distinct. Mesosternum anteriorly truncate produced. Meso- and metasternum with distinct impressions for fore and middle coxae.

Peritremes of metapleural glands (figs. 12—14). Peritreme cylindrical, laterally considerably protruding, dorsally approximately perpendicular to metepisternum. Ventrally, the peritreme appears on precoxale (slightly medioventrally from the posteroventral angle of supracoxal lobe of mesonotum), and is obliquely laterally raised at half the height of the supracoxal lobe of metanotum. The perpendicular dorsal wall of peritreme arising at the level of anterodorsal corner of the supracoxal lobe of metanotum. The peritreme occupies all the space between supracoxal lobe of metanotum and posteroventral margin of mesepimeron.

Base of peritreme covered by wax-like tomentose spot; its apex (= the most lateral part) smooth; all other parts dull and with a microsculpture resembling the boundaries between the cells of plant epidermis. The same microsculpture present also on a small, triangular *evaporatorium* situated above the peritreme, closely to the anterior margin of metepisternum.

The peritreme appears ventrally in the form of two ramparts, the anterior

covers ventrally the posterior one, which is slightly depressed on hind margin at $2/3$ of its length. A distally widening and shallowing ostiolar groove runs between these ramparts, reaches the apex of peritreme and there turns anteriorly. This smooth, slightly concave part of peritreme is limited by an horseshoe-shaped, posteriorly open ridge. There are two other grooves on the peritreme. The anterior groove runs along the anterior surface of peritreme, is perpendicular to the surface of metepisternum, and terminates closely under the ventrolateral part of the horseshoe-shaped ridge of the apex of peritreme. The dorsal groove runs along the whole dorsal surface of peritreme and terminates on the dorsal part of the ridge on the apex.

h. Legs (fig. 7)

All coxae rotatory, with trochalopodous articulation. All three pairs of legs very similar, rather long and thin, without peculiarities. Prefemur not developed. Femora long, thin, tibiae stick-shaped, with some fine spinous hairs (as have the femora). Tarsi 3-segmented, the 1st segment longest, stick-shaped, the 2nd shortest, the 3rd incrassate, with conspicuous dorsal seta.

Pretarsus (fig. 7): claws simply arch-shaped, pseudarolia large, their proximal and dorsal margins sclerotized. Arolium represented by paired setae, unguitractor ventrally serrate.

i. Hemelytra (figs. 16, 17)

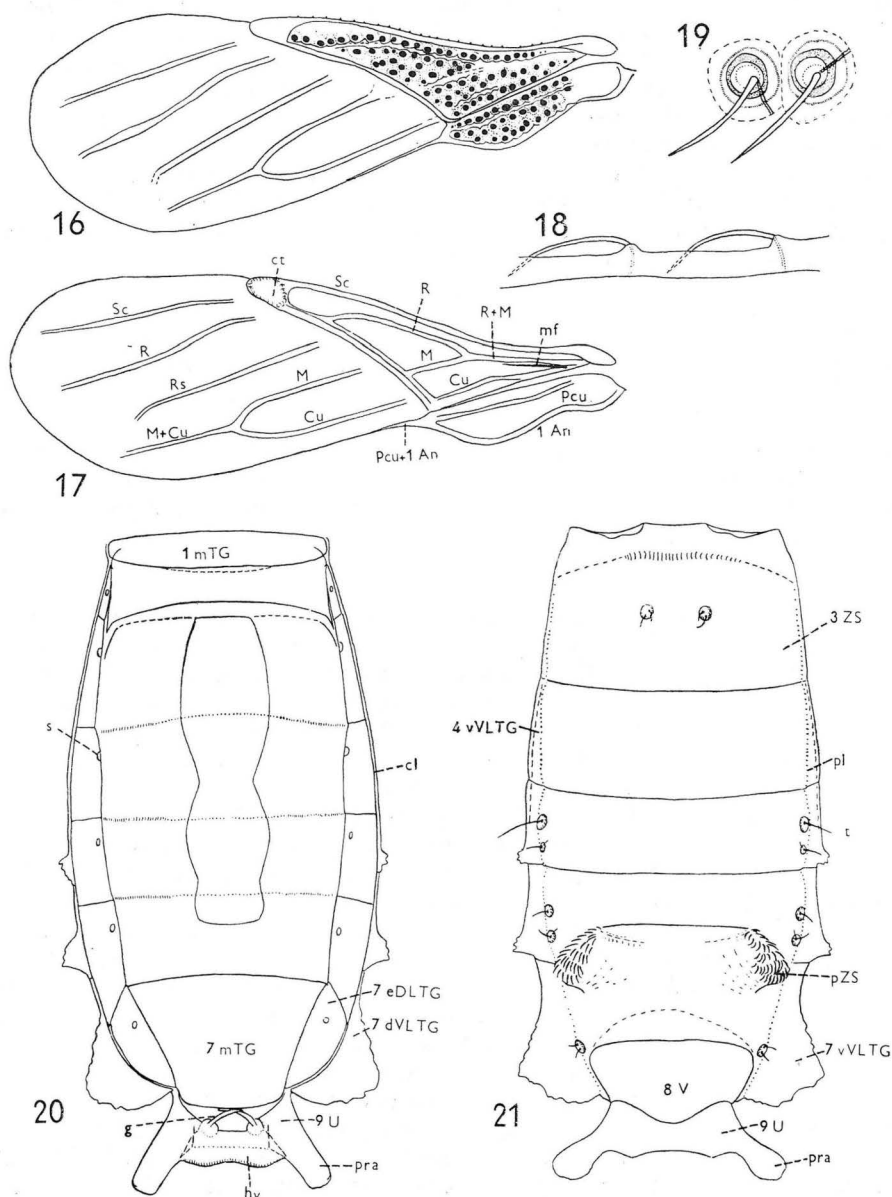
Always macropterous, clavus and corium coriaceous, membrane large; in 159 cases the dorsally situated membrane was that of left wing, only in 7 cases that of the right one. Ratio length of membrane: length of body ranges from 0.43 to 0.53 within the genus, ratio length of membrane: minimal width of combined hemelytra ranges from 1.56 to 2.42. The costal margin of corium proximally slightly inflected ventrally and forming a minute, from the marginal Sc not sharply distinguished, hypocostal lamina.

Clavus with distinct *Pcu* and marginal *1An*, with 3 rows of setigerous pores, the claval commissure well developed, long. Corium narrow, very elongate, its posterior (morphologically lateral) margin slightly concave, its lateral (morphologically anterior) margin distinctly concave in the middle, slightly convex distally. The whole corium deeply punctured. Medial fracture indistinct, short, present along the proximal part of *R+M* only. *Sc* marginal, *R* and *M* fused in proximal half, distally present as distinct veins, *Cu* not connected with *M*, close to the claval margin. The hind margin of corium vein-like, together with *Sc* and *R* fusing into conspicuous, elevated, convex corial tubercle in the laterodistal angle of corium.

Membrane with 5 prominent and strongly sclerotized veins, their proper bases usually indistinct and slightly remote from the posterior margin of corium. These veins are *Sc*, *R*, *Rs*, *M* and *Cu* respectively. *M* and *Cu* distally fused into *M+Cu* and forming thus the basal field. *Pcu+1An* sometimes recognizable on the membrane as slightly sclerotized proximal part of its inner margin.

j. Metathoracic wings (fig. 15)

Always well developed, bilobate. *Sc* marginal, poorly developed, proximally connected with *R*, the free distal part appearing as a narrow sclerotized



Morphology of *Malcus furcatus*, n. sp.

Fig. 16. Fore wing. Fig. 17. Fore wing, only the veins are figured. Fig. 18. Costal margin of fore wing. Fig. 19. Curved glandular hairs from the surface of corium, in transmitting light. Fig. 20. Abdomen, ♂, dorsal view. Fig. 21. Abdomen, ♂, ventral view.

Morphology of *Malcus furcatus*, n. sp., ♂

margin of wing, the apical part wider, but less sclerotized. The free part of R interrupted proximally, R and M diverge immediately at the point of their fusion. Without hamus, M proximally present only as a vein connecting Cu and R; a sclerotized fold between Sc+R and Cu represents perhaps a remnant of the base of M (= hamus). Cu parallel with the free distal part of M and with the anterior branch of cubital furrow. This furrow forked nearly from the base, both branches long, but hardly recognizable. Only an inconspicuous remnant of the 1st secondary vein recognizable. Postcubital sector with Pcu and 1An; only the common proximal stem of both veins well recognizable. Anal lobe without 2An, and with secondary folds distally.

k. Pregenital segments of abdomen
(figs. 20, 21, 26, 36—38, 49—55, 197—199)

Medial tergites (figs. 20, 36): The 1st mediotergite weakly sclerotized, by an unsclerotized line divided from the 2nd, which is connected with the 3rd mediotergite by a very short intersegmental membrane, but medially both tergites fused — here also "meandrine" and porose structures appear, similar to those between the fused ventrites. The 3rd—6th mediotergites firmly fused into a black, strongly sclerotized plate, the straight borders between the segments recognizable by different microsculpture, and by slightly weaker sclerotization (visible on cleared specimens only). These tergites with continuous medial impression delimited by a ridge. The orifices of abdominal glands unrecognizable; in strongly cleared specimens (observed under high magnification) the narrow, obliterated slits between the mediotergites 3—4, 4—5 and 5—6 are distinguishable. On the ventral surface of the respective tergites, the small, unpaired, ramparted borders of the reduced glands are recognizable.

The 7th mediotergite connected with the 6th by short intersegmental membrane; its shape sexually different: ♂: truncately produced, posteriorly reaching behind its dorsal laterotergites; ♀: non-produced, not reaching behind its dorsal laterotergites, the posterior margin less sclerotized, its lighter colouring contrasting with the black, strongly sclerotized anterior part.

The intertergal membrane (= membrane between mediotergites and dorsal laterotergites) narrow, not allowing larger expansion of abdomen.

Dorsal internal laterotergites present on urites 2—7, nearly perpendicular to the external dorsal laterotergites, divided from them by a slightly desclerotized line. These plates widening towards the apex of abdomen; their intersegmental sulci distinct, their lateral margins thickened. No part of internal laterotergites visible externally (these structures also not figured).

Dorsal external laterotergites (fig. 20) present on urites 2—7, indicated on the 1st tergum by incomplete lateral sulci. The shape and size as in the figure. The intersegmental sulci well developed, the intersegmental membrane present only in the posterolaterally directed sulcus between the dorsal laterotergites of the 6th and 7th urites. The latter laterotergite posteriorly acuteangularly produced in males, rounded in females. All laterotergites horizontal and with both medial and lateral margins thickened.

The ventral laterotergites (figs. 20, 21, 49—55). The connexival li-

ne running on the anterior segments slightly submarginally, on the segments with widened ventral laterotergites distinctly dorsally. The actual margin of the dorsum formed either by the dorsal margin of ventral laterotergites, or by the line limiting the dorsal and ventral parts of ventral laterotergites (see below). The following abbreviations are used in following paragraphs: dVLTG = dorsal part of ventral laterotergite, vVLTG = ventral part of ventral laterotergite, VLTG = ventral laterotergite.

VLTG are divided into vVLTG and dVLTG, which are, especially on urites 5—7, partly or entirely overturned on the dorsum of abdomen. On proximal segments dVLTG form lateral parts of ventrites (but after clearing they overturn on the dorsal side of abdomen). dVLTG are clearly limited by connexival line medially, by a distinct keel ventrally (laterally). Under this keel-like margin of dVLTG, the more or less distinct vVLTG are situated. This follows from the comparison of individual urites and from the accompanied figures.

1st urite: without VLTG.

2nd urite: dVLTG narrow, forming lateral part of the ventrite, its ventral margin keel-like, not conspicuously protruding in dorsal view. vVLTG forming a part of the impression ventrally to the margin of dVLTG.

3rd urite: dVLTG wider, its ventral edge more conspicuously protruding, in dorsal view visible laterally from the actual margin of abdominal dorsum. dVLTG becomes oblique to the dorsum, and has "drawn" laterally also the vVLTG, which forms the ventral wall of dVLTG, and is by an impression (= pleural line) limited from the zygosternum.

4th urite: similar to 3rd, tendency to horizontalization of both components of VLTG more marked.

5th urite: dVLTG narrowed, overturned on the dorsum and nearly horizontal anteriorly; its posterior part widened, forming a short, dentate horizontal process constituting already an integral part of dorsum. Its lateral (morphologically ventral) margin (= border between dVLTG and vVLTG) forms the actual margin of abdominal dorsum. vVLTG forms the underside of the process of dVLTG, and is by an sharp impression divided from the proper zygosternum.

6th urite: dVLTG anteriorly strip-like, posteriorly widened into a horizontal dentate process larger than that of the preceding urite. Otherwise as the 6th urite.

7th urite: as the 5th and 6th, the dentate posterior part of dVLTG largest and longest of all segments.

The shape of widened, horizontal, dorsally situated parts of dVLTG 5—7 variable at species level, and described in chapter IXe.

The intersegmental sulci between the ventral laterotergites straight and distinct.

Zygosterna (figs. 21, 25) divided from ventral parts of ventral laterotergites by shallow impression on anterior, by sharp pleural line on posterior pregenital urites. The 2nd and 3rd zygosterna fused, the sulcus distinct laterally only. The zygosterna 3—5 also immovably fused, the sulci, however, distinct. The obliterated intersegmental sulci with peculiar "meandrine" porose struc-

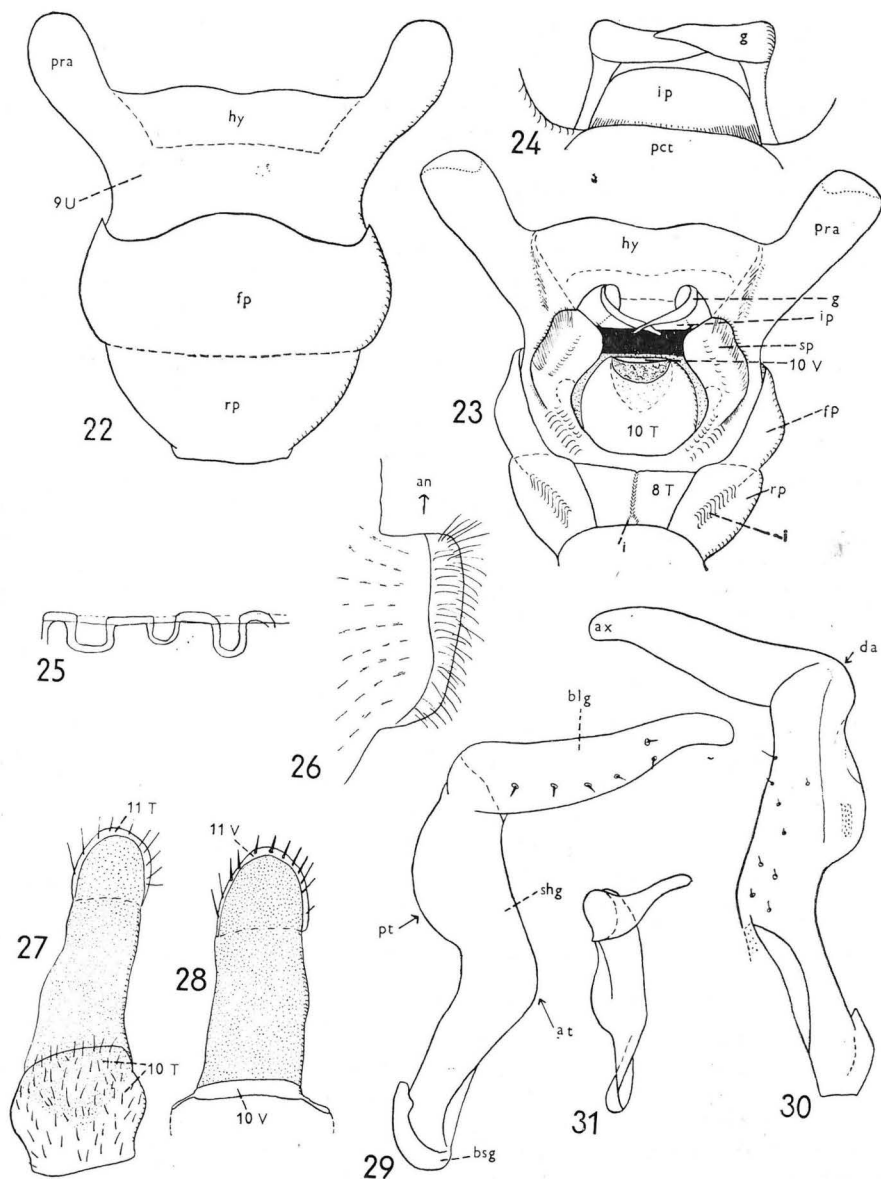


Fig. 22. The 8th and 9th urites, ventral view. Fig. 23. The 8th and 9th urites, dorsal view. Fig. 24. Hypandrium and gonostyli, anterodorsal view. Fig. 25. "Meandrine" structure of obliterated intersegmental sulcus between the 3th and 4th ventrites. Fig. 26. Process of the 7th zygosternum, dorsolateral view. Fig. 27. Proctiger region, dorsal view. Fig. 28. Proctiger region, ventral view. Fig. 29. Gonostylus, anterior view. Fig. 30. The same gonostylus, posterior view. Fig. 31. Gonostylus, medial view, schematized.

ture (fig. 25). The 5th and 6th zygosterna much shorter than the preceding. The sulci between zygosterna 5—6 and 6—7 not obliterated, the segments shortly overlapping and with very short intersegmental membranes, which do not allow any motions of the segments. All intersegmental sulci (or their remnants) straight, only the sulcus 6—7 posterolaterally produced in the males with modified 7th zygosternum (see below), and the posterolateral parts of the 7th zygosternum narrowly produced posteriorly under the produced widened parts of 7th ventral laterotergites.

Sexual modifications of 7th zygosternum: a) males (figs. 21, 26, 197—199): In most species without peculiarities, in *M. furcatus*, n. sp. sublaterally with a pair of prominent processes, their tips densely covered with rather rigid short hairs (modified curved glandular hairs). These processes hollow without any peculiar internal structures. Similar processes occur only in *M. auriculatus*, n. sp. and *M. similis*, n. sp.

In all species an arch-shaped internal transverse apodeme present submarginally in the posterior part of 7th zygosternum.

b) female (figs. 37, 38): A distinct transverse ridge divides the zygosternum into long anterior and short posterior parts. The posterior part formed by 2 transverse, separately rounded lobes, fused along the mid-line, where a distinct remnant of obliterated sulcus is recognizable. The 1st valvifers partly covered by 7th zygosternum. No structures corresponding to the processes on the 7th zygosternum in males of *M. furcatus*, n. sp. were found in females of this species.

1. The 8th urite of male (figs. 21—23)

Ring-shaped, dorsally entirely covered by 7th mediotergite; ventrally divided larger posterior, roughly sculptured part which is externally visible, and a smaller anterior smooth part invaginated into the 7th urite; both parts often divided by an impression, lateral constriction, etc. Dorsum (exc. posterolateral corners embracing the pygophore) smooth, its lateral parts formed by ventrite, its medial part formed by a distinctly limited tergum. Tergum medially with longitudinal impression, dorsal parts of the ventrite also with paired impressions. The shape of 8th urite is variable at species level, and as an important systematic character is described in chapter IXe.

m. The 9th urite of male (pygophore) (figs. 20—24)

Cup-shaped, the largest part exposed, covered by 7th tergum only to the anteriorly directed tips of gonostyli, the 8th urite embracing only the small anterior part of pygophore. The ventroposterior margin of pygophore produced laterally into paired, symmetrical, obliquely dorsally directed processes — parandria in *M. furcatus*, n. sp. and *M. similis*, n. sp., in a lesser degree also in *M. auriculatus*, n. sp.; this margin simple in other species. The shape of pygophore slightly different at species level and described in chapter IX e.

The posterodorsal margin of pygophore (the part between parandria, when developed) raised dorsally into a thin plate, distinguished from other parts of the walls of pygophore by light colouring. Its anterior wall strongly declivent towards the posterior part of genital chamber. This plate may be termed hypandrium.

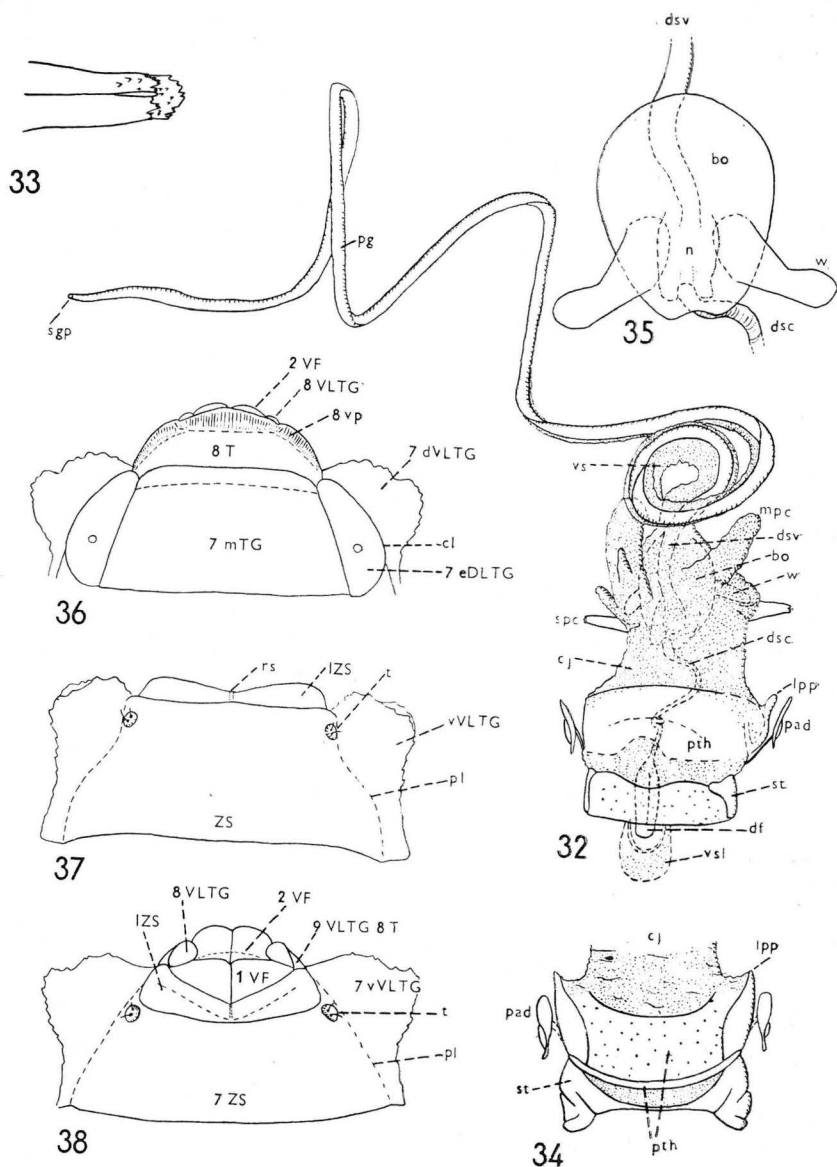
Morphology of *Malcus furcatus*, n. sp.

Fig. 32, Phallus, partly inflated, posterior view. Fig. 33, Sclerotized process of conjunctiva, posterior view. Fig. 34, Phallosome and basal apparatus, anterior view. Fig. 35, Endophallic sperm reservoir, dorso-anterior view. Fig. 36, Terminal urites of ♀, dorsal view. Fig. 37, 7th ventrite of ♀, ventral view. Fig. 38, Terminal urites of ♀, postero-ventral view.

The posterior foramen of pygophore dorsal and horizontal. The posterior part of diaphragm changed into clearly limited inferior process, forming an obliquely dorsally directed plate between the gonostyli, and being well visible in anterodorsal view. The inferior process ventrally prolonged in suspensorial apodemes forming the arms of phallic pivot.

The base of each parandrium (or the part of pygophore corresponding to it in other species) dorsally set off by a deep, laterally as well as posteriorly distinctly limited depression, changing anteriorly into a shallow groove, continuing to and disappearing at the anterodorsal part of the dorsal wall of pygophore. The thus limited region may be termed a superior process of pygophore.

n. Gonostyli (figs. 23, 24, 29—31)

Symmetrical, entirely visible in dorsal view, inserted at the sides of hypandrium, behind the superior processes of the pygophore. They are directed dorsally and crossed posterodorsally above the hypandrium. The base of each gonostylus small, the "shank" variously subangularly curved, the "blade" arising at approximately a right angle from the blade. The blade is overturned at approximately 180°; this results in fact that, e. g. in anterior view, the topographically anterior surface of blade represents morphologically its posterior surface. This clearly follows from the comparison of figures 29—31, and it is also demonstrated by the presence of sparse and short sensory hairs on the (topographically) anterior surface of blade, but on the (topographically) posterior surface of shank. The apex of blade usually ventrally slightly dentate or serrate (see the figures in the descriptive part of this paper). The shape of gonostyli slightly variable at species level, and described in chapter IX e.

o. Phallus (figs. 32—35)

(Only a partial inflation of the phallus has been attained.) Phallus differentiated into phallotheca, conjunctiva and vesica.

Basal apparatus large, nearly as long as the proper phallotheca. Vesicula and ductifer well recognizable. Stapes anteriorly fused and connected by a narrow bridge, posteriorly distinct as separate sclerites, but connected by a long sclerotization; thus a complete basal ring is formed.

The proper phallotheca short, hardly longer than the promotor apodemes. Posterior wall of phallotheca weakly, but uniformly sclerotized; the anterior wall desclerotized, with the exception of large, sharply limited lateral sclerites, produced dorsolaterally into paired processes of phallotheca. The lateral sclerites connected proximally on the anterior wall by a narrow, sclerotized bridge, parallel to the bridge connecting the stapes; the bridge continuous with the sclerotized posterior wall of phallotheca.

Conjunctiva has not been fully inflated and the structure of its membranous parts could not be sufficiently thoroughly studied. (It was often not clear, which processes belonged to conjunctiva and which to vesica. The figure and description is approximate in these respects.) Conjunctiva short, distally with 2 long membranous conjunctival processes, on their bases 1—2 small processes occur. At the level of base of the endophallic sperm reservoir 2 late-

rally directed, apically and ventrally dentate, sclerotized conjunctival processes (fig. 33) are present.

The endophallic sperm reservoir (fig. 35) remarkably large, strongly sclerotized, complete. Conspicuously large, shield-like "body", the laterally directed, very long "wings" (of the same direction as the sclerotized conjunctival processes) and "neck", situated at the level of bases of wings and dorsally entirely covered by the body, form this organ.

Vesica with wide and membranous proximal part, without sclerotizations and processes. Ductus seminis vesicae prolonged into a long, sclerotized 4 times coiled processus gonopori. Without processus apicalis or helicoid process. The secondary gonopore apical.

The males of all species share the long, coiled processus gonopori.

p. The proctiger region of male (figs. 27, 28)

Large, in resting position with dorsally directed anal orifice; in dorsal view the hind margins of 10th tergite and 10th ventrite only are visible, the 11th urite being telescoped within the 10th urite.

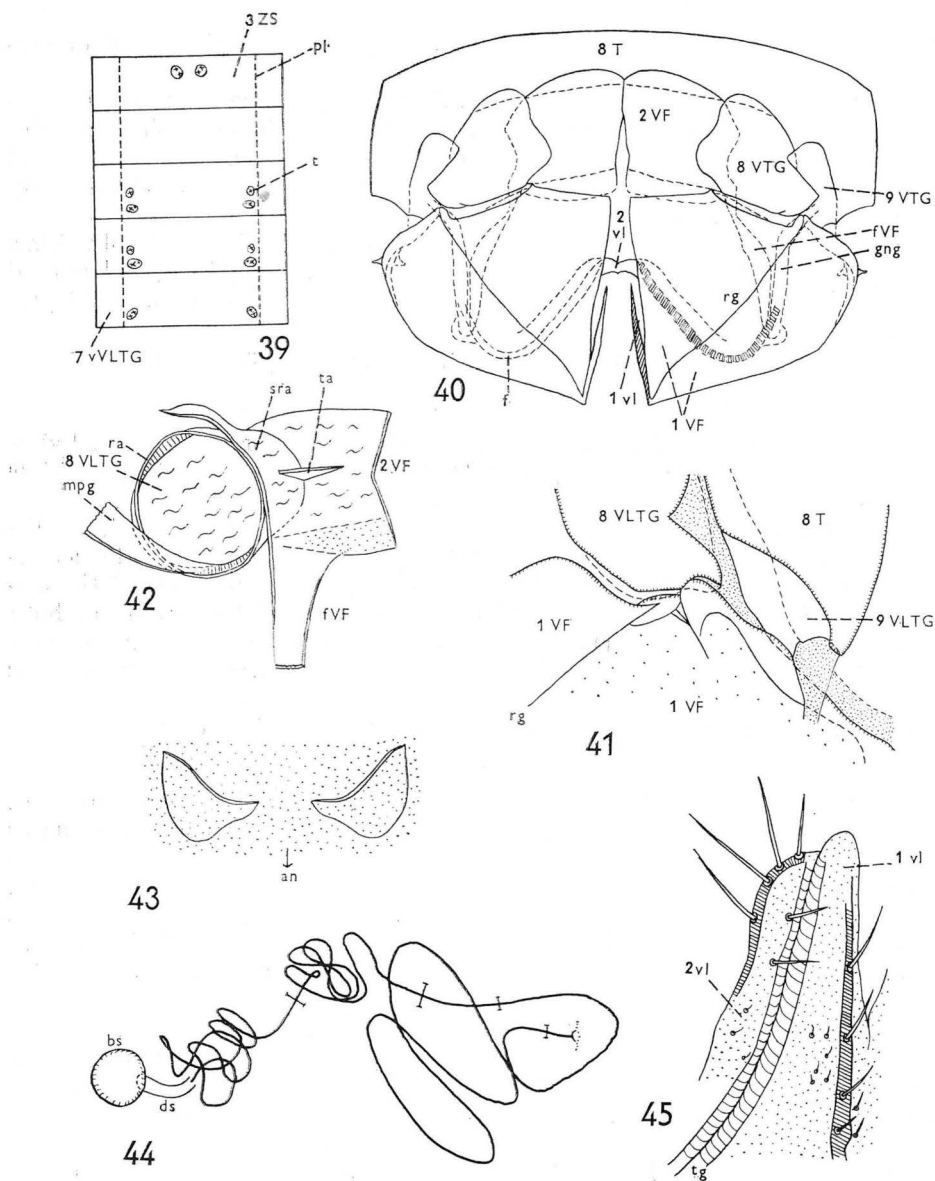
The 10th tergum large, with short hairs, its anterior part sclerotized, the distal triangular part membranous. The 10th ventrite strip-like, strongly sclerotized, bare, attached to laterodistal margins of the sclerotized part of the tergum. The 11th urite formed by 2 valve-like flaps, the distal margin of both dorsal and ventral flap with \cap -shaped, strip-like sclerotization, bearing a row of long setae, and representing obviously the tergum and ventrite of this segment.

q. Female genital segments, genitalia and proctiger region
(figs. 36—38, 40—47)

The articulations and fusions of the respective sclerites are highly modified. The whole complex of ovipositor in nearly vertical position, 3 pairs of plates visible externally: 1) the anterior (ventral) = the externally visible medio-posterior part of 1st valvifers, 2) the inner posterior (dorsal) = 2nd valvifers, 3) the external posterior = 8th ventral laterotergites. Although these plates remind one at first glance of the plate-shaped type of ovipositor found in Pentatomoidea, their homology is different, and the outer large pair of sclerites does not belong to 9th segment.

The 1st valvifer large, transverse, quadrangular. The triangular postero-medial freely exposed part divided by a distinct ridge from the anterolateral more weakly sclerotized part covered by 7th zygosternum. The anterior part of lateral margin of the 1st valvifer free, not contacting with any part of the 8th tergum. The whole lateral edge strongly sclerotized internally. The posterior end of this sharply limited sclerotization and the posterior end of the ridge dividing the valvifer into strongly and weakly sclerotized parts articulate with the 8th ventral laterotergite by a condyle (fig. 41). Laterally close to this condyle, the 1st valvifer is membranously connected with the ventrally turned posteroventral margin of 8th dorsal tergite and externally covers a part of the 9th ventral laterotergite (see below).

The 2nd valvifer quadrangular, its anterior (ventral) desclerotized margin covered by the 1st valvifer, its lateral margin by 8th (!) ventral laterotergite.



Morphology of *Malcus furcatus*, n. sp., ♀.

Fig. 39. Arrangement of trichobothria, scheme. Fig. 40. External genitalia, posterior view. The internal structures are indicated by dashed lines. Fig. 41. Articulation of the 1st valvifer with the 8th ventral laterotergite and with 8th tergum, posterolateral view. Fig. 42. The internal apodemes of the 8th ventral laterotergite and of 2nd valvifer-anterior view. Fig. 43. Sclerotization of gynatrial glands, dorsal view. Fig. 44. Spermatheca, cleared, the length and direction of ductus shown by a thick line, the width indicated by cross bars. Fig. 45. The left valvulae.

A distinct transverse external keel present. Both 2nd valvifers meet posteriorly, and are firmly fused. A medial keel-like transverse apodeme present on the internal surface of the 2nd valvifer (fig. 42); this apodeme on the inner surface of the lateral margin changed into a high semi-ring apodeme. The lateral wall of this apodeme formed by similar apodeme of the internal surface of the medial margin of 8th ventral laterotergite — thus the 2nd valvifer internally fused with the 8th ventral laterotergite. The dorsal part of semi-ring apodeme produced into the abdominal cavity as an apophysis, while from its ventral part (and from the whole anterior [ventral] desclerotized margin of the 2nd valvifer) the narrow fibular part of the 2nd valvifer arises.

The 8th ventral laterotergite irregularly oblong, articulating by a condyle with the 1st valvifer, and externally covering a part of 9th ventral laterotergite. Its surface with some setae (usually with porose insertions), one pore very distinct also on the internal surface, and representing, perhaps, the reduced spiracle. The medial and ventral internal margins with ring apodeme (fig. 42), its medial part fused with the semi-ring apodeme of the 2nd valvifer and with its fibular part. The lateroventral part of this ring fused with the posterior sclerotization of gonangulum (see below).

The dorsal (posterior) parts of the 2nd valvifer and 8th ventral laterotergite nearly perpendicular to the ventral (anterior) parts of these plates.

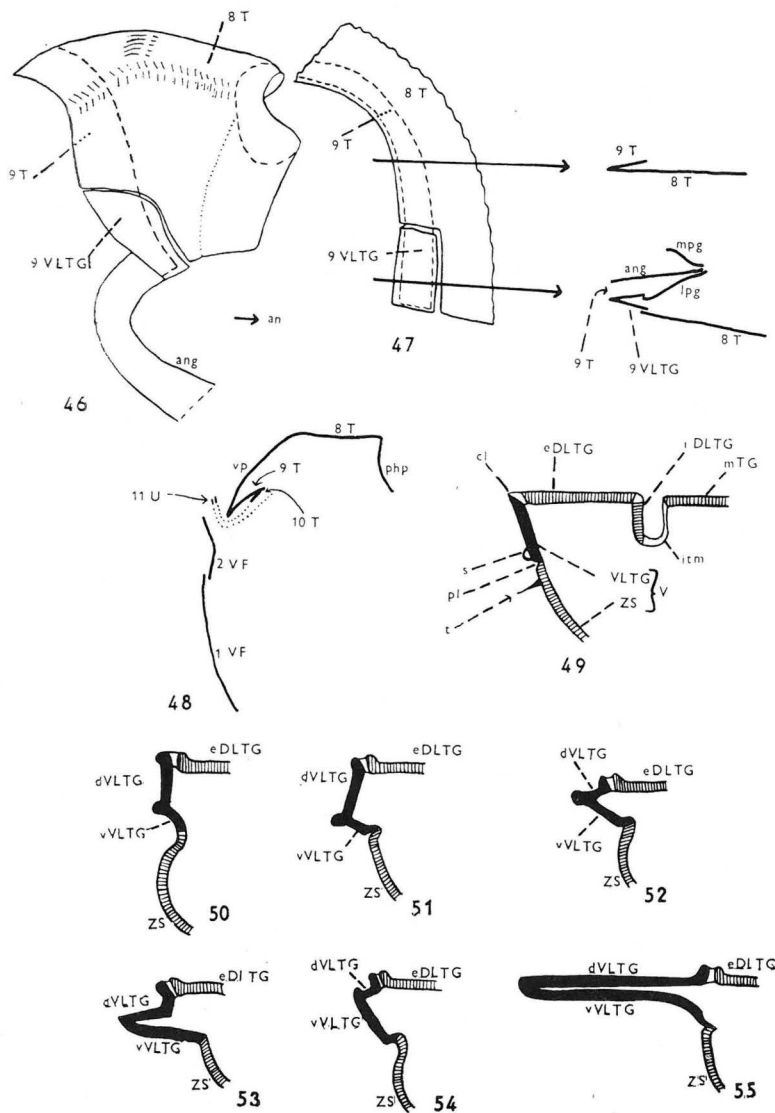
The 8th and 9th tergum, together with the 9th ventral laterotergite and gonangulum, are the most modified parts of female genitalia.

The anterior part of 8th tergum (more exactly the 8th dorsal tergite) horizontal, the posterior part ventrally declivent. The anterior margin with strongly sclerotized, large, internal phragma-like apodeme nearly perpendicular to the anterior part of tergum. The lateral parts of tergum nearly perpendicularly bent downwards; their anterior parts (covered by ventral parts of the 7th ventral laterotergite) desclerotized. The posteroventral corners of 8th tergum emargined; in these emarginations the 9th ventral laterotergites are situated.

The 9th tergum (dorsal tergite) (figs. 36, 46, 47) immovably fused with the hind margin of 8th tergum, and turned under its posterior margin: the dorsal surface of 9th tergum becomes ventral, the ventral (inner) surface dorsal, and the posterior margin becomes topographically anterior. The narrow 9th following the direction of the posterior margin of 8th tergum; laterally, in the tergum emarginations of the 8th tergum, the parts of the 9th tergum homologous to the 9th ventral laterotergites are turned anteriorly (externally), and are freely visible, while the lateral parts of the tergum are placed internally under the laterotergites (see the schematized figures).

The 10th tergum in similar relation to the 9th tergum as the 9th to 8th; non-individualized, appearing as a semicircular thickening of the actual ventral (morphologically dorsal) surface of 9th tergum. The 10th ventrite membranous, indistinguishable. The 11th urite as in the male. Of the proctiger region, only the 11th urite is protrusible, viz. through a narrow slit between the posterior margins of 8th tergum and 2nd valvifers, which posteriorly cover this slit.

Valvulae (fig. 45) of the ovipositor short, lacinate, weakly sclerotized (exc. their tongue-and-groove mechanisms, ventral edge of the 1st valvula,



Morphology of *Malcus furcatus*, n. sp.

Fig. 46. The 8th and 9th tergum in ♀, lateral view from right. Fig. 47. Scheme of situation of the right part of 9th tergum in ♀, and its relation to the 8th tergum and gonangulum. The arrows indicate levels of schematized horizontal sections shown in a simplified way in the right part of the figure. Fig. 48. Schematized vertical submedial section through the terminal urites in ♀, showing topographical relation of some components (at repose).

Figs. 49.—55. Schematized transverse section through the right laterodorsal parts of abdomen. The ventral laterotergites are black. Fig. 49. Generalized 5th or 6th urite of Coreoidea. Figs. 50.—55. *Malcus furcatus*, n. sp. Fig. 50. 2nd urite. Fig. 51. Posterior part of 4th urite. Fig. 52. Anterior part of 5th urite. Fig. 53. Posterior part of 5th urite. Fig. 54. The very anterior part of 7th urite. Fig. 55. Medial part of 7th urite.

and the dorsal edge of the 2nd), non-dentate, but probably with a definite chaetotaxy (see the fig. 45). Both 1st valvulae membranously connected up to the half of their length.

Gonangulum connecting the fibula of 1st valvula (united by coaptation with the fibular part of the 2nd valvifer) with the 9th tergum (not with the 9th ventral laterotergite!) and with the internal ring-apodeme of the 8th ventral laterotergite. The anterior part of gonangulum semicircular, its distal end reaching considerably anteriorly. From the sides of its anterior part 2 posteriorly directed sclerotizations branch: the medioposterior (inner) branch, attached to the inner surface of the ventral part of the ring apodeme of the 8th ventral laterotergite, and the lateroposterior (external) branch, attached to the lateral part of 8th ventral laterotergite. Both these posterior branches rather wide and flat; when superficially examined they look like a single sclerite.

The membrane between the 7th zygosternum and 1st valvifers short, not allowing the protrusion of genitalia; vagina, remnants of 8th sternum and paragenital glands were not ascertained.

Gynatrium without peculiarities, the sclerotizations of gynatrial glands (fig. 43) paired, lunulate, only their concave posterior margins more sclerotized.

Spermatheca (fig. 44). Ductus very long, many times coiled (especially in the distal half), simple, poorly sclerotized, proximally narrow, distally (at $\frac{1}{3}$ of its length) widened, twice as wide as proximally, narrowed near the bulb, only the very distal part well sclerotized. The bulb small, ball-shaped, simply joined to ductus, without flanges or other peculiarities. The shape of the spermatheca has been studied in *M. furcatus*, n. sp. and *M. flavidipes flavidipes* Stål only; it is practically identical in both species.

The shape of individual components of external genitalia and their sculpture is slightly different in various species, and may be, perhaps, important for taxonomy at species level, but it has not been studied in detail.

r. Abdominal spiracles (fig. 20)

The 1st urite without spiracles, the spiracles of the 2nd—7th urites situated on the dorsal external laterotergites near to their inner margins (the spiracles of the 3th and 4th urites direct at the borders between the dorsal internal and external laterotergites; the spiracles on more distal segments more remote from the inner margins of dorsal external laterotergites). The spiracles of the 8th ventral laterotergites absent or extremely reduced in females; the 8th urite without spiracles in males.

s. Abdominal trichobothria (figs. 21, 39)

Situated on loaf-shaped, conspicuous, sharply limited tubercles on zygosterna. The trichobothria of the urites 3 and 7 clustered, of the urites 5 and 6 dispersed. The lateral trichobothria close to pleural line, all trichobothria posterior to the spiracle of respective urite. The longest trichobothrium is the anterior one of the 5th urite; the anteroventral posterior trichobothria on urites 5 and 6 very small, hardly distinguishable.

- 3rd urite: 2+2, submedial, clustered, in an oblique longitudinal row
 4th urite: 0
 5th urite: 3+3, lateral, dispersed, in a longitudinal row (1+1 anterior, 2+2 posterior in an oblique row)
 6th urite: 3+3 in the same arrangement as on the 5th urite.
 7th urite: 2+2, lateral, clustered, in a longitudinal row.

t. Sex ratio and sexual dimorphism

Sex ratio practically 1 : 1 in Malcinae (46 % of males, 54 % of females in the material examined). Sexual dimorphism exhibited only in genitalia, genital segments, 10th urite, and in the form of 7th zygosternum, produced part of 7th mediotergite and 7th dorsal external laterotergites. Otherwise both sexes quite alike, surprisingly not differing either in absolute dimensions or calculated ratios of various parts of body.

u. Teratology (figs. 63—70)

1. The cases of anomalous venation of membrane (figs. 63—67):

a) presence of a cross-vein between M and Cu (*M. japonicus* Ish. et Has., no. 142) - fig. 63; b) Sc of normal length, but fused with R distally (*M. flavidipes flavidipes* Stål) - fig. 64; c) Sc reduced and meeting R proximally (*M. flavidipes flavidipes* Stål, no. 20) - fig. 65; d) Sc with lateral proximal branch (*M. flavidipes flavidipes* Stål, no. 16) - fig. 67; e) R shortened (*M. flavidipes flavidipes* Stål, no. 65) - fig. 66.

2. The cases of unilateral antennal oligomery (figs. 68—70):

a) *M. tuberculatus*, n. sp. (no. 130): antenna 3-segmented, the 2nd segment elongated, the 3rd and 4th fused, very short - fig. 68; b) *M. flavidipes flavidipes* Stål (no. 79): antenna 3-segmented, the 2nd segment elongated, the 3rd and 4th fused, the fused structure of normal length - fig. 70; c) *Malcus flavidipes kumaunensis*, n. subsp. (no. 119): antenna 2-segmented, the 2nd—4th segments fused, the fused structure extremely short - fig. 69.

2. Nymphs (figs. 71, 76, 77)

Malcus flavidipes flavidipes Stål, nymph of 5th instar.

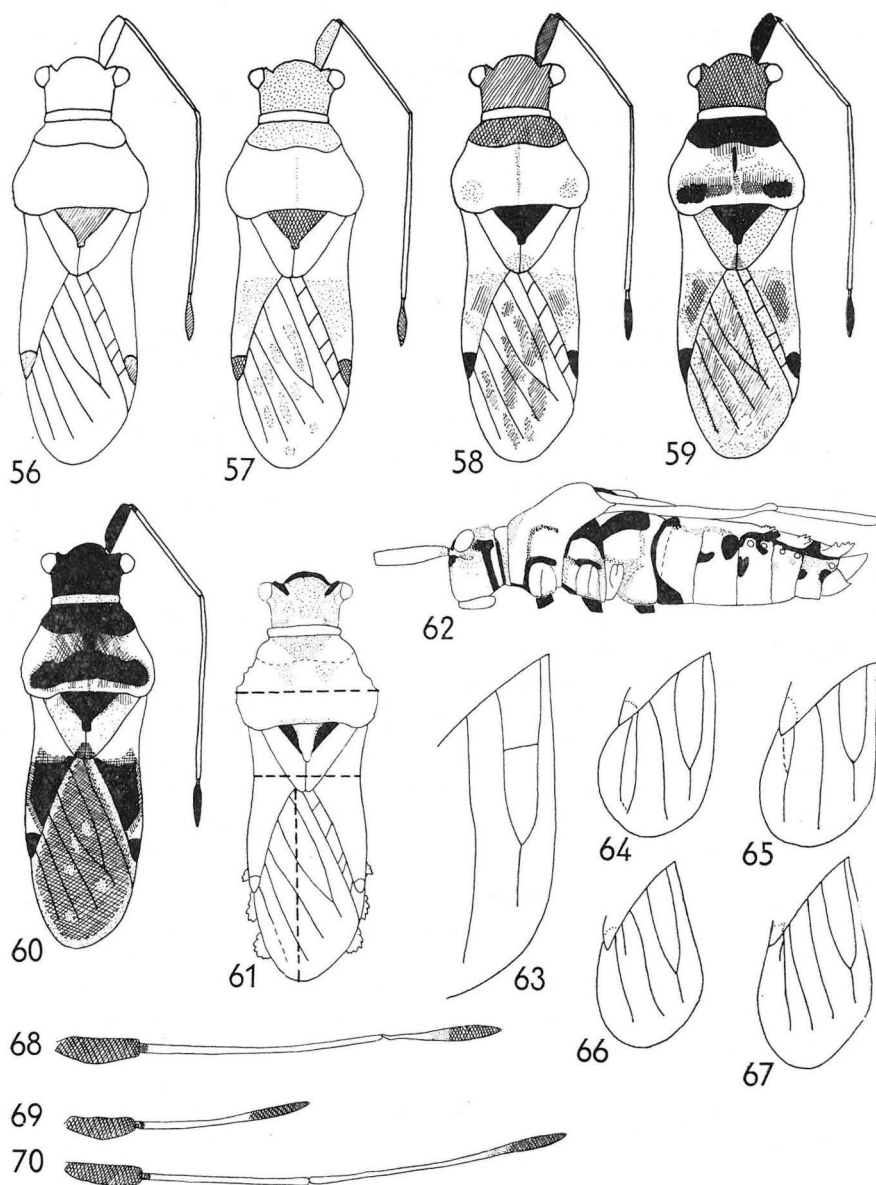
Material: 1 ♀ (no. 94), Ceylon, Green (coll. BM); 1 ♂ (no. 51), Kuala-Lumpur, lgt. Biró (coll. MNM); both specimens in dry condition.

After the completion of manuscript, some additional nymphs (including also younger instars) of this species from Ceylon were obtained from Dr Slater. This material could not be incorporated into this paper. Also the younger instars have the same spinous appearance as described below for the 5th instar.

Identification. Only the nominate subspecies of *Malcus flavidipes* Stål lives in Malaya and Ceylon; the adults were collected together with the nymphs. The very long antennae of nymphs support this identification.

General shape. Oval, body with numerous seta-bearing processes, slightly shining. Antennae very long, body 0.64—0.72 times as long as the length of antenna. Slightly sclerotized (esp. abdomen).

Measurements (if not otherwise stated without processes; all lengths given in mm). Length of body 2.37-2.49 (with processes 2.64-3.09). Width



Figs. 56.—60. Generalized eunomy of coloration in *Malcus* spp. Approximative significance of white areas = yellow colour, stippled = yellowish brown, hatched = brown, cross-hatched = blackish brown, black = black. Figs. 61.—62. Distribution of tomentose spots in *Malcus flavidipes flavidipes* Stål from Ceylon. Black areas: cuticula completely covered by spots, stippled areas: less developed spots — cuticle visible. Heavy dashed lines on fig. 61 show some measured dimensions: maximum width of pronotum, minimum width of combined hemelytra, and length of membrane.

of head across the eyes 0.68-0.69; maximal width of pronotum 0.81; maximal width across the hemelytral lobes 1.08. Lengths of antennal segments: I 0.57-0.63; II 0.84-0.96; III 1.50-1.65; IV 0.48-0.51; total length of antenna 3.45-3.69. Length of hind femur 0.90-0.96, of hind tibia 1.02-1.05. Maximal lengths of some processes not counting the length of terminal seta (together with the terminal seta in parentheses): anteocular 0.30 (0.39); postocular 0.33-0.39; discal on pronotum 0.39 (0.45); scutellar 0.57 (?); medial abdominal on 6th urite 0.48 (0.57).

Colouring. Ground colour stramineous or dirty greenish-yellow. The 4th antennal segment (exc. base) and a longitudinal strip on 1st segment brown. Hind part of the dorsum of head (the inner posterior margins of eyes, areas behind the eyes and behind the ocellar tubercle) red-brown. Lateral processes on head slightly darkened. Pronotum castaneous or brown-black (exc. the mid-line and the very margins). Also mesonotum, hemelytra lobes and visible part of alar lobes similarly dark, only the mid-line and proximal parts of hemelytral lobes lighter. Abdominal processes and their bases slightly darkened, circles around their bases and some other parts of abdominal terga may be red.

Description (without hairs and processes). Head transverse in dorsal view, anterior part nearly perpendicular to the dorsal part. Eyes small, ocelli and ocellar tubercle distinct. General structure as in adults, the antennal sockets, however, free, the preantennal plates not developed. Arms of epicranial sulcus poorly developed (do not confuse them with well developed ocellar grooves!), meeting before the posterior margin of head, epicranial stem absent.

Labium reaching the hind margin of 3rd abdominal ventrite.

Antennae: the 1st segment cylindrical, the 2nd and 3rd long, stick-shaped, the 4th fusiform. The 3rd segment 1.72-1.78 as long as the 2nd.

Pronotum trapezoidal, posterior margin slightly emarginate, mesoscutellum distinct, slightly convex, hemelytral lobes surpassing the hind margin of 3rd abdominal tergum. Only very small parts of metanotum and alar lobes visible.

Abdominal intersegmental sulci straight and distinct, the sulcus between the terga 2-3 slightly obliterated. Dorsal glands situated between the terga 3-4, 4-5 and 5-6. The orifices inconspicuous, without sclerotized plates, those of the two anterior glands paired. Some grooves, indicating the development of laterotergites, occur along the lateral margins of abdomen both ventrally and dorsally. Due to the dried condition and scarcity of material they were not studied in detail.

Legs long and slender, femora elongate, cylindrical, tibiae straight, stick-shaped, the tarsi 2-segmented, the 1st segment cylindrical, slightly longer than the incrassate 2nd segment. Praetarsus as in adults.

Figs. 63.-67. Teratological venation of membrane. Fig. 63. *Malcus japonicus* Ish. et Has. (no. 142). Fig. 64. *M. flavidipes flavidipes* Stål (no. 96). Fig. 65. *M. flavidipes flavidipes* Stål (no. 20). Fig. 66. *M. flavidipes flavidipes*, Stål (no. 65). Fig. 67. *M. flavidipes flavidipes* Stål (no. 16). Figs. 68.-70. Antennal oligomery. Fig. 68. *M. tuberculatus*, n. sp. (no. 130). Fig. 69. *M. flavidipes kumaunensis*, n. subsp. (no. 119). Fig. 70. *M. flavidipes flavidipes* Stål (no. 79).

Position of spiracles could not be ascertained in dried specimens, but probably the same as in adults.

Trichobothria and trichobothrial tubercles of the same shape, and in the same number and arrangement as in adults.

The sex clearly recognizable by the presence of "plates" on 8th and 9th female ventrites, indicating the external genitalia.

Hairs, chaetotaxy, processes (fig. 77). Legs and antennae with sparse, light, thin, oblique or suberect hairs, which easily break off. Their length on the 2nd and 3rd antennal segments exceeding the diameter of segment. The 4th segment also with dense, short, adpressed pubescence.

The anterior, lateral and ventral parts of head, the pleurae and sterna of thorax, and abdominal ventrites with numerous dark, stiff setae (arranged in transverse rows on ventrites), probably of definite position, and at least on the anterior part of head, in definite number. These setae intermixed with irregularly distributed light hairs, similar to those on legs and antennae. Due to the partial abrasio of both specimens, the chaetotaxy of these parts was not studied in detail.

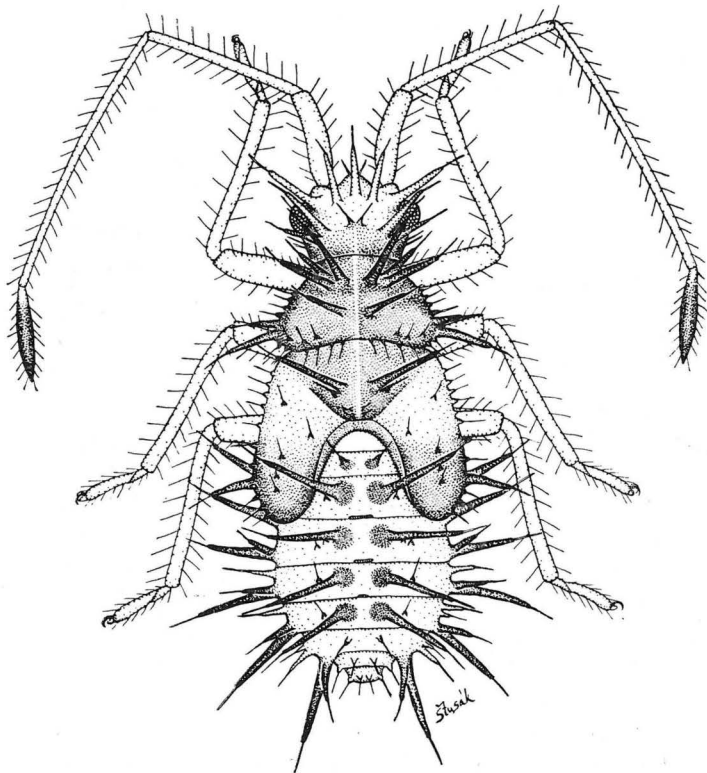


Fig. 71. The 5th stage nymph of *Malcus flavidipes flavidipes* Stål (Štusák del.)

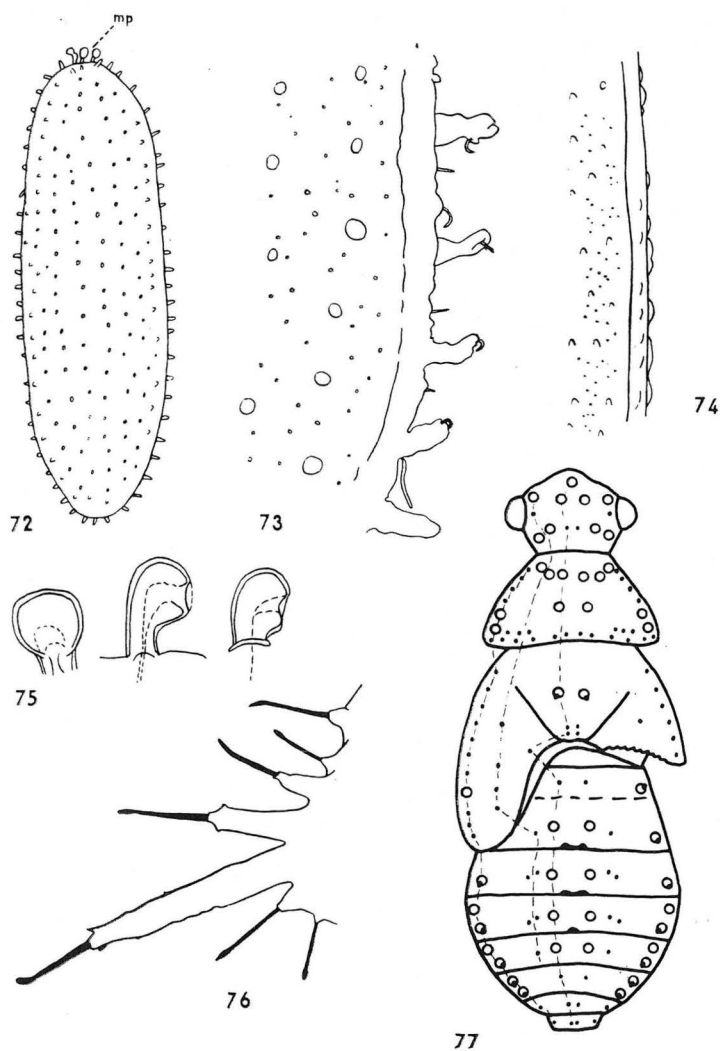


Fig. 72. Egg, non-cleared. Fig. 73. Margin and surface sculpture of a non-cleared egg. Fig. 74. Margin and surface sculpture of an egg treated by KOH. Fig. 75. Micropylar processes of an egg, cleared. Fig. 76. The left margin of pronotum in nymph. Fig. 77. A scheme of chaetotaxy and distribution of processes in nymph. The right hemelytral and alar lobes removed. Dashed lines indicate the medial, submedial and lateral rows. O = process, · = seta, ○ = bifurcate process with both terminal and lateral seta.

Dorsum of body with numerous whitish to brownish setae, mostly of definite position and number. Some of them situated on easily breakable cylindrical processes; the setae on thoracic and abdominal margins arising from elongate tubercles gradually changing into processes (on thorax) or vice versa

(on abdomen). Some processes bifurcate, with both terminal and lateral setae, the latter situated also on more or less elongate processes or tubercles. Generally the medial, submedial and lateral rows of setae or seta-bearing processes (tubercles) recognizable. Processes of the median row mostly perpendicular to the surface of dorsum, those of submedial row oblique, those of lateral row oblique or horizontal.

In total 51 processes occur on dorsal surface. Their setae stiff, straight or slightly bowed, moderately long, of the same diameter along the whole length, or slightly thickened apically (then club-shaped or fusiform). This probably caused by accumulation of a secretory substance apically — this substance, however, hardly distinguishable from the cuticle. These setae undoubtedly homologous to curved glandular hairs of adults.

Analogously to Tingidae, the number and distribution of processes (and setae) may be of great assistance in specific discrimination of nymphs of Malicinae, and may, perhaps, offer better systematic characters than the morphology of adults. The chaetotaxy and distribution of processes is, therefore, reviewed in detail in the following table.

Abbreviations: P = seta-bearing process; S = seta arising from surface of body or from a small tubercle; $\begin{smallmatrix} P \\ < \\ S \end{smallmatrix}$ = bifurcate process with both terminal and lateral setae; \rightarrow = changing into; row S = row of small hairs of probably non-definite number.

| part of body | median row | submedial row | lateral row |
|------------------|--|---|--|
| head | 1 P frontal 1+1 P vertical 1+1 S ocellar | 1+1 P anteocular 1+1 S interocular 2+2 P postocular | — |
| pronotum | 1+1 P anterior 1+1 P posterior | 2+2 P anterior | ↓ anterior row S ↓ 2+2 P posterior ↓ 2 posteromarginal row S |
| mesoscutellum | 1+1 $\begin{smallmatrix} P \\ < \\ S \end{smallmatrix}$ discal 2+2 S apical | — | — |
| hemelytral lobes | 1+1 S | row S (1+1 anterior, 3+3 posterior) | anterior row S 1+1 P posterior posterior row S |
| urite 1 | — | — | — |
| urite 2 | 1+1 S | — | 1+1 $\begin{smallmatrix} P \\ < \\ S \end{smallmatrix}$ |
| urite 3 | 1+1 P | 1+1 S | 1+1 $\begin{smallmatrix} P \\ < \\ S \end{smallmatrix}$ |
| urite 4 | 1+1 P | 2+2 S | 1+1 $\begin{smallmatrix} P \\ < \\ S \end{smallmatrix}$ |

| | | | |
|---------|-------|-------|--|
| urite 5 | 1+1 P | 2+2 S | 1+1 P anterior (small) 1+1 $\begin{smallmatrix} P \\ S \end{smallmatrix}$ posterior |
| urite 6 | 1+1 P | 1+1 S | 1+1 P anterior (small) 1+1 $\begin{smallmatrix} P \\ S \end{smallmatrix}$ posterior |
| urite 7 | 1+1 S | — | 1+1 $\begin{smallmatrix} P \\ S \end{smallmatrix}$ (or P) anterior (small) 1+1 $\begin{smallmatrix} P \\ S \end{smallmatrix}$ posterior |
| urite 8 | 1+1 S | — | 1+1 S |
| urite 9 | 1+1 S | — | 1+1 S |

3. Eggs (figs. 72—75)

Malcus flavidipes flavidipes Stål

Material: 6 eggs dissected from the non-expanded abdomen of a dried female from Vietnam (no. 163).

Description: Egg selongate, of the same size (0.89 × 0.27 mm). Chorion yellowish-brown to dark brown. Without pseudoperculum, three slightly club-shaped, closely clustered, small micropylar processes situated on the cephalic pole of egg. 20—24 longitudinal rows of small processes regularly distributed on the surface of chorion, the surface among these processes of papillose appearance. The mentioned processes very irregular (apparent under high magnification), mostly with seta-like structures; similar curved or straight seta-like structures intermixed among the processes (visible on the margins of non-cleared eggs). These structures look like large or small circles respectively on the surface of egg observed in transmitted light.

The chorional processes and seta-like structures disappeared on eggs treated by KOH, also the circles observable on surface of eggs were much smaller and less distinct. These structures are apparently formed by a non-resistant lipoprotein layer of exochorion.

Any details of structure of micropylar processes may only be seen on cleared eggs. They are asymmetrically club-shaped, with lateral subterminal funnel-shaped aperture leading to a very narrow canal running into the chorion.

d) Morphology of Chauliopinæ

1. Adults

a. General shape and colouring

Small (total length 1.80—3.07 mm), very stout, oval or subparallel bugs; ventrally strongly convex, dorsally flat, but with a strongly vaulted pronotum.

Only cuticular pigmentose colouring present. General ground colour variously shaded yellow or brown, in some species also a rusty or black colour occurs. Without definite colour patterns.

b. Hairs, sculpture and other cuticular structures (figs. 83, 84, 87)

Hairs principally of the same types as in *Malcinae*:

1. semierect, or erect setae (sparser than in *Malcinae*);
2. straight, very minute adpressed hairs (microtrichia?);
3. glandular hairs: a) adpressed curved hairs (as in *Malcinae*); b) clavate hairs and true scales (figs. 83, 84), often of clavate outline, and often adpressed to the surface of the body. In some species (*Neochauliops laciniata* (Bergr.), *Chauliops rutherfordi* Dist.) only the scales — often of different shape on various parts of the body — occur. In other species, some parts of the body (esp. head and abdominal ventrites) only with scales, other parts with curved hairs, various intermediate stages and true scales together. Most of the glandular hairs (and scales) seem to be covered by a wax-like substance, which probably changes during the ontogeny, and causes an often different shape of the scales on the same parts of body in different individuals of the same species.

The glandular hairs (and scales) generally arising from deep pores, especially well marked on pronotum, clavus, corium, pteropleurae and abdominal ventrites. These pores very reduced on some parts of the body in some species; at most in *Neochauliops laciniata* (Bergr.): e. g. without pores and glandular hairs on clavus. The pores may be empty or filled by a wax-like substance (same as that covering the scales), and, therefore, different in various individuals of the same species. The wax-like substance often covering in a continuous, thin, dirty whitish or yellowish layer the whole surface of some parts of the body (especially corium and clavus, often also pronotum), covering also the sculpture of cuticle and the pores (not to be mistaken for true reduction of pores!). This layer melts readily in hot water, dispersing over the whole body, and forming then a very thin, continuous layer.

The cuticle between the pores smooth and shining in some individuals, dull and microgranulate in others. This character may be different in various individuals of the same species; this may be, perhaps, ascribed to ontogenetic changes in the distribution of microparticles of the wax-like substance.

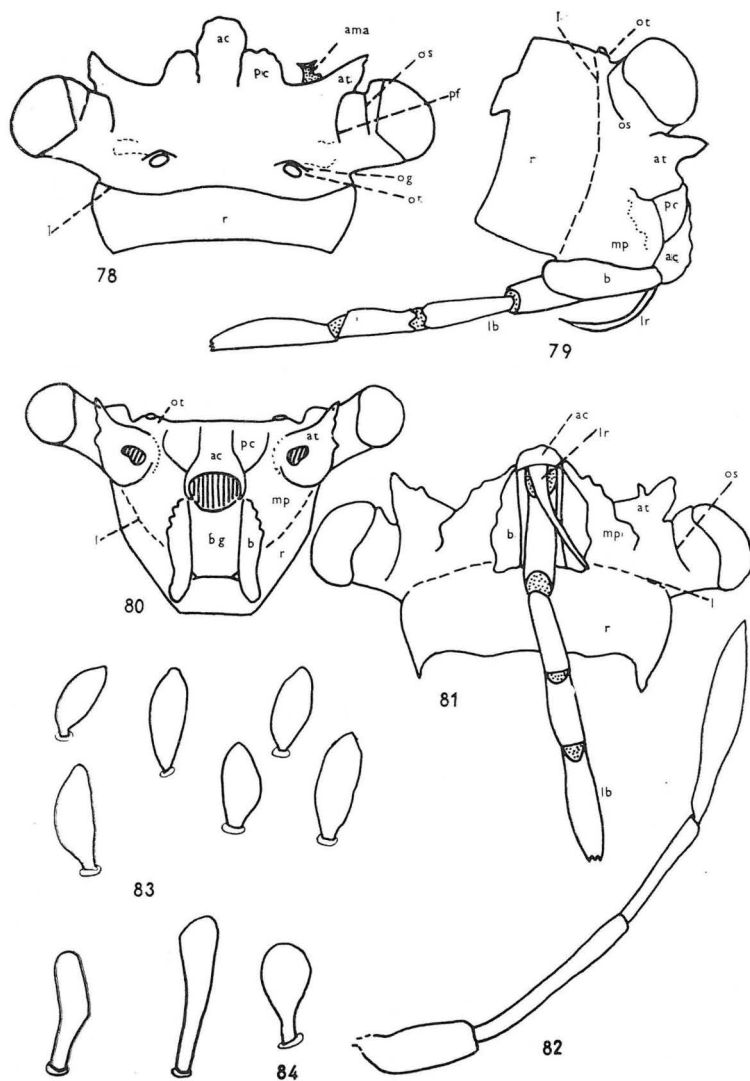
The whitish tomentose spots (fig. 87) are similar to those of *Malcinae*, but less developed, and usually of less curled appearance; best developed latero-proximally on mesoscutellum, laterally on the 2nd ventrite, and laterally on both pteropleurae.

c. Head (figs. 78—81)

Narrower than pronotum, very transverse, short and wide; its anterior part strongly sloping, anteclypeal part nearly vertical. Also the ventral part slightly dorsally sloping towards the apex (in anterior view also the ventral part of head visible). The posterior horizontal part of head retracted, in repose, into the pronotum up to the bases of bucculae and nearly up to the ocelli. The retracted part distinguished by shagreening, the free part by strong puncturation.

Vertex and frons practically flat. Ocelli situated on small tubercles, anteriorly encircled by ocellar grooves, indistinctly branching laterally. Ocelli situated behind the compound eyes, distant from them and each from other. The eyes distinctly stylate, the eye peduncles slightly anterodorsally directed.

Distinct ocular sulci, rather remote from the margins of eyes, encircling the eyes (exc. their posterior margins). The base of each peduncle distinctly set



Morphology of Chauliopinæ.

Figs. 78.—81. Head and mouthparts of *Chauliops* sp. (S. India, Chakkaballapura). Fig. 78. Dorsal view. Fig. 79. Lateral view. Fig. 80. Anteroventral view, mouthparts removed. Fig. 81. Ventral view. Fig. 82. Antenna of *Chauliops rutherfordi* Dist., lateral view. Figs. 83.—84. Scales of *Neochauiops laciniata* (Bergr.) from abdominal ventrites (fig. 83) and from actual lateral margin of abdominal dorsum (fig. 84).

off dorsally by a parafrontal sulcus, running on the dorsal surface of head parallel to the ocular sulcus and being anteriorly (on the anterior base of peduncle) identical with the external margin of antenniferous tubercle.

Antenniferous tubercle large, sharply limited (only posteromedially not divided from frons and posteriorly from gena). Dorsolateral part of each tubercle raised and spinously produced, also the externolateral margin with a small tooth. The inner part of tubercle not raised above the level of external part of paraclypeus, the maxillary plate divided from antenniferous tubercle by a distinct sulcus. Antennae freely articulating on anterior parts of antenniferous tubercles, their insertion slightly supericorn, or rather on a line connecting the middle of eye with the apex of head.

Anteclypeus short, distinctly widened apically, distinctly surpassing the short, triangular paraclypei. Maxillary plates posteriorly fused with genae. Bucculae well developed, parallel, slightly longer than the non-retracted part of head, their proximal tips divergent, free, and slightly produced under the anterior margin of pronotum. The walls of bucculae distinctly sloping laterally. A posteriorly limited, concave buccular groove present between the bucculae. Gula not distinguished from gena, maxillary plate and occiput.

The shape of peduncles, spinous processes and teeth of the antenniferous tubercles, and the declivity of head variable at species level.

d. Antennae (fig. 82)

4-segmented, the 1st segment stout, cylindrical, the 2nd and 3rd stick-shaped, distally slightly thickened, the 4th segment fusiform, proximally with more or less parallelsided peduncle. All segments with short semierect setae, the 4th densely covered with short, adpressed hairs also. The 1st and 3rd segments subequal, shorter than the subequal 2nd and 4th segments. Antennae short, about the length of combined head and pronotum. The 1st segment with conspicuously long articular membrane.

e. Mouthparts (figs. 79—81)

Labrum about the length of 1st labial segment, without peculiarities. Labium 4 segmented, reaching from between the middle to between the hind coxae. The 3rd segment distally swollen, the 4th segment apically truncate and denticulate. Labial formula (segments arranged according to diminishing length, the longest first): 1+4, 2, 3. Since the whole gula is retracted into the pronotum at repose, and most of the 1st labial segment is hidden between the bucculae, the labium seems at the first sight to arise from the posterior margin of head.

f. Thorax (figs. 85—87)

Pronotum swollen, convex, strongly anteriorly declivent, Collum small, distinct, callar region and pronotal lobe not distinctly separated, cicatrical impressions well developed. Pronotal lobe with structurally well developed mediane and with indicated posterolateral tubercles. Posterior lobuli slightly developed, but distinctly present. Lateral margins of pronotum indicated by indistinct ridges.

Pteronotum has not been studied in detail. Mesoscutum with both medial sulcus and parapsidal sulci. Mesoscutellum large, reaching behind the posterior margin of metanotum and dividing it into 2 halves. The 3rd phragma much larger than in Malcinae.

The visible part of mesoscutellum (fig. 87) rather small, triangular, longer than the very short claval commissure. The lateral margins straight, depressed, proximally covered by tomentose spots. A row of seta-bearing tubercles limiting the proximal concave part of scutellum; the discal and apical parts raised, the seta-bearing tubercles limiting there a medial channel-like groove. The tubercles subapically transformed into rampart-like ridges, which practically meet apically. The very apical part of scutellum produced above the level of hemelytra; its form variable at species level.

Pleurae and sterna (fig. 85). Propleura deeply punctured, its hind margin concave. Supracoxal lobe large, occupying nearly the whole ventral margin of pleura, but feebly distinguished. Precoxale fused with sternum, but very narrow.

Mesopleura: supracoxal lobe normally developed, feebly distinguishable from the other parts. Its commissure very oblique, its ventral epimeral margin very short. Precoxale fused with sternum, wide. The whole mesopleura (exc. dorsal part and smooth and ramparted anterior margin) deeply punctured.

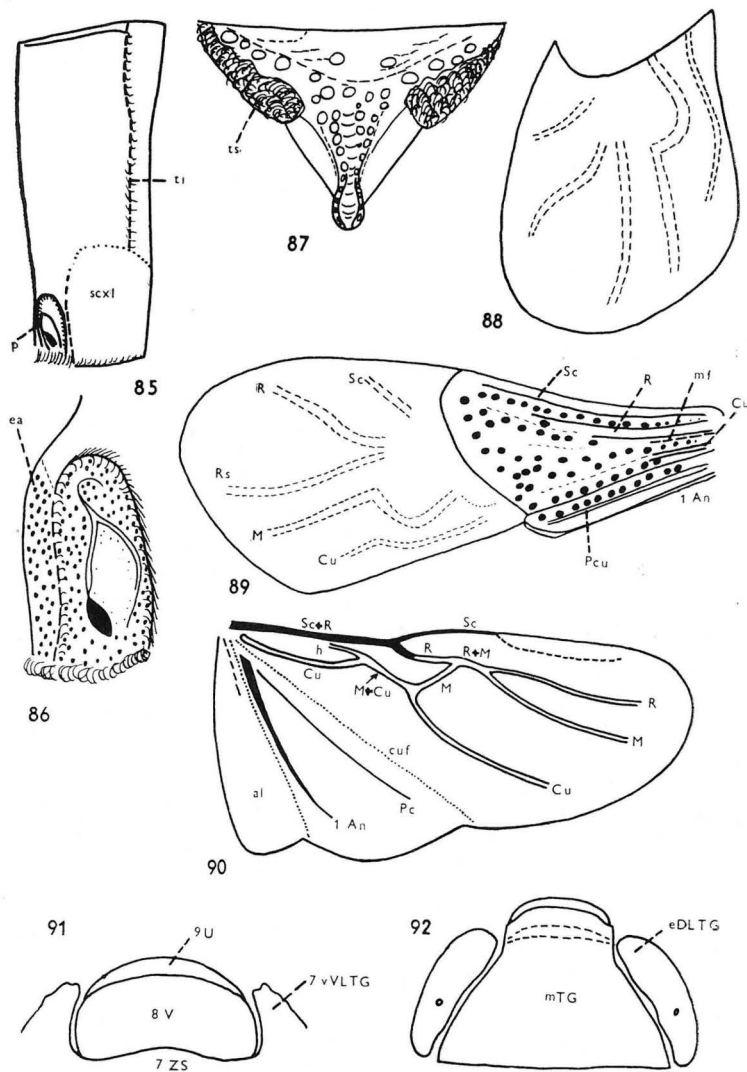
Metapleura: precoxale fused with sternum, very narrow, the supracoxal lobe normally developed, and occupying nearly the all ventral margin of metapleura. The narrow lateral part of posterior margin of metepisternum (metepimeron non-visible externally) smooth, thickened, rampart-like, widening dorsally, and distinctly limited by a transverse anterior impression. The hind margin of metapleura nearly straight or slightly concave, its posterolateral angle rectangular or indistinctly produced and slightly acuteangular (about 80°). The posteroventral angle of metapleura rectangular in lateral view.

Anterior part (= xyphus) of prosternum feebly concave, tongue-shaped. Mesosternum anteriorly truncately produced, posteriorly straight, distinctly concave. Metasternum anteriorly straight, moderately concave. Meso- and metasternum with distinctly limited impressions for fore and middle coxae. All coxal cavities externally opened posteriorly. The distances between coxae variable at species level: the distance between the fore coxae equal to the width of $\frac{1}{2}$ —1 coxa, between the middle coxae of 2—2.5 coxae, between the hind coxae of about 1.5 coxa; between the fore and middle coxae of 2—2.5 coxae, between the middle and hind coxae of $\frac{1}{2}$ — $\frac{2}{3}$ coxa.

Peritreme of metapleural glands (fig. 86) cylindrical, dorsally and posteriorly sharply, anteriorly gradually rising above the surface of metepisternum, its axis identical with the vertical axis of metepisternum. A smooth, often indistinctly limited line bordering a pointed auriculate depression on the lateral surface of peritreme; a small ostiole visible on its ventral part — it does not seem to be externally connected with coxal cavity. The auriculate depression finely, the other parts of peritreme very roughly granulate. Evaporatorium very small, limited to a narrow space between the peritreme and anterior metepisternal margin, equally roughly granulate as the peritreme.

g. Legs

Relatively short, all pairs practically of the same shape. Coxae and trochanters without peculiarities, prefemur non-developed. Femora subclavate, the



Morphology of Chauliopinae.

Fig. 85. Metapleura of *Chauiops rutherfordi* Dist. Fig. 86. Peritreme of metapleural gland of *C. rutherfordi* Dist. Fig. 87. Mesoscutellum of *C. nigrescens* Dist. Fig. 88. Membrane of *C. rutherfordi* Dist. Fig. 89. Fore wing of *C. rutherfordi* Dist. Fig. 90. Wing venation of Chauiopinae, scheme (based primarily on fig. 24 by Slater and Hurlbutt 1957 : 78). Fig. 91. Terminal urites of *Chauiops* sp. (S. India, Chakkaballapura), ♂, ventral view. Fig. 92. 7th medial tergite and dorsal laterotergite of *Chauiops* sp. (S. India, Chakkaballapura), ♂, dorsal view.

hind femur with distinct ventral subapical spine, an indication of such a spine present on middle femora (these teeth present in *Neochondriops* Štys and *Chauliops fallax*-group, but lacking in *Chauliops bisontula* Banks). Tibiae stick-shaped, rounded. Tarsi 3-segmented, the 1st and 3rd segments subequal, the 2nd shortest, the 3rd incrassate. Pretarsus: claws simple, regularly curved, membranous pseudarolia well developed.

h. Hemelytra (figs. 88, 89)

Reaching to or surpassing the tip of abdomen, always macropterous. Corium and clavus coriaceous, clavus very narrow, membrane large. Hypocostal lamina rather narrow, disappearing at the level of distal margin of the 2nd urite.

Clavus with rather rounded apical angle, the claval commissure very short. Pcu distinct, 1An marginal, well recognizable distally and proximally only. A single row of punctures present between claval fracture and Pcu in *Chauliops* Scott; without punctures in *Neochondriops* Štys.

The whole lateral margin of corium slightly concave, the external posterior angle obtusely angulate, the posterior margin conspicuously convex. Only marginal Sc and the proximal parts of R and Cu distinctly recognizable; M indistinct. The arrangement of rows of punctures variable at species level. Medial fracture very short.

Membrane with 5 veins (Sc, R, Rs, M, Cu) in form of non-sclerotized folds. Sc, R and Rs non-recognizable proximally, M and Cu either connected with corium or proximally indistinct (individually variable). Sc short and oblique, remote from the distal end of corial Sc. R and Rs with approached bases, the proximal part of M bent, its distal part angularly caudally turned. Cu slightly bent.

i. Metathoracic wings (fig. 90)

(The fig. 90 is based on Slater and Hurlbutt's (1957) figure of *Chauliops fallax* Scott, and is only slightly modified as to some details ascertained by me.) Metathoracic wings always well developed, indistinctly trilobate. Only Sc+R, proximal parts of free Sc and R, and 1An well sclerotized. Sc marginal distally from the divergence of R, apically indistinct and appearing as an submarginal fold. R non-interrupted proximally. Hamus distinct, incomplete, meeting Cu markedly proximally before the point of divergence between Cu and M. M forming an oblique cross-vein between Cu and R, running a short distance as fused R+M, distally free. Cu parallel with M. Cubital fracture with one branch only; without secondary veins. Pcu nearly indistinct, without long basal stem common with 1An. 1An strongly sclerotized, divergent from Pcu, non-diffused distally. Anal lobe moderately large, with a feeble remnant of 2An.

j. Pregenital segments of abdomen (figs. 92, 103, 104, 106)

Medial tergites (figs. 92, 103). The 1st mediotergite well developed, sclerotized, without laterotergites (incomplete lateral sulci indicate the laterotergal region). The 1st to 7th mediotergites immovably fused, the sulci straight and distinct. The obliterated sulci between the tergites 1—2, 4—5, 5—6 and 6—7

with meandrine structure and external rows of pits; these sulci seemingly doubled (remnants of the originally overlapping tergal margins?).

The intersegmental sulci straight, the paired orifices of abdominal glands present between the tergites 4—5 and 5—6. The surface of mediotergites 2—7 with conspicuous deep pits (non-setigerous), their size decreasing towards the tip of abdomen. Large unpaired pits, more or less in intersegmental position, present between the mediotergites 1—2, 2—3 and 5—6; similar paired pits between the tergites 3—4 and 4—5.

The 7th mediotergite: ♂ (fig. 92): posteriorly produced into a rounded process, with terminal and subterminal transverse ridges, divided by a transverse concavity; ♀ (fig. 103): slightly wider than in the male, non-produced, its hind margin straight.

The dorsal internal laterotergites (fig. 103) horizontal, firmly fused to the lateral margins of mediotergites; present on the urites 2—6 (not on the 7th!). Their intersegmental sulci often indistinct, the intertergal membrane missing.

The dorsal external laterotergites (fig. 103) well developed, present on the urites 2—7. The medial parts of these plates more or less distinctly limited on the anterior urites.

The ventral laterotergites (figs. 103, 104). The connexival line running distinctly submarginally on all urites (exc. 1st), the actual margin of dorsum formed by the lateral margins of dorsal parts of ventral laterotergites. This part strip-like and narrow on the urites 2—4; much wider, slightly dentate (each dens with 1 seta) and strongly obliquely dorsally raised on the urites 5—7. Dorsal part of ventral laterotergite of the 7th urite conspicuously surpassing the tip of the respective dorsal external laterotergite. The detailed shape of these structures variable at species level.

The ventral parts of ventral laterotergites (further only vVLTG) more complicated than in Malcinae. The vVLTG form lateral parts of the ventrites, and are divided from the zygosterna by a slightly impressed line on the 2nd urite, and by a distinct keel on the 3rd—7th urites. A distinct concave impression present on zygosterna closely ventral to this keel. This impressed part, although otherwise not different from the medial parts of zygosterna, belongs obviously also to vVLTG; this being indicated by the position of trichobothria on the urites 5—7 closely ventral to this impression. Thus probably the impression, and not the keel, represents the pleural line.

The parts of vVLTG dorsad of the keel with longitudinal impressions on the urites 3—6, weakly developed also on 7. vVLTG of the urites 3—7 conspicuously high.

The zygosterna (fig. 103) strongly vaulted, the 2nd zygosternum well developed, the 2nd to 5th immovably fused, their intersegmental sulci very distinct, but with the same meandrine structures as in Malcinae. All intersegmental sulci straight; otherwise without peculiarities.

Sexual modifications of 6th and 7th zygosterna: a) males (fig. 92): the 6th and 7th zygosternum normally developed, free, without peculiarities; b) females (figs. 104, 106): The 6th zygosternum with slight, the 7th with strong, oblique, transverse impression. The 7th zygosternum entire, not cleft, without plica, its

medial part very narrow, looking (in both posterior and ventral views) as a very narrow, transverse strip.

k. The 8th urite of male (figs. 91, 93—95)

Ring-shaped. Venter long, posterior margin simply rounded, laterally subangular. The anterior part smaller, invaginated into the 7th urite, smooth; the posterior freely visible part larger, with lateral groups of pores and postero-medial group of pores and setigerous tubercles, which form a medial, transverse ridge.

Dorsum short, completely covered by the 7th mediotergite. Lateral parts formed by the ventrite, medial part by distinctly limited, mostly membranous (exc. its posterior triangular sclerotized part) tergum.

l. The 9th urite of male (pygophore) (figs. 91, 96—100)

Ventrally for the most part covered by 8th urite, only the posterior narrow margin of pygophore free in ventral view. Dorsally, the larger proximal part covered by the 7th mediotergite up to the bases of gonostyli.

Pygophore cup-shaped, ventral wall broad, posteriorly slightly subtruncately produced into an indistinct hypandrium, laterally obtusely angulate, the distal part transversely wrinkled, divided from the smooth proximal part by an irregular ridge. The distal part raised obliquely dorsally (in an angle of approx. 45°) to the proximal part.

Dorsal part of pygophore with large dorsal foramen; its posterior wall formed by hypandrium. The posterolateral margins of foramen formed by superior processes of the pygophore, dorsally covering parts of gonostyli. The base of each process with small tooth medially.

An inferior process of the diaphragme of genital chamber present in front of gonostyli. In anterior or dorsal view, it has the shape of the "Eiffel Tower", composed of 2 arms meeting under an acute angle in front of blades of gonostyli, and being ventrally connected by a transverse bridge. The construction of inferior process exactly recognizable only after its removal from the wall of genital chamber. It is composed of 2 wing-like lobes meeting at the acute angle, the "arms" and "bridge" being only thickenings of cuticle. The whole structure distinctly limited, its ventral parts in close contact with phallus, its posterior parts fused to hypandrium.

The proctiger region remarkably large in male, but not studied in detail in either sex.

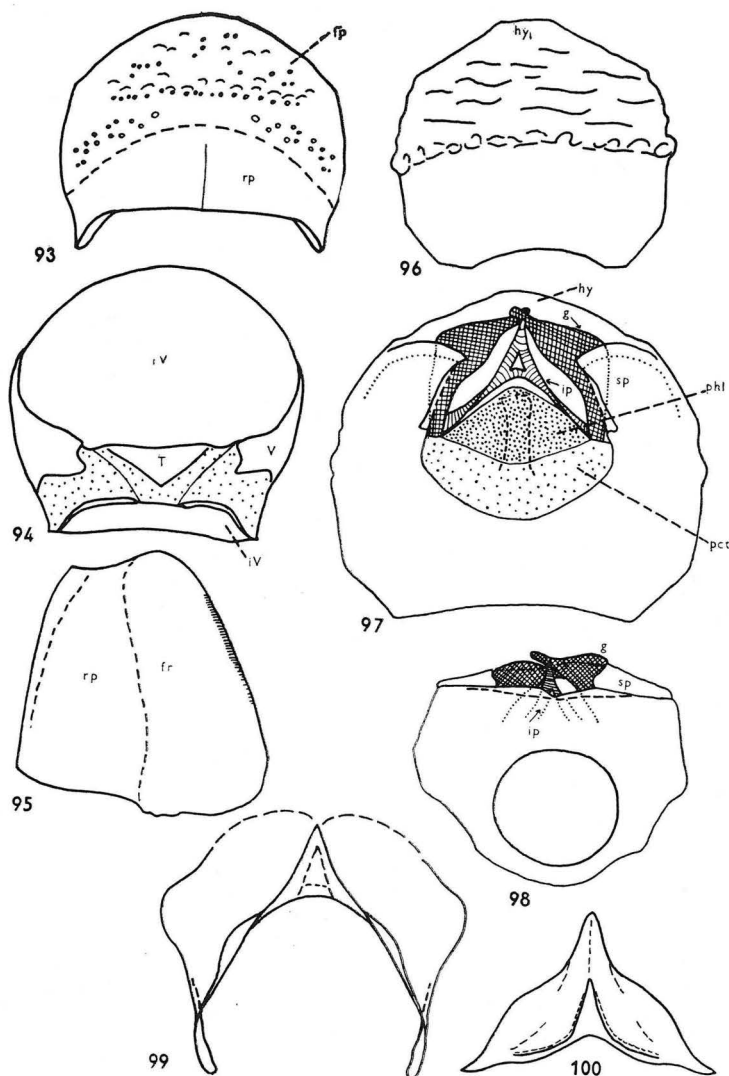
m. Gonostyli (figs. 97, 98, 101)

Large, crossing, the tips situated at the inner wall of hypandrium. Blade not distinctly divided from shank, the distal part of gonostylus with a distinctly bird-head outline. Otherwise without peculiarities.

n. Phallus (fig. 102)

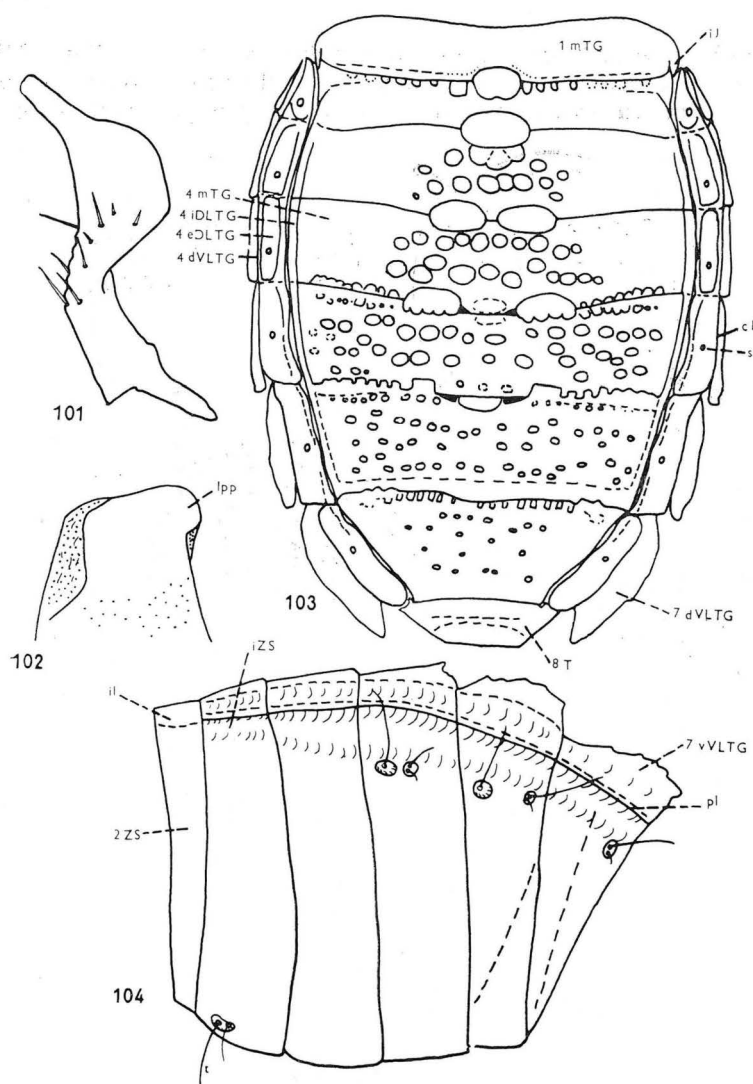
Many attempts to inflate or to stretch out the phallus of *Chauliops* sp. (S. India, Chikkaballapura) were unsuccessful. The phallus was, therefore, not figured, and only the safely ascertained features of the non-inflated phallus are described.

Phallosome with large, distinct posterolateral processes (fig. 102). Endophallic sperm reservoir complete, wings and body broad. Without sclerotized processes on conjunctiva and vesica. Processus gonopori very long, 6 times



Morphology of *Chauliops* sp. (S. India, Chakkaballapura), ♂.

Fig. 93. 8th urite, ventral view. Fig. 94. 8th urite, dorsal view. Fig. 95. 8th urite, lateral view. Fig. 96. Pygophore, ventral view. Fig. 97. Pygophore, dorsal view. Cross-hatching indicates gonostyli, hatching the inferior process. Fig. 98. Pygophore, anterior view. Cross-hatching indicates gonostyli, hatching the inferior process. Fig. 99. Inferior process of pygophore, dorso-anterior view. Fig. 100. Inferior process of pygophore, ventral view.



Morphology of Chauliopinæ (figs. 101. — 103. *Chauliops* sp. [S. India, Chakkaballapura])
 Fig. 101. Right gonostylus, anterior view. Fig. 102. Distal part of phallosome, lateral view.
 Fig. 103. Abdomen of ♀, dorsal view. Fig. 104. Pregenital segments of ♀ abdomen of *Chauliops rutherfordi* Dist., lateral view.

coiled, secondary gonopore apical, non-flaring. Well, developed helicoid process with 2 turns present.

o. Female genital segments and genitalia (figs. 103, 106—110)

The genital complex nearly in vertical position, no part of genitalia covered by 7th zygosternum. In posterior view the large 1st valvifers, 8th and

6th ventral laterotergites, 2nd valvifers (mostly medially in contact in dried specimens, more rarely — always in cleared specimens — distant each from other), the tips of valvulae and the posterior margin of 8th tergum are exposed.

The 1st valvifers large, triangular, entirely externally visible, deprived of any connection with the 1st valvulae.

The 2nd valvifers wide, the medial half of each valvifer internally thickened (well recognizable also on external surface), the limit of this part indicated by a notch in the posterior (dorsal) margin of the valvifer. Fibular part very short, abruptly turned laterally.

The 8th tergum (dorsal tergite) trapezoidal, with 2 transverse grooves, anteriorly desclerotized, but with 2 anterolateral, strong, intersegmental internal apophyses. The 8th ventral laterotergite set off by an indistinct, desclerotized line.

The 9th tergum externally non-visible, covered by 8th tergum, narrowly oblong, its lateral parts slightly turned posteriorly. The 9th ventral laterotergites turned medioventrally, each laterotergite set off from the respective dorsal tergite by a weak desclerotized line. The 2nd valvifers laterally embraced by 9th ventral laterotergites.

Both valvulae lacinate, firmly joined, poorly sclerotized, the 1st valvulae with well developed fibulae.

Gonangulum slightly sclerotized exc. its dorsolateral angle, where also an apophysis is developed.

The intersegmental membrane 7—8 very short; vagina, any remnants of 8th sternum and paragenital glands were not ascertained.

The sclerotization of gynatrial glands (fig. 109) unpaired, very short, the posteromedial margin indistinct.

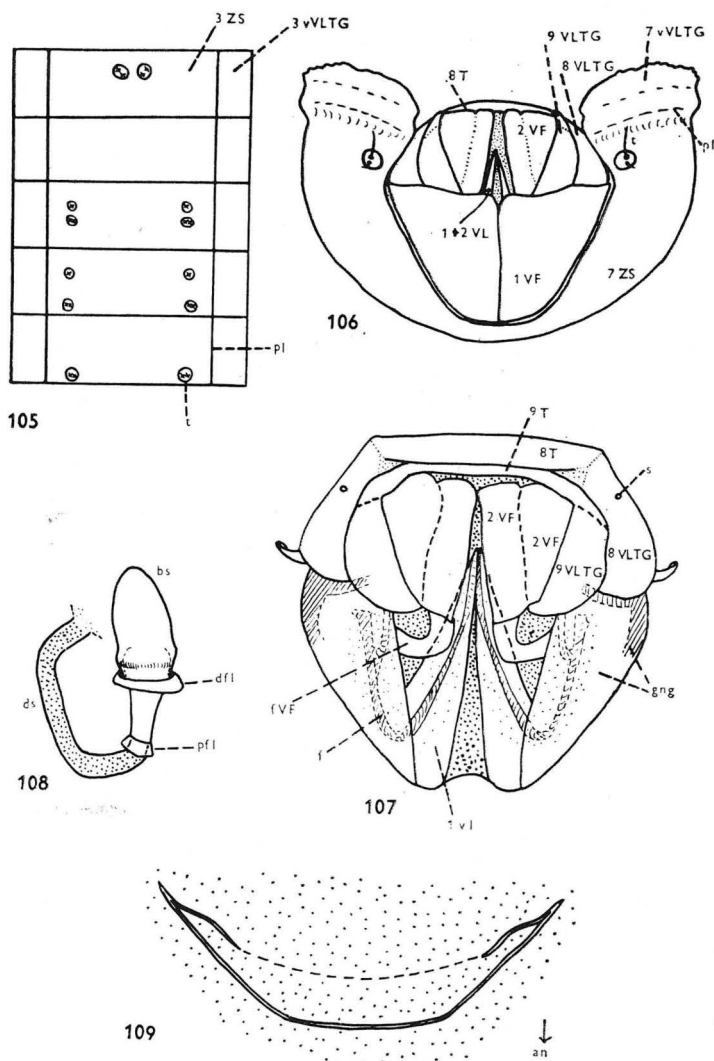
Spermatheca (fig. 108) with very thick, short, non-coiled and non-sclerotized duct, only its distal part between the flanges, the flanges and the bulb heavily sclerotized. Both proximal and distal flanges present, simply collar-like, the distal one situated on the base of bulb. The bulb elongate, subproximally with a transverse, elevated ridge.

p. Abdominal spiracles (fig. 103)

The 1st urite without spiracles, the 2nd—7th urites with spiracles situated on dorsal external laterotergites, always in the middles of their widths, on the proximal segments in posterior parts, on distal segments in the middles of their lengths. The spiracle of 8th ventral laterotergite in female very reduced, nearly indistinguishable, probably non-functional; the spiracles of 8th urite were not ascertained in the male.

q. Abdominal trichobothria (figs. 104, 105)

Situated on distinctly elevated, loaf-shaped, sharply limited tubercles. The trichobothria of the 3rd and 7th urites clustered, those of the 5th and 6th urites dispersed. The sublateral trichobothria distinctly ventral to the keel, which, however, probably does not represent the true pleural line (see the paragraph on ventral laterotergites). The most anterior trichobothrium on each segment



Morphology of *Chauliops* sp. (S. India, Chakkaballapura), ♀
 Fig. 105. Scheme of arrangement of trichobothria. Fig. 106. Terminal part of abdomen, posterior view. Cleared specimen, the 2nd valvifers slightly pushed apart. Fig. 107. External genitalia, the 1st valvifers removed. Fig. 108. Spermatheca, cleared. Fig. 109. Sclerotization of gynatrial glands, dorsal view.

is the longest; the posteroventral trichobothria on the urites 5—7 very minute.

3rd urite: 2+2, medially, clustered, in an oblique longitudinal row

4th urite: 0

- 5th urite: 3+3, sublateral, dispersed, in a longitudinal row (1+1 anteriorly, 2+2 posteriorly in a transverse row)
6th urite: 3+3, in the same arrangement as on the 5th urite, the posterior pairs more distant from the anterior trichobothria
7th urite: 2+2, sublateral, clustered, in a transverse row

2. Nymphs

After the finishing of the manuscript, one 5th instar nymph of *Chauliops* sp. (either *C. rutherfordi* Distant, 1904, or n. sp.) from Nigeria has been obtained from Dr Slater. Its detailed description will be published elsewhere; only some preliminary remarks are given here.

Head, thorax, hemelytral lobes and plates surrounding the orifices of dorsal abdominal glands black, antennae, legs and abdomen dark brown. Body of lygaeoid appearance, without any spinose processes. Head declivent, without recognizable epicranial sulcus, eyes substylate. Abdomen with straight inter-segmental sulci; narrow, slit-like openings of dorsal glands situated between the terga 4—5 and 5—6, both openings surrounded by strongly sclerotized plates. Abdominal terga without any structures corresponding to the pits present in adults. Deep impressions set off the laterotergal regions along the whole length of margins of abdomen both on the dorsum and on the venter. Abdominal venter with some scales. Trichobothria situated on similar tubercles as in adults, of the same number and position. Spiracles as in adults.

e. Discussion of morphology etc. of Malcinae, Chauliopinae and related groups

1. Adults

a. General shape

Malcinae are larger, more slender and more elongate than Chauliopinae, and possess much more slender and longer extremities. The appearance of Chauliopinae is similar to many groups of Lygaeidae, the Malcinae resemble at most the Ninini and some genera of Berytidae (e. g. *Gampsocoris* Fuss).

b. Hairs, sculpture and other cuticular structures

The hairs of Malcinae and Chauliopinae are of the same basic types, the scales of Chauliopinae are homologous to the curved glandular hairs of Malcinae. True scales do not occur in Malcinae (contrarily to the statement by Ashlock 1957). The "tomentose spots" of both groups seem to be primarily of the same nature as the wax-like secretory substance of glandular hairs, but in some species they seem to be changed into permanent epicuticular tomentose structures. The changes in the degree of development of wax-like secretions in pores or on the surface of body are probably ontogenetic, and similar to those described by Hertel (1953) in *Neides tipularius* (L.) (Berytidae).

The deep porose puncturation of the body and the pruinose dull covering of some parts of the body occur in many groups of Lygaeidae (esp. in Ischnorhynchinae, in many Blissinae, Lygaeinae etc.). The most similar conditions exist in Cymini, where also the ontogenetic changes of the substance filling the

pores are proceeding, and in Ninini, where the body (exc. hemelytra) is strongly punctured and mostly provided with pruinose covering, sometimes even changing into tomentose layers. The erect hairs of Ninini are mostly provided with wax-like particles, similar to those figured by Hertel (1953) in *Neides tipularius* (L.). In no Lygaeidae, however, the exact counterparts of the tomentose spots of Malcinae and Chauliopinae occur, and the scales are developed only in *Slaterellus hackeri* Drake and Davis, 1959 (Slaterellinae) and *Heinsius* Distant, 1901 (Blissinae). This is undoubtedly only a convergent character.

The Berytidae are very similar to Chauliopinae, Malcinae and Cyminae. They are deeply punctured (in Berytinae also on hemelytra), the ontogenetic changes of the pores occur, and the typical curved glandular hairs (in *Neides* Latr. even partly transformed into scales) are developed. On the other hand, no pruinose or tomentose structures and no continuous wax-layers are developed in Berytidae.

The Colobathristidae are mostly less punctured (especially the hemelytra are practically glabrous- as well as those of most Metacanthinae), but in some species the pronotum and pleurae are deeply punctured, and some parts of them may bear pruinose or even permanent tomentose covering.

S u m m a r y. The cuticular structures of Chauliopinae are more derivative than those of Malcinae. Both subfamilies are most similar to Cyminae and Berytidae.

c. Head

The head of Chauliopinae and Malcinae exhibit some common derivative features: strongly declivent anterior part of head, well developed ocellar grooves, presence of parafrontal sulci, distally widened anteclypeus, supericorn or intermediate insertion of antennae. Derivative features of Malcinae, not present in Chauliopinae: ocelli closely approached and situated on a common tubercle, head more declivent, insertion of antennae more supericorn, antenniferous tubercles lacking, but antennal sclerites and preantennal plates developed, the whole clypeal region distinctly limited. The derivative characters of Chauliopinae, not present in Malcinae: eyes distinctly stylate, ocular sulci distant from eyes, antenniferous tubercles with spines and teeth, head more retracted into pronotum (in repose). The ocular sulci are undoubtedly homologous in both subfamilies, although they are more remote from the eye margins in Chauliopinae — probably due to the development of the peduncles of eyes. Also the parafrontal sulci are homologous in both subfamilies — this is indicated by a similar directions of these sulci on the dorsal part of head. The antennal sclerites and preantennal plates of Malcinae are homologous to the antenniferous tubercles in Chauliopinae.

The head of all groups of Lygaeidae is porrect or slightly declivent (e.g. Slaterellinae), only in Ninini a distinct trend to the declivity of head appeared — the all stages between the porrect head and head with nearly vertical anterior part may be found. The declivity of head in Chauliopinae resembles the Ninini. The vertically declivent head of Malcinae is very different from the head of any Lygaeidae, and resembles more the head of Berytidae and Colobathristidae; the clypeal region of these families is often practically vertical.

The head of Berytinae differs from the head of Malcinae and Chauliopinae by presence of anteriorly directed frontal process.

The ocellar grooves are in various form developed in all mentioned groups (especially strongly in Colobathristidae). The parafrontal sulci are peculiar to Malcinae and Chauliopinae, and do not occur elsewhere. Only an indication of such sulci may be found in some Colobathristidae (esp. in *Peruda flavida* Breddin). The parafrontal sulci of Malcinae and Chauliopinae are non-homologous to the similar structures present on the dorsal surface of head in those Coreidae having the anterior part of head vertical and the antenniferous tubercles closely approached. The similar sulci of these Coreidae run along the inner margin of antenniferous tubercles, and not to their dorsal (Malcinae) or external (Chauliopinae) margins.

The stylate eyes of Chauliopinae occur in various Lygaeidae (esp. Henestariinae, Ninini) and in most Colobathristidae. The eyes of Cymini and Berytidae are sessile.

The intermediate or supericorn insertion of antennae in Malcinae and Chauliopinae is similar to Berytidae, Colobathristidae and Ninini (also some genera of Cymini with intermediate insertion of antenna occur), and different from the rest of Lygaeidae. The insertion of antenna closely to the inner anterior margin of eye is characteristic for Malcinae, Berytidae, Colobathristidae and Ninini — the antennae are more remote from the eyes in Chauliopinae, Cymini and other Lygaeidae. This character is caused by the reduction of antenniferous tubercles in Malcinae, Berytidae, Colobathristidae and Ninini. In the latter 3 groups, the antenniferous tubercle is changed into more or less distinctly limited and separated plates, of which that situated between the insertion of antenna and the inner margin of eye is transformed into a small, scale-like structure, homologous to the preantennal plate of Malcinae. The most similar condition to Malcinae is present in some Ninini and some Colobathristidae although in no group the large preantennal plate of Malcinae is developed. The antenniferous tubercle in Cymini and Chauliopinae is a precursor of the discussed structure, its spinous lateral part, covering laterally the insertion of antenna, is homologous to the preantennal plate in Malcinae and to the similar structures in other mentioned groups. The sulcus between the paraclypeus and maxillary plate and the sulcus limiting the anteromedial part of the remnant of antenniferous tubercle meet always posteriorly in Malcinae, Ninini and Colobathristidae; the situation in Berytidae is more complicated and has not been studied in detail.

The antenniferous tubercles are reduced also in various other Lygaeidae (e. g. many Ischnorhynchinae), but they are never changed into separate plates, the antennae are always supericorn, and their insertion is always in front of the eyes and more or less remote from them.

The closely approached ocelli in Malcinae are only similar to some species of Ninini and especially to some Colobathristidae, but in no species the conditions of Malcinae were reached.

The distinctly limited (even proximally) clypeal region of Malcinae represents a derivative feature simulating the primitive condition, and it does not occur elsewhere.

The relatively large bucculae of Malcinae and Chauliopininae, posteriorly slightly rounded and prominent, are much larger than those of Cyminae, Berytidae and Colobathristidae — they occur on the very anterior part of head in these groups. The bucculae of *Cryptorhamphus* Stål (Cymini) are percurrent along the whole length of the head and thus different from the rest of the tribe.

S u m m a r y. The head of Malcinae is more derivative than the head of Chauliopininae, and it resembles in many derivative characters the head of Ninini, Berytidae and Colobathristidae. The head of Chauliopininae resembles at most the head of Cymini and in some respects also Ninini. The parafrontal sulci are peculiar to Chauliopininae and Malcinae.

d. Antennae

The antennae of Chauliopininae are more primitive than the antennae of Malcinae and resemble especially the antennae of Cyminae. The antennae of Malcinae are similar to the antennae of some Ninini, and especially to the antennae of Berytidae. The antenna of Berytidae differs from that of Malcinae only by extreme elongation of the proximal stalk of the 1st segment. In this interpretation, the club of the 1st segment of antenna in Berytidae is homologous to the proper 1st segment of lygaeid bugs, being only extremely stalked. The striking difference between the antennae of Berytidae and Lygaeidae is thus easily explainable and seems to be rather unimportant from the morphological point of view.

The antennae of the primitive Colobathristidae (*Dayakiella* Horv.) do not differ from the usual lygaeid type, those of the derivative genera are extremely thin and elongate (incl. the 1st segment) and of different type than in Cyminae, Malcinae and Chauliopininae, where the 1st segment is always more or less incrassate.

e. Thorax

The thorax of Malcinae is more derivative than that of Chauliopininae in the following characters: larger pronotal lobe, sinuate hind margin of propleura, spinously produced posterolateral angles of metapleura. The thorax of Chauliopininae has the following features more derivative than in Malcinae: more swollen pronotum, larger, but less clearly defined supracoxal lobes, more modified hind margin of metapleura, narrower precoxale, scutellum distinctly longer than claval commissure and surpassing the hind margin of metanotum, callar region not distinctly limited from the pronotal lobe. The general structure of thorax is, however, very similar in both subfamilies, and they agree also in some conspicuous derivative features: produced and grooved apex of scutellum, always elevated above the level of hemelytra, transverse impression on the metapleura, presence of posterior lobuli on pronotum.

The latter character distinguishes Malcinae and Chauliopininae from the majority of Lygaeidae; these lobuli are fully developed only in an aberrant pachygronthine genus *Stenophyella* Horv. and in some Blissinae. The indistinct indications of these structures occur in some lygaeid groups (esp. in some Ninini — e. g., *Ninus insignis* Stål perhaps also in Slaterellinae), but never

in Cymini, and in no group the definite shape of the posterior lobuli, like in Malcinae and Chauliopinae, has been attained. The posterior lobuli are, however, characteristic for Berytidae and Colobathristidae.

The presence of posterior lobuli seems to be correlated with the presence of posterolateral tubercles on pronotum, which are always more or less developed in Berytidae, Colobathristidae, Malcinae (missing in some species) and Chauliopinae, but missing in most Lygaeidae. The pronotum of Berytidae, with often occurring posteromedial tubercle (*Gampsocoris* Fuss e. g.) as in some Malcinae, strongly resembles the pronotum of Malcinae; the Chauliopinae are more lygaeid-like as to the appearance of pronotum. The well developed cicatrical impressions of Malcinae and Chauliopinae are shared by Lagaeinae, Orsillinae, Cyminae and Ischnorhynchinae, they are indistinctly developed in Berytidae-Metacanthinae, and absent in other Lygaeidae, Berytinae and Colobathristidae.

The posteriorly produced and grooved scutellum of Malcinae and Chauliopinae is, of all Lygaeidae, most similar to the bifid scutellum of Ninini. The scutellum of Cymini, with often occurring medial keel, is more similar to the primitive scutellum of Berytidae and Colobathristidae. The derivative scutellum of two latter families differs profoundly from the considered groups by the presence of horizontal, vertical or oblique spinous process, the apex of which represents the original apex of scutellum. The prominent and narrowed apex of scutellum, is however, shared by Colobathristidae, Berytidae, Malcinae and Chauliopinae.

Malcinae agree with Ninini in the length of scutellum — it is mostly subequal to the length of the claval commissure in both groups. The scutellum of Cymini and Berytidae is much shorter than the claval commissure; this commissure is missing in Colobathristidae. The scutellum of Chauliopinae is longer than the claval commissure as well as the scutellum of all other Lygaeidae.

The thorax of Slaterellinae differs profoundly from that of Malcinae and Chauliopinae (and all other considered groups) by externally well visible post-coxale on prothorax, and by fused episternal and epimeral parts of supracoxal lobes on mesothorax. The first character occurs also in *Cavalerius* Dist. (Blissinae — Slater and Miyamoto 1963).

The transverse impression on metapleura occurs in all Chauliopinae Malcinae, Berytidae, Colobathristidae, Ninini, many other Lygaeidae, but not in Cymini.

The acuteangularly produced posterolateral angle of metapleura occurs in many groups of Lygaeidae (incl. Cyminae), in Malcinae, in most Berytidae (although often apically rounded), but not in Colobathristidae and Chauliopinae (or very indistinctly).

The metathorax of Berytidae and Colobathristidae differs profoundly from that of Chauliopinae, Malcinae and other Lygaeidae by a posterodiagonal turn of the vertical axis of supracoxal lobe (and of coxa), which is enlarged and occupies the largest part of metapleura.

The structure of pteronotum is insufficiently known in Coreoidea, and no inferences can be drawn from its structure in Malcinae and Chauliopinae.

Peritreme of the metapleural glands is rather different in Malcinae and Chauliopinae, but it does not differ profoundly from the basic type of other Lygaeidae, in which often (e. g. Ischnorhynchinae) some genera with elevated peritreme occur. The peritreme of Malcinae and Chauliopinae is, however, much more developed than that of Cyminae, and differs from the usually much more conspicuously dorsally produced (esp. in many Metacanthinae) and from the anterior margin of metapleura remote peritreme of Berytidae. Also the peritreme of Colobathristidae is always very remote from the anterior margin of metapleura.

S u m m a r y. The thorax of Malcinae and Chauliopinae has well developed posterior pronotal lobuli, which occur in Berytidae and Colobathristidae, but mostly not in Lygaeidae. Some other characters also resemble Berytidae and Colobathristidae, but some (esp. of Chauliopinae) are very different, and both subfamilies have many lygaeid characters, resembling at most the Ninini.

f. Legs

The legs of Chauliopinae are more derivative than those of Malcinae, but they do not differ from the type found in many groups of Lygaeidae. Their subclavate femora resemble the Cymini, but the latter group does not possess the dentate femora. The legs of Malcinae are longer, but generally very similar to those of Ninini. The legs of Berytidae are even longer and differ by their clavate femora, much larger coxae and by the posteriorly turned axes of the hind coxae. The same is true (exc. the clavate femora) for Colobathristidae; many genera of them have, moreover, dentate femora. The tarsi of Slaterallinae are very different from all considered groups by incompletely fused 2nd and 3rd tarsal segments.

g. Hemelytra*)

The common derivative features of the fore wings of Malcinae and Chauliopinae are: distinctly concave lateral margin of corium, very short medial fracture, no connecting vein between M and Cu, Cu running closely and parallel to claval fracture, deep puncturation of corium and clavus, indistinct bases of the veins on membrane. The derivative features peculiar for Malcinae: corium apically produced and posteriorly concave, presence of corial tubercles, fusion of M and Cu distally on the membrane. The derivative features peculiar for Chauliopinae: distinctly convex posterior margin of corium, narrowed clavus with very short commissure, loss of clavus puncturation in *Neochauliops* Stys, reduction of M on corium, remoteness of the end of corial Sc from the base of Sc on the membrane, angularly bent M on the membrane.

The concave lateral margin of corium occurs in Malcinae, Chauliopinae,

*) Leston (1962) has studied the tracheation of hemelytra in Heteroptera, and some veins, especially on the membrane, should be homologized differently than in this paper according to his interpretation. The membrane vein Rs should be M, the vein M = Cu, the vein Cu = the 1st vannal. Although the Leston's conclusions seem to be well founded, no attitude is provisionally taken to them, since the homologization of veins adopted here is well utilizable for comparative purposes within the Coreoidea, and since the acceptance of Leston's views cannot in any way influence the below presented comparative conclusions.

Ninini, Pamphantinae, many Berytidae — Metacanthinae, and in all Colobathristidae. This margin is convex (esp. in Cymini), straight or slightly insinuate proximally in other groups of Lygaeidae; some exceptions occur only in individual aberrant genera, the concavity of the lateral margin is not characteristic for any higher taxon. The lateral margin is straight or slightly convex in Berytinae.

The strongly convex posterior margin of corium in Chauliopinae is different from any of the considered groups. The posterior margin is straight, slightly insinuate (strongly in *Entisberus esakii* Slat. et Hid., Megalonotinae — Slater and Hidaka, 1958) or indistinctly concave in most of the Lygaeidae and in Berytidae-Berytinae. Those genera with distinct concave margin (many Ischnorhynchinae e. g.) have conspicuously convex lateral margin. The concavity of the posterior margin combined with always distally elongated and narrowed apex of corium is, however, characteristic for Malcinae, Berytidae — Metacanthinae and Colobathristidae; this character is most extremely developed in the latter family.

The corial tubercle of Malcinae is homologous to the indistinct thickening found in the same place in Cyminae. Corial tubercles do not occur in other Lygaeidae, and in Berytidae and Colobathristidae.

The distinctly coriaceous corium and clavus of Malcinae and Chauliopinae is similar to most Lygaeidae (incl. Cymini) and Berytidae-Berytinae, but very different from the at least partly hyalinized corium of Pamphantinae, Ninini, Berytidae-Metacanthinae and Colobathristidae.

Cu, running on corium parallel and close to the claval fracture, is characteristic for many Lygaeidae (e. g. for Ischnorhynchinae; quite different direction in Lygaeinae and Orsillinae!); it is an important fact that this direction of Cu is shared also by Cyminae (exc. *Cryptorhamphus* Stål), Malcinae, Chauliopinae, Berytidae and Colobathristidae.

The absence of the connecting vein between M and Cu on corium occurs in all Cyminae, Ischnorhynchinae, Chauliopinae, Malcinae, Berytidae and Colobathristidae, but also in many other lygaeid groups (incl. e. g. Orsillinae; this vein is present in Lygaeinae, Heterogastrinae etc.).

The reduction of M (or non-branching of R+M?) on the corium in Chauliopinae does not occur in Cyminae, Malcinae, Berytidae and many groups of Lygaeidae (incl. Lygaeinae, Heterogastrinae etc.), but it is, perhaps, comparable with the conditions in Orsillinae and Ischnorhynchinae, where R+M is not branched or branched apically only. The venation of corium in Colobathristidae is extremely derivative and rather different from the other discussed groups: Sc, R and M are fused and form a sclerotized lateral margin of corium, R never appears as a free vein on corium, M in some genera is free only very apically, forming a short oblique vein enclosing a short subapical corial areole (the homology of the corial veins in Colobathristidae may be easily understood by comparison of the venation of corium with that of the membrane).

The very narrowed clavus of Chauliopinae with extremely short commissure is most similar to that of Geocorinae — this is certainly a convergent feature. The only similarly narrowed clavus occurs in Colobathristidae, where

no commissure is developed, and the clavi of both wings are broadly overlapped.

The venation of the membrane of Chauliopinae is similar to many Lygaeidae having 5 free veins, and it cannot show any relationship. The venation of Cyminae is, however, very similar, although more derivative: membrane with 5 free, basally often indistinct, non-sclerotized, veins appearing as folds only; similar distal supplementary folds, representing, perhaps, the branched apical parts of the principal veins, often occurring among them. The membrane venation of the aberrant Cymine genus *Cryptorhamphus* Stål is more derivative, but in a different direction: Sc practically missing, the remaining 4 veins forming a multicellular reticulum (a distinct, but differently formed reticulum, occurring also in some Oxycaeninae and in Slaterallinae). The distal fusion of M and Cu in Malcinae, forming a proximal cell on the membrane, does not occur in any groups of Lygaeidae. The veins M and Cu are connected by a cross vein, which forms a proximal membrane cell, in Lygaeinae and Orsillinae, but M and Cu are not fused distally. Moreover, in some Lygaeinae, like in Heterogastrinae, a secondary subbasal cross-branch of M is developed, "capturing" the bases of more lateral veins.

The venation of the membrane in Berytidae seems to combine the characters found in Lygaeinae and Malcinae: the same principal veins (Sc, R, Rs, M and Cu) are developed, M and Cu have independent bases (often nearly indistinct in M or in both veins, both veins are then for a short distance fused - as in Malcinae, but they appear distally as free veins - as in Lygaeinae). M and Cu may be, however, quite independent in some species, or may be connected by a cross-vein only; the vein M "captures" also Rs (the base of Rs then indistinct) in the more derivative genera. Sometimes even the veins M and Cu have a common basal stalk (M+Cu) — then, however, the original basal stem of Cu is indicated by a fold, which is not connected with M and runs distally often even behind the branching point of M and Cu (e. g. *Gampsocoris* Fuss).

The venation of the membrane of Colobathristidae is most derivative of the considered groups, but as to the course of M and Cu it reminds one of the conditions found in Lygaeinae: only 4 veins are developed (Sc has been lost), R and Rs with variously long common basal stem, M proximally oblique, running towards Cu and forming an oblique cross-vein between M and Cu, enclosing thus a basal cell-the free distal part of M arising from this oblique vein and running parallel with Cu. Sometimes even a proximal cross-branch of M towards R is present (as in Heterogastrinae and some Lygaeinae). The basal parts of veins are often lost or indistinct, and the basic patterns of the venation are then hardly recognizable.

Summary. Hemelytra of Malcinae and Chauliopinae display a set of common derivative features, but are very different from each other. The combinations of characters of both subfamilies are very distinctive and do not appear as a whole in any other group of Lygaeidae or related families. Many important derivative features characteristic either for both Malcinae and Chauliopinae, or only for one of these subfamilies (mostly for Malcinae) occur also in Cyminae, Berytidae and Colobathristidae (the latter family being most derivative of the whole lygaeoid complex as to the structure of hemelytra).

Some very important features are shared also by Malcinae and Chauliopininae (or by one of these subfamilies) with Lygaeinae, Orsillinae and Ischnorhynchinae (some of these features are shared also by Cyminae, Berytidae and Colobathristidae, or by some group of them). Some characters shared by some of the mentioned groups with Geocorinae, Heterogastrinae and Pamphantinae are probably convergent. The subfamilies of Berytidae and the tribes of Cyminae (as well as *Cryptorhamphus* Stål, an aberrant genus of Cymini) have also very distinctive combinations of the characters of hemelytra. The characters of any of the considered groups cannot be direct derived from the conditions existing in any modern representative of another group. The hemelytra show, however, that Malcinae, Chauliopininae, Cyminae, Berytidae and Colobathristidae are probably related groups, and that they may be in some way related also to Lygaeinae, Orsillinae and Ischnorhynchinae.

h. Metathoracic wings

The hind wings of Chauliopininae and Malcinae were studied by Slater and Hurlbutt (1957); their descriptions differ from my observations only in insignificant details; the branches of cubital furrow in Malcinae were, however, described as fused and diverging only distally — both branches are distinct practically from the base of wing in my opinion. In this paper I have adopted the homologization of heteropterous venation published by Davis (1961). The terminology by Slater and Hurlbutt is somewhat different, and is given in parentheses: cubital furrow (= vannal fold), secondary veins (= intervannals), Pcu (= anterior vannal vein), 1An (= posterior vannal), 2An (= jugal vein), anal lobe (= jugal lobe).

The wings of Malcinae are more derivative than those of Chauliopininae: the hamus is missing and Pcu and 1An are very reduced. Also Chauliopininae possess some, although less important derivative characters, which are not present in Malcinae: the free part of Sc is submarginal, R+M is longer, cubital furrow is not forked; it is, therefore, not possible to derive the venation of Malcinae direct from Chauliopininae (suggested by Slater and Hurlbutt 1957). The common derivative characters of both subfamilies: almost complete absence of secondary veins in cubital sector, and reduction or absence of 2An.

The following discussion is based primarily on the characters described by Slater and Hurlbutt (1957). The wings of Malcinae agree in 2 most important derivative characters (loss of the hamus and of the secondary veins) with the wings of most Cyminae, derivative Geocorinae, derivative Blissinae and Megalonotinae, and with Pamphantinae. The wings of Pamphantinae and of the similar Megalonotinae differ, however, by well developed Pcu and 1An, and by a part of the free branch of R mostly in marginal or submarginal position; the former character is also peculiar for Geocorinae, the latter (together with well developed 2An) for Blissinae. The most similar wings as to the derivative characters are those of the derivative genera of Cymini (as the genus *Cymus* Hahn) and Ninini.

The wings of Chauliopininae with retained hamus, but lost secondary veins, are similar to many less derivative Lygaeidae, including Lygaeinae, deri-

vative Orsillinae, primitive Cymini (e. g. *Ontiscus* Stål), primitive Blissinae, some Heterogastrinae and Cleradini (Megalonotinae). They differ distinctly from Lygaeinae by proximally completely fused Sc with R, from Heterogastrinae by much more proximal position of hamus, and from Blissinae by the free part of R not in marginal or submarginal position, and by Pcu and 1An without common base. Chauliopinae are by the latter character distinguished also from the primitive Cymini. The wings of Cleradini are extremely similar to those of Chauliopinae, but it is certainly only a convergent feature.

Many groups of Lygaeidae have a generalized venation, of which the features of the venation in Malcinae and Chauliopinae could be derived. It is important that the venation of both subfamilies is easily derivable from that of primitive Cymini, and that the venation of primitive Ischnorhynchinae is in every respect more generalized than in all above mentioned groups.

Of the lygaeid groups not considered by Slater and Hurlbutt, the venation of Idiostolinae (Scudder 1962b; probably not Lygaeidae in my opinion!) is one of the most primitive among Lygaeidae, and the venation of Slaterallinae (Drake and Davis 1959) is the most derivative: without hamus, extremely reduced M, without secondary veins and 2An, very reduced Pcu and 1An. The venation of the latter subfamily is even more derivative than that of Malcinae.

The venation of metathoracic wings of Berytidae shows the same basic patterns as that of Malcinae: hamus, secondary veins and 2An are lost. The other characteristic features are, as follows: 1An and Pcu well developed to strongly reduced, cubital furrow usually with 2 branches, anal lobe strongly reduced or absent, the field between Sc+R and Cu very narrow, the free distal part of M sometimes without connection with R, only Sc+R and the proximal short part of R well sclerotized. The venation of Berytidae is easily derivable from that of primitive Cyminae.

Also the venation of Colobathristidae shows the same derivative features as the most of Cyminae, and as Malcinae and Berytidae: the hamus, secondary veins and 2An are lost. Moreover, the cubital furrow, anal lobe, Pcu and 1An seem to be greatly reduced or entirely absent. In all examined species also the distal free part of Cu is lacking, only in *Dayakiella* Hoev. it is present, possessing also a distinct glochis. Thus the venation of Colobathristidae exhibits principally the same reduction trends as the above mentioned groups, but it is the most derivative of them, and may be derived direct from the venation of Cyminae, Malcinae or Berytidae.

S u m m a r y. The venation of Chauliopinae is much more primitive than that of Malcinae, and it is most similar to that of primitive Cyminae (and Cleradini). The venation of derivative Cyminae, and of Malcinae and Berytidae has basically the identical patterns, and it is derivable from that of primitive Cyminae. The venation of Colobathristidae is more reduced (usually lost Cu) and may be derived from the venation of the mentioned groups. Only Slaterellinae have so much derived venation, although in different direction (nearly lost M). Slater and Hurlbutt's (1957) suggestion that the venation of Cyminae, Chauliopinae and Malcinae could have been evolved from that of primitive Ischnorhynchinae is acceptable.

i. Pregenital segments of abdomen*

The sexual modifications of the 7th urite are discussed in connection with the male or female genital segments and genitalia. Since the knowledge of abdominal structures in many groups of Lygaeidae is insufficient, generally only Cyminae, Berytidae, Colobathristidae, Malcinae and Chauliopinae are discussed. The pregenital dorsum of abdomen in *Chauliops lobatula* Breddin and *Malcus flavidipes flavidipes* Stål was figured by Breddin (1907); both figures are erroneous.

The general form of abdomen in Chauliopinae is similar to many short-bodied Lygaeidae, that of Malcinae is similar to Cyminae and some primitive Berytidae. Most Berytidae have very elongate, linear abdomen, while the Colobathristidae differ by basally constricted subpetiolate abdomen (occurring also in some Cyminae), with very elongate 3rd and 4th urites, and strongly developed ventral part of the 2nd urite.

Medial tergites and orifices of dorsal glands. Both Malcinae and Chauliopinae share the following derivative characters: straight sulci between the medial tergites, reduction of intersegmental membranes, fusion of some tergites, "meandrine" structure of these fusions. The derivative features of Malcinae, not present in Chauliopinae: external reduction of the orifices of dorsal abdominal glands, obliteration of intersegmental sulci 3—4, 4—5 and 5—6. Derivative features peculiar to Chauliopinae: lack of the orifice of dorsal abdominal gland between the tergites 3 and 4 (noted also by Scudder 1963), presence of deep pits on tergites. The straight intersegmental sulci between the medial tergites represent probably a derivative condition in Coreoidea, dependent, perhaps, on the reduction of respective abdominal glands; usually, the tergite preceding the gland is produced posteriorly. Malcinae are more primitive than Chauliopinae by the retention of remnants of all 3 dorsal abdominal glands (presence of 3 glands noted also by Slater, Woodward and Sweet 1962; Scudder 1963 regarded Malcinae as having the orifices only behind the 4th and 5th mediotergites), but more derivative by strong reduction of their external orifices.

The straight intersegmental tergal sulci occur in various groups of Lygaeidae; this character is often variable at generic level. The straight sulci are characteristic of the higher groups, for Lygaeinae, Cyminae, Ischnorhynchinae, Slaterellinae and also for Berytidae. The tergites 3, 4 and 5 (sometimes only 3 and 4) are always posteriorly produced in Colobathristidae.

There is no trend to fuse the mediotergites in Cyminae, only the 1st and 2nd are firmly fused. The same conditions occur in primitive Berytidae (e. g. *Gampsocoris* Fuss), the other tergites are either membraneous in more deriva-

*) Shortly before putting this paper into print, a paper by Scudder (1963) has been noted, in which many features of abdomen of Coreoidea are described, and a key to this group based on abdominal characters is constructed. Many identical, up to now unpublished observations are contained both in Scudder's and my paper (as well as by Štys 1964b) — in such cases, the Scudder paper is not mentioned here. It is only referred to when the morphological data not originally contained in my paper are discussed, when the Malcinae or Chauliopinae were directly mentioned by Scudder, and in the cases of criticism of Scudder's paper (not applied in cases concerning the groups, which are not considered here).

tive genera, or the tergites 3—6 are firmly fused into a common plate (e. g. *Neides* Latr.), exactly as in Malcinae. The tergites 1—2 and 3—5 are fused in Colobathristidae, the intersegmental sulci between the latter tergites may be lost.

The dorsal abdominal glands occur in full number (between the tergites 3—4, 4—4 and 5—6) in Artheneinae (Slater, Woodward and Sweet 1962 otherwise stated in key-not in the table-by Scudder 1963), Phasmosominae (Scudder 1963), *Kleidocerys* Steph. (Ischnorhynchinae), in some Megalonotinae and also in some Heterogastrinae (Slater, Woodward and Sweet 1962, not mentioned by Scudder 1963;) this is a very primitive condition shared also (in a reduced form) by Malcinae. The anterior gland is lost in the rest of Lygaeidae, including also all other genera of Ischnorhynchinae (Scudder 1962a), and in Chauliopininae; only in Cyminae the anterior gland is present and the posterior lost (or rudimentary in some Ninini). The loss of posterior gland is also characteristic of Berytidae (the external orifices are reduced in *Neides* Latr. like in Malcinae, but Hertel 1955 erroneously reported that only the orifice between the tergites 4—5 is present). All 3 dorsal glands occur in Colobathristidae.

The laterotergites. The generalized structure of a pregenital abdominal segment of Trichophora (fig. 49) is, as follows: medial tergite (= mediotergite) connected by intertegular membrane with a pair of dorsal internal laterotergites (mostly more or less vertical, covered in a membranous pouch and well visible only in expanded abdomen), these connected with dorsal external laterotergites, the lateral margin of each laterotergite desclerotized (= connexival line) and forming the margin of abdominal dorsum; the ventral plate (= ventrite) formed laterally by ventral laterotergites bearing the spiracles, and divided by more or less distinct pleural lines from the medial zygosternum (= sternum + limb basis, Štys 1959). In lygaeoid families, the lateral groups of trichobothria are situated closely ventral to the pleural line.

The reduction of intertergal membrane is a common derivative feature of both Malcinae and Chauliopininae. The presence of dorsal external laterotergites on the 7th urite is a common primitive character of Malcinae, Chauliopininae, all Lygaeidae, Berytidae and Colobathristidae.

The common derivative character of both Malcinae and Chauliopininae is the partial replacement of the ventral laterotergites on the dorsum of abdomen, most conspicuous on the 5th—7th urites, where they form dentate lobes. The ventral laterotergites are divided into ventral and dorsal parts, both placed ventrally on anterior urites, the dorsal part becoming an integral part of dorsum on posterior urites, or on the posterior parts of individual urites. The actual lateral margin of the dorsum is formed by the lateral (dorsal) margin of the dorsal part of ventral laterotergites anteriorly, by a border between the dorsal and ventral parts of the ventral laterotergites posteriorly. The ventral parts of ventral laterotergites remain as parts of the ventrites dorsally from the pleural line. This interpretation of the marginal abdominal structures in Malcinae and Chauliopininae clearly follows from the comparison of individual urites in these groups, and by comparison of a cleared, slightly expanded abdomen with the non-expanded.

In no group of Lygaeidae do similar conditions occur*). Although the occurrence of the internal laterotergites is variable (noted also by Slater, Woodward and Sweet 1962), the dorsal external (and mostly also internal) laterotergites are well developed, and the ventral laterotergites are situated virtually ventrally, and limited by more or less distinct pleural line. The ventral laterotergites are very narrow in Cyminae, and the trichobothria of this subfamily are situated closely to the lateral margin of abdomen. Also the laterotergites of Colobathristidae are similar to those of Lygaeidae, and the pleural line is always well marked.

The laterotergites of Berytidae are highly modified, and the structure of abdomen of this family is here reinterpreted, as follows. The dorsal internal laterotergites are not present, and the intertergal membrane is very broad. The dorsal external laterotergites (always bearing the spiracles) are on non-expanded abdomen externally visible only on the 2nd urite and in the posterior half of the 7th (also only the spiracles of these urite are externally well visible); they are desclerotized, often hardly distinguishable from the intertergal membrane and covered by ventral laterotergites on the other urites. The ventral laterotergites are entirely replaced on the dorsum of abdomen, their shape and position superficially simulates the dorsal external laterotergites of other groups. The lateral margin of dorsum is formed by pleural line, and the ventral plates represent the true zygosterna, without any laterotergal elements. There are several reasons for this interpretation:

1. The dorsal spiracles are in all Coreoidea situated on the dorsal external laterotergites.
2. The 2nd urite of Berytidae has distinct, ventrally situated laterotergites, the dorsal external laterotergites are free.
3. The anterior part of the 7th urite is similar in construction to the preceding urites, but on its posterior part the ventral laterotergites are replaced ventrally again and constitute the lateral parts of the ventrite, while the posterior parts of the dorsal external laterotergites with spiracles are freely visible, sclerotized, and their lateral margins form the actual margin of abdominal dorsum.
4. The dorsally replaced ventral laterotergites on the urites 3-anterior part of 7 become components of the lateral wall of abdomen in either artificially or naturally expanded abdomen, in which also the dorsal external laterotergites are free and horizontal.
5. No pleural line on the ventral plates is developed, and when the lateral trichobothria are present, they are situated close to the actual margin of abdominal venter.

Thus Berytidae are the only family sharing the dorsally replaced ventral laterotergites with Malcinae and Chauliopininae, although in more derivative condition, attained, perhaps, by a different process.

*) A similar situation as described below in Berytidae seems to occur in Oxycareninae only, but the partial dorsal replacement of ventral laterotergites is in this group not accompanied by the dorsal shift of spiracles (exc. on the 2nd urite) as in Berytidae, Malcinae and Chauliopininae. The laterotergal patterns of Oxycareninae have not been studied in detail, and it will be discussed elsewhere, but since this subfamily does not seem to be in any way phylogenetically connected with the groups considered here, the results will be probably irrelevant to the problems here involved. The strange structure of the laterotergal region in Oxycareninae was anticipated by Slater, Woodward and Sweet (1962).

Venter. The immovably fused 2nd—5th zygosterna represent a common derivative feature of Malcinae and Chauliopininae. A trend to fusion of anterior zygosterna occurs in many Lygaeidae, and is exhibited in various degrees (e. g. in Geocorinae variable at generic level — contrary to the statement by Scudder 1963). Only the zygosterna 2—4 are fused in Cyminae, the zygosterna 2—4 to 2—5 in Berytidae (the intersegmental sulci often lost in both groups). In Colobathristidae mostly only the zygosterna 3—4 are fused (the intersegmental sulcus is often lost).

Summary. Many characters of pregenital abdominal segments are peculiar only to Malcinae and Chauliopininae, especially the striking structure of ventral laterotergites. They differ profoundly from all Lygaeidae by this character, the family Berytidae (and Oxycareninae?) is the only group comparable with Malcinae and Chauliopininae in this respect. Also some other characters of pregenital segments of Malcinae are shared by some Berytidae. The Cyminae have a much more primitive abdomen, but some derivative features are common to them and Malcinae and Chauliopininae. Colobathristidae (not taken in an account their own derivative features) more resemble the primitive lygaeid type.

Although the reduction of the orifices of dorsal abdominal glands in Malcinae reminds one of the derivative Berytidae, the full number of their remnants in Malcinae (occurring in the groups worth considering in *Kleidocerys* Steph. and Colobathristidae) shows that Malcinae could not evolve from the modern Cyminae. The number and position of dorsal glands in Cyminae is shared by Berytidae, but not by any other lygaeid group. The Chauliopininae agree in number and position of dorsal glands with most of the derivative Lygaeidae.

j. The male genital segments and genitalia

Generally. The form of the 7th mediotergite and the degree of exposure of male 8th and 9th urites is identical in Malcinae and Chauliopininae. The posteriorly produced 7th tergum is a derivative character shared by Berytidae, many Lygaeidae, but not by Cyminae. The 7th tergum of Colobathristidae is either non-produced, or slightly produced into a ventrally sloping process. The partly dorsally free pygophore occurs in various Lygaeidae; the whole pygophore is practically dorsally free in Cyminae. In Berytidae and Colobathristidae mostly no dorsal part of pygophore is exposed, being completely covered by the process of 7th mediotergite in Berytidae and retracted into the 7th urite in Colobathristidae. Only some genera of Berytidae, with markedly vaulted and slightly produced 7th mediotergite, have the pygophore for the most part free dorsally.

The greater part of the 8th urite is ventrally exposed in Malcinae, Chauliopininae and Cyminae; this is a primitive condition. This urite is completely retracted (in repose) in Berytidae, only its posterior margin is visible in Colobathristidae. The structure of this urite is not adequately known in Coreoidea and it is not discussed.

The sexual modification of the 7th zygosternum in the species of Malcinae similar to *Malcus furcatus*, n. sp. do not occur elsewhere in related groups. Their

form suggests that they may function as some sort of adhesive organ during copulation.

Pygophore. The terms parandrium, hypandrium, inferior and superior process are used according to Dupuis (1963), the term gonostylus for paramere according to Bonhag and Wick (1953). The terminology of gonostyli was adopted from Ashlock (1957).

Malcinae and Chauliopinae agree in details of the construction of pygophore, but some details in the form of the inferior process and especially of superior processes are different. The structure of pygophore has not been adequately studied in Lygaeidae and related groups, and therefore, the primitive or derivative nature of most features cannot be discussed and compared. The hypandrium of Berytidae is, however, very similar to that of Malcinae, and the superior and inferior processes are nearly the same in Berytidae and Chauliopinae. The pygophore of Cyminae has exactly the same inferior and superior processes as in Malcinae.

The parandria occurring in the species similar to *Malcus furcatus*, n. sp. do not occur in Chauliopinae or in any other related group. An indication of the development of 2 parandrial processes, situated, however, more dorsally, is characteristic of Berytidae. It is interesting that the parandria occur only in those species of Malcinae with sexually modified 7th zygosternum.

The gonostyli of Malcinae and Chauliopinae lack any distinctive derivative features. Their position (in repose) is similar to many Lygaeidae (incl. Cyminae) and to Berytidae.

Phallus. For the sake of uniformity, the terminology of Ashlock (1957) has been completely accepted, only the term "endophallic sperm reservoir" (Bonhag and Wick 1953) has been preferred to the ambiguous "ejaculatory reservoir" (Ashlock 1957).

The phallus of *Malcus flavidipes flavidipes* Stål has been studied in non-inflated stage by Ashlock (1957). His short description differs in some points from my description of partly inflated phallus of *M. furcatus*, n. sp. (also the phallus of *M. flavidipes flavidipes* was studied by me): 1. The phallotheca of Malcinae is provided with lateral processes (lacking according to Ashlock). 2. Definitely no helicoid process is present ("its presence is not to be excluded as a possibility" — Ashlock). 3. Ashlock ascertained 2 pairs of sclerotized processes: the larger one, compared by him with "flat vesical processes of *Blissus leucopterus*", is a pair of sclerotized conjunctival (vesical?) processes, but the smaller one, described by Ashlock as "rod-like and originating in the region of the ejaculatory reservoir" does not occur in Malcinae. Ashlock obviously confused the unusually large wings of the endophallic sperm reservoir for the mentioned processes.

The non-inflated phallus of *Chauliops lobatula* Breddin was studied by Pruthi (1925); its figure and description is schematized, the figure of gonostylus obviously erroneous and need not be discussed. He said that the phallus resembled Lygaeinae and differed from Heterogastrinae. The non-inflated, but stretched out phallus of *Chauliops fallax* Scott was studied by Ashlock (1957). His short description corresponds in the most important points with my description of *Chauliops* sp., only the lateral processes of phallotheca were pro-

bably overlooked by Ashlock. Some other characters ascertained by Ashlock, which could not be observed in the telescoped phallus of *Chauliops* sp., are here reviewed: "Conjunctiva short, robust: without processes.... Vesica with one pair of lobes proximally, and possibly with a second pair also; a short tubular region following;.... secondary gonopore non-flaring."

In spite of the excellent paper by Ashlock (1957) it is impossible to distinguish the primitive and derivative condition of most characters of lygaeid phallus; these structures are, therefore, of a little value for evolutionary considerations, although they provide excellent characters for definitions of higher taxa. Due to the difficulties with inflation of phallus, it is often uncertain which lobes or sclerotized processes belong to vesica and which to conjunctiva, and their exact homology cannot be ascertained at present. This is also the case in Malcinae: the described membranous and sclerotized processes of conjunctiva may belong to vesica as well. Nevertheless, their large development is different from any other Lygaeidae. The phallus of Malcinae and Chauliopinae share the presence of lateral processes on phallotheca, well developed endophallic sperm reservoir and long processus gonopori; the phallus of both group is inflatable with great difficulty.

Taking into account the characters regarded as most important in the conclusions of the study by Ashlock (1957), and regarding both Malcinae and Chauliopinae as possessing the lateral processes of phallotheca, the subfamilies of Lygaeidae may be grouped, as follows:

1. Pachygronthinae and Heterogastrinae — vesica reduced.
2. Lygaeinae, Cyminae, Oxycareninae, Pamphantinae (?), Artheneinae, Malcinae — lateral processes of phallotheca present, helicoid process absent.
3. Chauliopinae, Blissinae part. (Slater and Miyamoto 1963) — lateral processes of phallotheca and helicoid process present.
4. Ischnorhynchinae, Geocorinae, Henestarinae, most Megalonotinae — without lateral processes on phallotheca, helicoid process present.
5. Blissinae part. (Ashlock 1957), Orsillinae (incl. Metrargini), Lethaeini (Megalonotinae), Slaterellinae (?) — lateral processes on phallotheca and helicoid process absent.

It seems well possible that the phallus of Malcinae could be derived from that of Cyminae; in this subfamily also some genera with large wings of the endophallic sperm reservoir (Ashlock 1957), similar to those of Malcinae, occur. The presence of helicoid process in Chauliopinae is confusing, but as shown by Slater and Miyamoto (1963), the occurrence of this structure is not so stable as supposed by Ashlock (1957). The helicoid process evolved probably convergently in several different evolutionary lines.

The phallus of Berytidae and Colobathristidae has not been, unfortunately, adequately studied. That of Colobathristidae is without sclerotized processes on conjunctiva and vesica, has well developed ejaculatory reservoir, long conjunctiva and probably long, coiled processus gonopori (Pruthi 1925). It is probably of a rather generalized lygaeid type; the long conjunctiva was compared by Pruthi with that of Heterogastrinae and Pachygronthinae. The phallus of Berytidae is generally of the lygaeid type, and has long, coiled processus

gonopori (Pruthi 1925), in some species probably no conjunctival or vesical processes occur (Pruthi 1925), in others (Pruthi 1925, Scudder 1959) a pair of partly sclerotized conjunctival appendages and a pair of proximal vesical membranous lobes is present. The latter conditions seem to be very similar to Malcinae.

k. The female genital segments and external genitalia

The 7th zygosternum. Malcinae and Chauliopinae share an important derivative feature: the non-split 7th zygosternum in female. Malcinae are less derivative, since a remnant of obliterated medial sulcus is present, and their zygosternum is not medially narrowed as in Chauliopinae. The division of the 7th zygosternum into anterior and posterior parts in Malcinae does not occur in any Lygaeidae (comparable perhaps with *Trisecus* Bergr. [Scudder 1962b], Idiostolidae). The all Lygaeidae (exc. some highly aberrant fossorial Blissinae) have the 7th zygosternum medially split — it is a primitive condition. The non-split 7th zygosternum occurs invariably in all Berytidae and Colobathristidae, and it can form a subgenital plate in the latter family and in *Paraberytus* Štusák, 1964.

The external genitalia and genital tergites. The external genitalia of both Malcinae and Chauliopinae are in a nearly vertical position, and represent an intermediate type between the lygaeoid and coreoid types (as defined by Štys 1961): the 7th zygosternum is non-split, the intersegmental membrane 7—8 is very short, a distinct vagina is not present, the ovipositor is short, but lacinate. The external genitalia of Chauliopinae are of the usual lygaeoid type, and much more generalized than those of Malcinae. Characters resembling Malcinae are, as follows: presence of antesegmental apophyses of the 8th tergum (comparable with phragma-like podeme in Malcinae), and the reduced, externally non-visible 9th tergum. The narrowed 7th zygosternum caused the unusual complete exposure of the all external components of the genitalia in Chauliopinae. The genital complex of Malcinae is extremely derivative and modified in an unique way in Coreoidea. Many described characters cannot be compared with any of the related groups (form of the invaginated 9th tergum, its fusion with 8th tergum, phragma-like apodeme on 8th tergum, ring-spodeme of the 8th ventral laterotergite, peculiar course of gonangulum, attached to the 9th tergum and 8th ventral laterotergite instead of to the 9th ventral laterotergite, the externally reversed position of the 8th and 9th ventral laterotergites — the 8th instead of the 9th, being attached to the 2nd valvifer etc.). Scudder's (1959) opinion that the female genitalia of Berytidae are "almost identical in structure with those of . . . Malcinae" cannot be confirmed.

The other subfamilies of Lygaeidae (incl. Cyminae) have a generalized ovipositor, the lygaeoid type of inner genitalia, their split 7th ventrite covers partially the genital complex, the genital tergites are never so modified as in Malcinae. The genital tergites are divided into hemitergites in Cyminae, similarly to all Berytidae. The genitalia of the latter family are intermediate between the lygaeoid and coreoid type (as above summarized for Malcinae and Chauliopinae), but they are more generalized than those of Chauliopinae and esp. of Malcinae, the 9th tergite is well developed, all the principal structures

are present, and in normal position. (The genitalia are completely retracted into the 7th urite in *Paraberytus* Štusák, 1964). The only unique, important derivative character of Berytidae is a complete fusion of the 1st valvifer with 8th ventral laterotergite in Berytinae (Štys 1961).

The female genitalia of Colobathristidae (shortly described only in *Phaenacantha* sp. by Scudder 1959) are poorly known, but they are probably of coreoid type. They are nearly in vertical position, more or less telescoped into the 7th urite (similarly to Rhopalidae), only the 1st valvulae are in some genera elongate and protruded posteriorly (they are always visible externally). There is a distinct trend towards the development of a plate-shaped type of ovipositor; the 2nd valvifers are free in primitive genera, but often fused medially, and forming then a single transverse plate (as in some Alydinae and Pyrrhocoridae). The 1st valvifers are free from the 8th ventral laterotergites.

S u m m a r y. The non-split 7th ventrite, together with the general derivative structure of genitalia is shared by Malcinae, Chauliopinae and Berytidae. Some characters show relation of Chauliopinae to Malcinae, and of Cyminae to Berytidae. The modifications of genitalia and genital segments are, however, quite distinctive in Chauliopinae, Malcinae and Berytidae, those of Cyminae are lygaeid-like. The genitalia of Colobathristidae, although in some points similar to those of mentioned groups, are modified in quite special way, their derivative features seem to be more similar to some coreoid or pyrrhocorid bugs (probably only convergency).

1. The inner female ectodermal genitalia.

Sclerotizations of gynatrial glands are paired (primitive) in all examined Lygaeidae (Štys 1961) (incl. Cyminae) and in Malcinae, unpaired (derivative condition) in Chauliopinae and Berytidae. Unknown in Colobathristidae.

Spermatheca. The spermatheca of Chauliopinae is rather primitive (the very short ductus is a derivative feature) and very different from that in Malcinae, which is characterized by some conspicuous derivative characters: ductus very long, many times coiled, both flanges absent (present in Chauliopinae). There is a great diversity in the shape of spermatheca in Lygaeidae (emphasized also by Pendergrast 1957), often at generic level. Of the possibly related groups, the spermatheca of most Ischnorhynchinae (Scudder 1962a) has mostly globular bulb with similarly developed proximal flange as in Chauliopinae, but with reduced distal flange. The spermatheca of Orsillinae has usually also globular bulb, but both flanges are well developed; that of Lygaeinae lacks differentiated bulb. The spermatheca of Cyminae has also globular bulb, but the proximal flange is absent, and the distal one is poorly developed or absent. The spermatheca of *Cymus* Hahn is very similar to that of *Malcus* Stål, the distal flange is only slightly indicated, but the ductus is very short (as in Chauliopinae). The spermatheca of Berytidae is characterized by variously developed bulb with well developed distal, but poorly developed or absent proximal flange, the ductus is relatively short. The only information on the spermatheca of Colobathristidae is the following note Pendergrast by (1957) "The spermatheca of *Phaenacantha sedula* Horváth is simple with a glo-

bular apical bulb and a very long irregularly coiled duct." It seems be of exactly the same type as in Malcinae.

S u m m a r y. The reduction of proximal flange of spermatheca may show the relationship of Cyminae and Berytidae. The spermatheca of Colobathristidae and Malcinae may be derived from this type by complete reduction of flanges and by elongation of the duct. The spermatheca of Chauliopininae reminds one of Cyminae by its short duct, but otherwise is more generalized. The unpaired sclerotization of gynatrial glands is shared of the lygaeid groups by Berytidae and Chauliopininae only.

m. Abdominal spiracles

Malcinae and Chauliopininae share the same highly derivative position of the spiracles on the 2nd—7th urites: dorsal, on the dorsal external laterotergites. The same position is shared by Lygaeinae, Orsillinae, Ischnorhynchinae and Berytidae (since the dorsal external laterotergites of Berytidae are mostly sub-turned under the dorsally replaced ventral laterotergites, they are non-visible externally on a non-expanded abdomen, excepting the spiracles of the 2nd and 7th urites). At least one pair of spiracles retained the primitive ventral position in other subfamilies of Lygaeidae, the most similar conditions occur in Cyminae, Slaterellinae and Blissinae, where all spiracles are dorsal, and only the spiracles of the 7th urite are marginal (on the lateral margins of the 7th dorsal external laterotergites) or ventral. The position of spiracles in Colobathristidae is more primitive: those of the urites 2—4 are dorsal (on dorsal external laterotergites), those of the urites 5—7 ventral (on ventral laterotergites); the same position is shared by Pamphantinae (Scudder 1963), Geocorinae and some Megalonotinae. The reduced spiracles of the 8th ventral laterotergites in females are shared by Malcinae, Chauliopininae and Berytidae, they are mostly well developed in Lygaeidae.

The spiracles of Malcinae were regarded as ventral by Handlirsch (1925), Beier (1937) and Obenberger (1958) although already Breddin (1907) observed their true dorsal position.

n. Abdominal trichobothria

Both Malcinae and Chauliopininae have the same basic patterns of the distribution of trichobothria (the basic features noted by Scudder 1963 in key), and they share 3 important derivative characters: only 2+2 trichobothria on the 3rd urite, absence of trichobothria on the 4th urite, and the insertion of trichobothria on elevated, sharply limited tubercles. The remoteness of trichobothria from the "pleural line" in Chauliopininae is not a derivative character of the trichobothria themselves, since the conspicuous ventral keel is probably only simulating the true pleural line, which is indistinct and indicated by an impression closely dorsal to the lateral trichobothria.

In no other group of Lygaeidae or related families, the pronounced trichobothrial tubercles occur. The majority of Lygaeidae have a full number of trichobothria: 3+3 submedially on the urites 3 and 4, 3+3 laterally in dispersed arrangement on the urites 5 and 6, and 2+2 laterally, dispersed or clustered on the urite 7. The distributional patterns of trichobothria in Malci-

nae and Chauliopinae are easily derivable from the primitive lygaeid scheme, occurring also in Cyminae. A trend to the reduction of trichobothria, occurs, however, in some Blissinae (*Riggiella* Korm. — Kormilev 1949a, *Heinsius* Dist. — Slater and Sweet 1963 e. g.), in Slaterellinae and Oxycareninae. The arrangement of trichobothria in the latter group is very different from other Lygaeidae: trichobothria lacking on the 5th urite, clustered on the 6th (noted also by Scudder 1963).

The trichobothria of the primitive genera of Berytidae (e.g. *Gampsocoris* Fuss) are arranged in the typical lygaeid form on the urites 3 and 4, the trichobothria on the urites 5—7 are lateral, often reduced in number and hardly distinguishable from other hairs; the number of trichobothria is extremely reduced in Berytinae, where mostly only 2+2 submedial trichobothria on the 3rd urite are present.

The arrangement of trichobothria in Colobathristidae (mentioned, but oversimplified by Scudder 1963) does not share any similar features with Malcinae and Chauliopinae. The primitive lygaeid number and position is retained on the urites 3 and 4 (although the trichobothria are situated sublaterally on the 4th urite in such genera as *Peruda* Distant and *Perudella* Korm. [Kormilev 1949b]), the trichobothria are dispersed and usually in full number on the urites 5 and 6 (1 + 1 anteriorly, 2 + 2 posteriorly), although sometimes one of the posterior trichobothria is lacking on the 6th urite, and all trichobothria are situated sublaterally, remote from pleural line. The trichobothria of the 7th urite are clustered and occur in 1 or 2 pairs. Some other hairs, very similar to trichobothria (ascertained by Kormilev 1949b in *Perudella* Korm., but occurring also in some other genera) may occur on various zygosterna; it is not certain whether they represent subsidiary trichobothria, other special sensory hairs or only erected cover hairs; also some intermediate forms between these hairs and normal cover hairs seem to occur.

The arrangement of trichobothria in Idiostolinae (Lygaeidae?) differs profoundly from that of any group of Coreoidea, and represents, perhaps, the ancestral condition (see the figure by Scudder 1962 b).

S u m m a r y. The arrangement of trichobothria in Malcinae and Chauliopinae shows the close relation of both groups. The trichobothrial patterns of these subfamilies and of Berytidae evolved by reduction from the primitive lygaeid type (possessed also by Cyminae). The Colobathristidae have only slightly modified, and mostly non-reduced lygaeid type of the arrangement of trichobothria.

2. Nymphs

The nymphs of Malcinae differ profoundly from those of Chauliopinae, their distinctness contrasts sharply with the general similarity of adults. Malcinae are in nearly all respects more derivative, the only more derivative characters of Chauliopinae are: the reduced number of dorsal abdominal glands, presence of subcircular sclerotized plates surrounding them (regarded by Puchkov 1958 as evaporatoria) and lack of epicranial sulcus. The spinous appearance distinguishes at first sight the nymphs of Malcinae from Chauliopinae*) and from the other Coreoidea; the presence of trichobothrial tubercles and the peculiar trichobothrial patterns (esp. lack of trichobothria

on the 4th zygosternum) distinguishes Malcinae and Chauliopinae from other groups of Lygaeidae and Coreoidea.

The general shape of the nymphs of Malcinae resembles strongly the nymphs of some Tingidae. The nymphs of the latter family differ from Malcinae by the lack of abdominal trichobothria, by much shorter 2nd antennal segment, by smaller number of the processes on head (5 only), by lack of dorsal abdominal gland between the terga 5 and 6, by shorter legs and much shorter tarsi, and mostly by presence of peculiar microsculpture of the body. Nevertheless, the body processes of the nymphs of such tingids as e. g. *Galeatus* spp., *Stephanitis* spp., *Lasiacantha* spp., *Tingis reticulata* (H.—S.), *Diconocoris capsui* Horv., *Physatocheila* spp., *Dictyla* spp. (exc. *D. echii* [Schreck.]) and *Octacysta rotundata* (H. — S.) are the only structures exactly comparable with the seta-bearing processes of Malcinae.

Of the Coreoidea, only the nymphs of some Coreidae (esp. Phyllomorphini — fig. by Jeannel 1909) resemble Malcinae by the spinous surface of body. The nymphs of Coreidae have, however, only 2 dorsal abdominal glands, full number of trichobothria, and do not possess the trichobothrial tubercles. There exist certain analogies in the distribution of the spinous processes on the body between the nymphs of Malcinae and Phyllomorphini, but since no study on the distribution of dorsal setae in nymphs of Pentatomomorpha exist, it is not possible to appreciate these analogies at present.

The nymphs of Chauliopinae are much less distinctive (not taking into account the trichobothrial patterns) and does not differ from the usual lygaeid type; in the keys to nymphs of Lygaeidae by Puchkov (1958) and Sweet and Slater (1961) they would run under Lygaeinae, with which they share similarly built evaporating areas. These areas are practically non-developed in Malcinae, Cyminae, Berytidae and Orsillinae, and they are very short, wide and transverse in Ischnorhynchinae (Claassen 1921, Jordan 1933, Puchkov 1958, Slater 1963). The nymphs of Colobathristidae are unknown to me.

There is no necessity to discuss the other morphological structures in nymphs, since the number and position of dorsal abdominal glands, the spiracular and trichobothrial patterns have been discussed in adults and the other structures cannot up to the present be used for comparative purposes with phylogenetic aspects. The characters of nymphs of Malcinae are derivable by specialization from the primitive precymines with retained 3 dorsal glands or from the ancestors of Ischnorhynchinae with full number of dorsal glands and non-developed evaporating plates. The nymphs of Chauliopinae are most similar to Lygaeinae, and their characters are derivable direct from Ischnorhynchinae, Orsillinae or from the primitive precymines. With regard to the resemblance of the trichobothrial patterns of Chauliopinae with Malcinae, it is probable that both groups evolved from the same ancestral stock and that the characters shared by Chauliopinae and Lygaeinae are convergent.

*) The characterization of the nymphs of Chauliopinae, based only on the African material, is inaccurate. Dr. Remane (kind communication by letter) found nymphs of Chauliopinae with spinous body in Nepal — one of the greatest differences between Chauliopinae and Malcinae is thus overcome.

3. Eggs

In spite of the comprehensive papers by Southwood (1956) and Puchkova (1956, 1959), the eggs of Lygaeidae and related groups are poorly known, and especially the derivative or primitive nature of most characters is unknown. Moreover, many authors did not state whether their descriptions were made according to the eggs treated by KOR or non-cleared eggs, and it is, therefore, hardly possible to appreciate their descriptions of the surface of chorion or of the form of micropylar processes. Consequently, no more important conclusions may be drawn from the morphology of eggs in Malcinae (eggs unknown in Chauliopinae).

The lack of pseudoperculum and the general form of micropylar processes in Malcinae is similar to many Lygaeidae of various subfamilies. The eggs of Cyminae (Jordan 1935, Puchkova 1956) have 4—8 non-clustered, papillose micropylar processes. Very similar eggs to those of Malcinae occur in Berytidae (summarized by Southwood 1956): without pseudoperculum, micropylar processes club-shaped, but more numerous (4—6), scattered, the chorion may be longitudinally sulcate. It is important that the eggs of Ischnorhynchinae (Claassen 1921, Jordan 1933, Puchkova 1956) are quite different from other Lygaeidae, having very complex and peculiar micropylar processes (comparable to some Orsillinae only — Puchkova 1956), arranged in a circle around a non-functional (Puchkova 1956) pseudoperculum (Claassen 1921, Jordan 1933), which possesses also a polar process. The pseudoperculum does not occur in other Lygaeidae (exc. in some genera of Megalonotinae — Puchkova 1956), but it is typical for Colobathristidae (summarized by Southwood 1956); the micropylar processes of Colobathristidae are, however, arranged in a circle right on pseudoperculum.

4. Anatomy and cytology

Nothing is known on Colobathristidae and excepting the alimentary organs and ovarioles, on Malcinae and Chauliopinae, but some hints as to the relationship of the considered groups may be inferred from the following data.

a. Chromosome number

(Reviewed by Pfaller-Collander 1941, Leston 1958 and Southwood and Leston 1959.) The primitive karyotype of Lygaeidae is $2n = 12A + X + Y$. This condition is shared by Orsillinae, Ischnorhynchinae, most Lygaeinae, and part of Pachygronthinae and Megalonotinae. Some modifications occur in other subfamilies, but the doubled karyotype $2n = 26A + X + Y$ is characteristic only for Cyminae and Berytinae (Manna 1958 mentioned, however, a species of *Cymus* with only 26 chromosomes). In Metacanthinae, the karyotype $2n = 18A + X + Y$ occurs in *Metatropis rufescens* (H.—S.), the more primitive karyotype $2n = 14A + X + Y$ is known in *Gampsocoris punctipes* (Germar). Thus the Berytidae share the trend to doubling of chromosome number with Cyminae, although they are not derivable from them, since Metacanthinae are more primitive than modern Cyminae.

b. The male inner genitalia

The testis of Lygaeidae consists of 7 follicles, that of *Berytinus minor* (H.—S.) of only 2 follicles, the mesadenes are much more complicated in Berytidae than in Lygaeidae (Pendergrast 1957). A considerable variability in number of testicular follicles occurs in Blissinae (Slater and Miyamoto 1963) — the numbers 4, 6 and 7 were reported.

c. The ovarium

The ovarium consists of 7 ovarioles in most Lygaeidae (Lygaeinae, Orsillinae, Ischnorhynchinae, Geocorinae, Henestarinae, Heterogastrinae, Pachygronthinae and Megalonotinae — Carayon 1950, Miyamoto 1957). A trend to the reduction of their number occurs in Blissinae (6—7 — Slater and Miyamoto 1963) and Cyminae (5—7 in Cymini — Miyamoto 1957, 1959 — and 5 in Ninini — Miyamoto 1957). The ovariole numbers in Malcinae and Colobathristidae are unknown, but *Chauliops fallax* Scott has only 5 ovarioles (Miyamoto 1957). Ovarium of Berytidae consists of 6—7 ovarioles (Carayon 1950, Miyamoto 1957, 1959). These data suggest a close relationship among Cymini, Ninini, Chauliopinae and Berytidae; the reduction of the number of ovarioles in Blissinae has been probably evolved convergently.

d. The alimentary organs

The alimentary organs were studied by Miyamoto (1961) in both Berytidae and Lygaeidae. The species *Malcus japonicus* Ish. et Has. (Malcinae) and *Chauliops fallax* Scott (Chauliopinae) were studied, the latter species was also figured. Some important conclusions taken from Miyamoto's paper are here reviewed, as follows:

Berytidae and most of the Lygaeidae (incl. Malcinae) share mid-gut subdivided into 4 portions, only Chauliopinae and Geocorinae into 3 portions. No gastric coeca are present in Cymini, Geocorinae, Henestarinae, Lygaeinae, Orsillinae and Chauliopinae; vesicular coeca occur on the 1st portion of mid-gut in Ischnorhynchinae (*Pylorgus colon* Thunbg.), on the 4th portion in Malcinae, Megalonotinae part., Pachygronthinae, Heterogastrinae, tube-like coeca on the 4th portion in Blissinae and most Megalonotinae, tube-like, but closely tufted coeca on the 4th portion in Ninini and Berytidae.

The 4 malpighian tubules occur in all Berytidae and Lygaeidae; apices of the tubules on each side are fused and 2 rings of malpighian tubules are thus formed in Berytidae and Cymini; the apices are in close contact, but are not fused in other groups.

The principal salivary glands are 3-lobed in both families, 4-lobed in *Lasiosomus pallipes* Scott (Megalonotinae), some lobes are subdivided in Lygaeinae; 2 anterior and 1 posterior lobes are characteristic for Berytidae, 1 anterior, 1 dorsal (lateral) and 1 posterior lobe are characteristic for Lygaeidae.

Miyamoto (1961) emphasized the diversity of alimentary organs within Megalonotinae and Cyminae, and he regarded Ninini and Megalonotinae as very close to Berytidae. As to the groups considered in my paper, the alimen-

tary organs display some common derivative characters in Nihini and Berytidae, Cymini and Berytidae, Chauliopinae and Cymini. Some derivative characters shared by Chauliopinae and Geocorinae must be of convergent nature. The alimentary organs of Malcinae seem to be rather generalized.

5. Zoogeography

The distribution of Malcinae (see the map on p. 507) and Chauliopinae (Štys 1963) is nearly the same in Asia, but the Chauliopinae colonized also equatorial Africa, probably in at least 2 invasions. Berytidae and Cymini are cosmopolitan, Ninini circumequatorial, whereas Colobathristidae occur only in Neotropical, Oriental and Australian regions. The Oriental fauna of Berytidae is, however, rather poor, composed of only Palaearctic, Ethiopian and Australian genera (Štusák, personal communication), and this family is in Oriental region replaced by Malcidae. This fact suggests that the hypothesis on a close relationship of both families is correct and that the Oriental Berytidae are probably rather recent immigrants into this region.

V. Phylogeny and rank of Malcinae and Chauliopinae

a) History

Stål (1859) was hesitant whether *Malcus* Stål belonged to Lygaeidae or to Berytidae (cited as Coreidae), but included it in Lygaeidae, and later (1866) regarded it as a member of a separate subfamily Malcida, which was in his key placed closely to Lygaeinae. This action has been followed by most subsequent authors.

Some authors included the genus *Malcus* Stål in Colobathristidae (or into Colobathristinae in Lygaeidae), particularly Lethierry and Severin (1894) and Distant (1904a) — the Distant's conception of Colobathristidae was, however, completely wrong, since he referred to this family only 2 Indian genera, none of them actually belonging there (*Malcus* — Malcinae, *Artemidorus* Dist. — Heterogastrinae). The inclusion of *Malcus* Stål into Colobathristidae was criticized by Horváth (1904), who also emendated Malcida into Malcinae.

Scott (1874) described Chauliops n. gen. as a lygaeid genus standing between *Nysius* Dallas and *Henestaris* Spinola. Distant (1904b) included it in Heterogastrinae. This action has been followed by Oshanin (1906), but strongly opposed by Breddin (1907), who established a subfamily Chauliopinae for this genus. Breddin's opinion was accepted by nearly all subsequent authors (including Oshanin 1912).

Only Bergroth (1916) included *Chauliops* Scott in Malcinae; his conception of this group was, therefore, the same as the conception of the here proposed family Malcidae (see below).

Breddin (1907) noted that Chauliopinae are allied to Malcinae, Cyminae and Lygaeinae (cited as Astacopinae), and certainly not to Heterogastrinae; Malcinae are most closely related to Lygaeidae in his opinion. Pruthi (1925) gave morphological reasons against any relationship between Chauliopinae and Heterogastrinae. Handlirsch (1925) and Beier (1937) mentioned that Malcinae

differ from all other Lygaeidae by the shape of head, and that they are, perhaps, worth of elevation into a family rank. Slater and Hurlbutt (1957) regarded the venation of Malcinae as similarly reduced to that of Cymini nad Ninini and they supposed that Malcinae belonged to an ischnorhynchine evolutionary line and that the venation of Malcinae could evolve by specialization from that of Chauliopininae; both groups are closely allied in their opinion. Ashlock (1957) also stated that Malcinae and Chauliopininae are closely related, and that they are, perhaps, related also to Megalonotinae (cited as Rhyparochrominae), Geocorinae, Henestarinae and Ischnorhynchinae. Drake and Davis (1959) remarked that Malcinae and Chauliopininae are not related to Slaterellinae. China and Miller (1959) placed Malcinae and Chauliopininae close together in the key, but set them quite apart in their list of lygaeid subfamilies. Scudder (1959) noted the similarity between the female genitalia of Malcinae and Berytidae and considered them as related groups; Štys (1963) stated that Malcinae and Chauliopininae are very closely related, and (1964a, b) that they are worth of family rank. Scudder (1963) included Malcinae and Chauliopininae under the same couplet of key to Coreoidea based on abdominal characters.

b) Phylogeny

The family Lygaeidae represents a stem-group*) of all the other families of Coreoidea (sensu Štys 1961, 1964a, b) — this has been stated by Štys (1961, 1964a, b) and results also from the Leston's (1958) scheme. Practically each derivative character of the non-lygaeid families occurs in a primitive form (primitive for Coreoidea, of course) in some representative of Lygaeidae, and may be derived from the primitive lygaeid condition. This is applicable only for characters considered in isolation, since no group of modern Lygaeidae possesses such a combination of primitive patterns enabling us to derive any non-lygaeid group direct from any modern lygaeid group. The extinct ancestors of non-lygaeid families had, however, probably such combinations of characters including them into the range of morphological variability of the modern Lygaeidae. It results that the ancestors of the non-lygaeid groups have to be searched for either among the ancestors of the family Lygaeidae, or direct among the extinct members of this family, i. e. among the extinct ancestors of the modern lygaeid subfamilies. The latter possibility seems to me more probable for the following reasons:

a) The family Lygaeidae displays an extreme morphological, anatomical and cytological variability (compare the discussion of morphology in this paper and papers by Ashlock 1957, Slater and Hurlbutt 1957, Leston 1958, Miyamoto 1961, Scudder 1963, Štys 1964a). Even the characters which are usually stable

*) Some terms applied need specification in the following:

A n c e s t r a l g r o u p = an extinct group from which another modern group (groups) evolved.

E x - g r o u p (the term used in somewhat different sense by Michener 1957) = a group with many derivative characters, conspicuously differing by their combination from another more primitive group (groups) of the same ancestry.

S t e m - g r o u p (= Stammgruppe by Naef 1919) = a modern group retaining many primitive features of its extinct ancestral group and differing by these features from the more derivative group (groups) of the same ancestry. The respective ancestral group may be subordinate to the stem-group in the formal hierarchy.

in other families vary, and nearly all derivative characters of non-lygaeid families occur at least in the initial stage somewhere in Lygaeidae (together with the same characters in the primitive condition). Such variability is peculiar to the stem-groups characterized by a great evolutionary plasticity, and by a capability of giving origin to other groups which may be so derivative against the stem-group that they can stand at a coordinate level with it in the formal hierarchy.

b) An analogy to the extreme variability of Lygaeidae in comparison with the non-lygaeid families is the variability of the lygaeid subfamilies Megalonotinae (e. g. number of dorsal glands, position of spiracles, metathoracic venation — Slater and Hurlbutt 1957, phallus — Ashlock 1957, caryotype — Leston 1958, development of ventral sulci and pleural line on abdomen — Štys in litt.) and Cyminae (emphasized many times in this paper) when compared with the other lygaeid subfamilies (similar variability occurs in a lower degree in Ischnorhynchinae and Blissinae). Both subfamilies mentioned have a wide range of variability of morphological and anatomical characters, and especially in these groups occur some derivative characters, which are peculiar for the non-lygaeid families. The occurrence of these characters may be taken as evidence for phylogenetic relation of Cyminae and Megalonotinae with the non-lygaeid families. I have shortly discussed this problem (Štys 1964a) with regard to the subfamily Megalonotinae. In my opinion, the premegalonotine lygaeid bugs were ancestors of the largid (Largidae, Pyrrhocoridae) and coreid (Hyocephalidae, Stenocephalidae and Coreidae) evolutionary lines. My discussion was purposely incomplete since only the characters which could have been ascertained on the museum female specimens of Hyocephalidae were discussed, but it could be supported by many other morphological, anatomical and especially cytological characters (Leston 1958). In the discussion of the morphology of Malcinae and Chauliopinae in the present paper, many common points between these groups, families Berytidae and Colobathristidae and the lygaeid subfamily Cyminae were ascertained. Before the phylogeny of these groups is considered, some theoretical aspects of the study of the phylogenetic relationship should be mentioned.

In the examination of phylogenetic relationship of any taxa, the whole set of their features known (i. e. Hennig's holomorphic condition) must be considered; only the derivative characters can indicate the relationship of the respective taxa, the common occurrence of primitive characters indicates only the existence of a common ancestor, but not the closer relationship (i. e. relatively more recent common ancestry) of the taxa sharing the primitive characters, against the taxa having these characters in a derivative form. If the complete set of characters of any higher taxon is compared with other taxa, the following facts are usually ascertained:

1. Usually in no taxon the primitive condition of all characters, which occur in the derivative form in the taxa compared, can be found. No taxon can be, therefore, derived from the modern representatives of the other taxa.
2. Most taxa are not characterizable by stable characters, but by certain ranges these characters from more primitive to more derivative condition, i. e. by trends to the evolution of certain derivative characters.

3. These trends are usually non-correlative, i. e. some subordinate taxon may be primitive in one character, derivative in another, etc., and the derivative and primitive characters seem to be mosaic-like distributed in subordinate taxa.

4. A group of phylogenetically closely related taxa is not characterizable by the invariable occurrence of common derivative characters, which do not occur elsewhere, but only by a combination of common trends to the evolution of derivative characters. These trends do not occur elsewhere, or occur in isolation and are not accompanied by the combination of other trends peculiar to that evolutionary line. In the latter case a true convergency is involved, i. e. the isolated occurrence of a derivative character or trend in unrelated groups — typical example: the narrowing of clavus and reduction of its commissure in Chauliopininae and Geocorinae.

The true convergency must be distinguished from that type of parallel evolution when the evolutionary trends, characteristic in their integral set for a certain evolutionary line, are not realized in all its members, but occur mosaic-like. The expression "mosaic-like realization of evolutionary trends" is most telling: a set of evolutionary trends characterizes a certain evolutionary line, these trends do not occur in the same combination elsewhere, but a single trend need not be shared by all members of the line. It may be presumed that the genotypes of common ancestors of such an evolutionary line limited the possibilities of future evolution of their descendants. Due to the different selective pressures in the environments in which the evolution of the descendants proceeded, all evolutionary possibilities could not be realized, or were realized to a certain extent only, or new derivative characters, for which no predisposition had been present in the ancestor, was later acquired. If this idea is correct, then the illusory chaos and discordant occurrence of characters and trends in phylogenetically related groups is easily explainable and regular. The phylogenetic relationship can be then established by the study of a maximal attainable number of characters and by finding a great number of common trends (though realized mosaic-like).

It clearly follows from the discussion of the morphology of Malcinae and Chauliopininae that many common trends and characters are shared by these groups and Berytidae, Colobathristidae and Cyminae (especially Ninini), and that we may suppose the existence of a common lygaeid ancestor of all these groups. The common most important trends are, as follows (the trends and definite characters are not distinguished; Cym. means Cymini, not Cyminae!):

deep puncturation and pruinose covering of body (Cym., Nnini, Malc., Chaul., Beryt., Colob. part.), tomentose spots (Malc., Chaul., Colob. part.) parafrontal sulci (Malc., Chaul.), declivity of head (Ninini, Malc., Chaul. Beryt., Colob.), stylate eyes (Ninini, Chaul., Colob.), supericorn antennae (Ninini, Malc., Chaul., Beryt., Colob.), reduction of antenniferous tubercles (Ninini, Malc., Beryt., Colob.), approached ocelli (Ninini part., Malc., Colob. part.), large bucculae (Malc., Chaul., *Cryptorhamphus* of Cym.), elongation of antennae (Ninini, Malc., Beryt. part., Colob.), posterior lobuli on pronotum (indication in Ninini, Malc., Chaul., Beryt., Colob.), prominent and narrowed

apex of scutellum (Ninini, Malc., Chaul., Beryt., Colob.), posterodiagonal turn of the axis of metacoxa (Beryt., Colob.), produced peritreme of metapleural gland (Malc., Beryt.), elongate legs (Malc., Beryt., Colob.), concave lateral margin of corium (Ninini, Malc., Chaul., Beryt. part., Colob.), desclerotization of corium (Ninini, Beryt. part., Colob.), Cu close and parallel to claval margin (Cym., Ninini, Malc., Chaul., Beryt., Colob.), narrowed clavus (Chaul., Colob.), many similar patterns in the venation of membrane (Malc., Beryt., Colob.) and in reduction of the venation of hind wings (Cym., Ninini Malc., Beryt., Colob.), reduction of the posterior opening of dorsal abdominal glands (Ninini, Cym., Beryt.), fusion of mediotergites (Malc., Beryt. part.), dorsal replacement of ventral laterotergites (Malc., Chaul., Beryt.), dorsal shift of spiracles, fusion of some ventrites (Cym., Ninini, Malc., Chaul., Beryt., Colob.), similar form of inferior process of pygophore (Cym., Ninini, Malc., Chaul., Beryt.), loss of splitting of the 7th female zygosternum and reduction of ovipositor (Malc., Chaul., Beryt., Colob.), unpaired sclerotization of gynatrial glands (Chaul., Beryt.), elongation of spermathecal duct (Malc., Colob.), reduction of spermathecal flanges (Cym., Ninini, Malc., Beryt., Colob.), reduction of the number of trichobothria (Malc., Chaul., Beryt. part., Colob. part.), doubling of caryotype (Cym., Beryt. part.), lack of gastric coeca (Cym., Chaul.), similar form of gastric coeca (Ninini, Beryt.), ring-like malpighian tubules (Cym., Beryt.), etc.

Malcinae and Chauliopinae are undoubtedly most closely related, and are treated as a family Malcidae in this paper (see below). Chauliopinae retained a greater number of primitive features, but they cannot be regarded as direct ancestors of Malcinae with regard to the presence of some derivative characters in Chauliopinae retained in a primitive condition in Malcinae. The great number of common characters (or trends) in Malcidae (esp. in Malcinae) and Berytidae suggests the common ancestry of both groups. This evolutionary line can be derived together with the lygaeid subfamily Cyminae from the precymine bugs. Especially the cymine tribe Ninini exhibits a set of characters or trends common with Malcinae; the morphology of *Cryptorhampus* Stål (Cymini) suggests that this genus should be included in a separate tribe. The ancestors of precymine bugs may be found among the ancestors of the modern subfamily Ischnorhynchinae — the modern representatives of this subfamily (esp. *Kleidocerys* Steph.) have most of the characters in a more primitive condition than Cyminae, Malcidae and Berytidae, though the set of the derivative characters (e. g. presence of helicoid process on phallus, reduced distal flange on spermatheca, all spiracles dorsal, peculiar micropylar apparatus on egg, different situation of gastric coeca etc.) present in modern Ischnorhynchinae shows that the cymine line cannot be derived direct from the modern Ischnorhynchinae. The phylogenetic relation of Ischnorhynchinae to Cyminae has been already noted by Slater and Hurlbutt (1957) and Leston (1958).

Somewhat enigmatic is the relationship of Colobathristidae. As shown in this paper, this family possesses many unique derivative characters, but is connected by many trends with Berytidae, Malcidae and Cyminae (esp. Ninini); this seems to suggest a common ancestry of these groups. Colobathristidae, however, display also some derivative characters occurring in quite different groups of Coreoidea (e. g. female genitalia similar to Rhopalidae, pseudopercu-

lum on egg as in coreid line etc.), and, moreover, they have retained some characters not occurring in such a primitive form in the cymine line (e. g. well developed 3 abdominal glands, abdominal spiracles 5—7 ventrally). If the idea of the precymine ancestry of Colobathristidae is correct, then the precymines were still very primitive at the time of divergence of Colobathristidae and a considerable part of their abdominal spiracles was in the primitive ventral position.

The above phylogenetic conclusions are presented in fig. 1 on p. 353. With regard to the fact that the study of morphology, anatomy and cytology of the modern groups cannot enable us to ascertain either absolute or relative time of divergence of the respective taxa from the ancestral stock, and that the ideally constructed dendrogram is always arbitrary without the palaeontological evidence (which is at present of no assistance in the considered problems), the presented scheme must be regarded as a graphic illustration of the author's ideas, and not as an attempt to express the evolution of Coreoidea in time dimensions.

The family Rhopalidae is included in the scheme tentatively; I have not studied its phylogeny. It should be noted that the scheme is in the basic features extraordinarily similar to the scheme of evolution of the caryotype in Pentatomomorpha by Leston (1958). In his scheme the Berytidae occur close to Cyminae and Ischnorhynchinae, and a single lygaeid subfamily connected evolutionarily with the largid and coreid families are Megalonotinae.

It follows from this interpretation of the phylogeny of Coreoidea that it is impossible to split this taxon in 2 or more separate superfamilies (Štys 1961, 1964a, b). The traditional division of this group into Lygaeoidea and Coroidea has been apologized for by Scudder (1963). His method of analysis of the phenetic affinity between various taxa seems to be, however, inapplicable in phylogenetic study, and has been reasonably criticized by Schaefer (1963). The application of the principles of numerical taxonomy in the study of phylogeny of higher taxa seems to me doubtful, since these taxa are usually not characterized by characters, but by ranges of characters and by trends — these factors are hardly expressible numerically. The realm of numerical taxonomy is, in my opinion, mostly in estimation of the phenetic affinity between the lower taxa, the characters of which are not estimable as to their primitiveness or derivativeness, and in the estimation of the overall similarity between the higher taxa, which must not be confused with the study of phylogeny.

c) Rank

The main purpose of biological classification is, in my opinion, its informativeness. It means that any superordinate taxon should give the maximum attainable amount of information about each subordinate taxon. All other views should be subordinated to this aim, except one: such a classification should be consistent with the well-known or reasonably enough supposed phylogeny (not expressing the phylogeny, since such an aim cannot be reached by any static universal classification — see the discussion by Simpson 1961). It follows that some ex-groups characterized by a large number of derivative characters must be coordinated with their stem-groups in the formal hierarchy,

though their evolution from these groups (or their direct ancestors) is obvious (the same opinion was advocated also by Naef 1919). The removal of such ex-groups from their stem-group taxon increases the informativeness of the stem-group taxon, which can be more simply and more explicitly defined. In case of retention of the ex-group within the stem-group, the informativeness of such taxon could be limited sometimes to a single piece of information: on the common ancestry of subordinate taxa. An example from the classification of Vertebrata can illustrate this view:

Both Mammalia and Aves are distinct ex-groups of Reptilia, Reptilia themselves are an ex-group of Amphibia, etc. In spite of this well-known phylogeny, these groups coexist as coordinate taxa in the taxonomical hierarchy, having a great informative value and representing distinct entities in the living world. Any attempt to "phylogenize" the formal hierarchy of these groups would diminish the informativeness of the taxa involved. It would be equally absurd to include Mammalia and Aves as subordinate taxa into Reptilia, the latter as a subordinate taxon into Amphibia, etc., as well as to include Crocodilia and Aves into one taxon, to coordinate this taxon with a group including Rhynchocephalia and Squamata, etc, due to the mere fact that the respective groups share a relatively more recent common ancestry.

These problems are usually less pointed in Insecta due to the lack of objective palaeontological evidence of phylogeny. Nevertheless, if the informativeness and consistency with the presumed evolution are set as main criteria of the construction of classification, the subfamilies Malcinae and Chauliopinae must be removed from Lygaeidae and included in a single taxon, the family Malcidae. The discussion of the morphology etc. of this and similar groups showed that both subfamilies share many common derivative features and that they profoundly differ from Lygaeidae by the arrangement of trichobothria, construction of the laterotergal region of abdomen, by the entire 7th ventrite of female (shared only by some fossorial Blissinae), by different patterns of female genitalia, by presence of parafrontal sulci and by some other characters. The informativeness and morphological homogeneity of Lygaeidae is increased by this action, which is also in accordance with the long ago established existence of such families as Berytidae and Colobathristidae. These families in no way differ more from Lygaeidae than do the Malcidae. The contrary solution, i. e. the inclusion of Berytidae and Colobathristidae into Lygaeidae, is obviously disadvantageous, since thus the informativeness of the taxon Lygaeidae would be decreased to a minimum. The diagnoses of Malcidae, Malcinae and Chauliopinae are to be found on pp. 427 and 428.

Even in the case that the presented opinions on the necessity of the removal of Malcidae from Lygaeidae and on the phylogenetic relation of the non-lygaeid families of Coreoidea to the precymines and premegalonotines are correct, the problem remains, whether it is useful either to combine all the phylogenetically related groups into common taxa, coordinate with Lygaeidae, or to remove the subfamilies Cyminae and Megalonotinae (eventually also other subfamilies with the same ancestry) from Lygaeidae as separate families.

In my opinion it is not advisable to combine into a single taxon the groups though obviously phylogenetically related and characterizable by the

common occurrence of evolutionary trends, but hardly defineable and distinguishable from other groups (e. g. to combine Cyminae, Malcidae and Berytidae in a single taxon). Such attempt has been made by Southwood and Leston (1959), who included Cyminae into Berytidae, and Anthocoridae into Cimicidae. Although their action is fully justifiable from the purely phylogenetic point of view, it cannot be followed in view of the main aim of formal classification, i. e. the maximum information given by a respective taxon.

Neither is the second of the mentioned solutions recommendable at present, in spite of the fact that the family Lygaeidae is morphologically so heterogeneous by comparison with the other families of Coreoidea that the informativeness of this taxon hardly exceeds the similar appearance and similar ovipositor. The splitting of this family into several separate families would undoubtedly increase the informativeness of these taxa, but such a step would be premature at the present level of knowledge of the evolutionary relations within Lygaeidae, and is at present advisable only for such groups as Malcidae, Thaumastellidae and Idiostolidae (Štys 1964b). It must be understood that any stem-group will be always less morphologically homogeneous than its coordinate ex-groups; this is applicable for the subfamilies Cyminae and Megalonotinae as well as for the family Lygaeidae itself. The eventual raising of the subfamilies Cyminae and Megalonotinae to family rank, while the bulk of the other Lygaeidae would be left in a single family, is an unjustifiable action, since the raising of these groups would not be made due to their morphological etc. properties, i. e. due to the characters intrinsic for the respective group, but only due to the evolutionary potency of their ancestors, which gave origin not only to the respective subfamilies, but also to other groups, which are now so different that they can be regarded as taxa at the family level (e. g. Berytidae, Largidae). If such an action was made, and e. g. the relatively more recent common ancestry of Berytidae with Ninini was ascertained, the elevation of Ninini to the family level would be a logical sequence of the previous elevation of all Cyminae to this level. Any stem-group could then be split ad infinitum. Such splitting can be limited only by a wise estimation of the proportion of the phenotypic gaps between the coordinate taxa.

VI. Malcidae — diagnosis

Malcidae Stål, 1866, **stat. nov.**

Malcinae: Bergroth 1916: 215

Malcidae: Štys 1964a: 248; 1964b: 239, 251

Small to medium-sized bugs, body deeply punctured, covered with curved glandular hairs and tomentose spots. Anterior part of head practically vertical, ocelli present, parafrontal sulci present. Bucculae large, antenna 4-segmented, the 1st segment cylindrical, 2nd and 3rd stick-shaped, 4th fusiform. Pronotum with posterior lobuli, peritreme of metapleural gland well developed. Tarsi 3-segmented, tibiae non-sulcate. Corium and clavus coriaceous, lateral margin of corium concave, M not connected with Cu, membrane with 5 non-branching veins. Metathoracic wings practically without secondary veins. Sulci between abdominal terga as wed as zygosterna straight, the 2nd—5th ventrites fused,

but the sulci are distinct. Dorsal external laterotergites present on urites 2—7, ventral laterotergites divided into ventral and dorsal parts, the latter replaced on dorsum and conspicuously widened on the urites 5—7. Both 8th urite and pygophore of male partly visible ventrally, pygophore not completely covered by 7th tergum, cup-shaped, with hypandrium and conspicuous inferior and superior processes. Gonostyli symmetrical. Phallosome with lateral processes, endophallic sperm reservoir wide and complete, processus gonopori long, sclerotized and coiled. The 7th zygosternum of female entire, 8th ventral laterotergites free from 1st valvifers, the latter large. Valvulae lacinate, short, poorly sclerotized, spermatheca with apical bulb. Abdominal spiracles 2—7 dorsal, situated on external laterotergites. Trichobothria situated on sharply limited loaf-shaped tubercles, submedial (2+2) on 3rd urite, lacking on 4th, lateral on following urites, dispersed on 5th and 6th (1+1 anterior, 2+2 posterior), clustered on 7th urite (2+2).

Subfamilies included: Malcinae Stål, 1866 and Chauliopinae Breddin, 1907. Some peculiar characters of diagnostic significance shared only by species of one subfamily are mentioned in the diagnoses of subfamilies; they must be considered as integral parts of the diagnosis of family.

VII. Chauliopinae — diagnosis

Chauliopinae Breddin, 1907 : 40

Body stout, with scales and often with continuous wax-like layers. Head strongly sloping, the anterior part nearly vertical. Ocelli distant from each other, eyes stylate, antenniferous tubercles large, spinously produced. Postclypeus not set off from frons. Antennae short, the 2nd and 3rd segments not conspicuously thin. Peritreme of metapleural gland not conspicuously protruding, posterolateral part of metepisternum notor indistinctly produced. Legs moderately long, femora subclavate, hind femur with or without spines, the 1st and 3rd tarsal segments subequal. Clavus strikingly narrow, its commissure very short, much shorter than distally grooved scutellum. Corium without tubercle, its posterior margin convex, M indistinct. The veins of membrane non-sclerotized, hardly distinguishable, not forming any fields. Metathoracic wing with hamus, cubital furrow incomplete. Abdominal mediotergites not fused into a common plate, provided with many deep pits, paired openings of dorsal glands situated between tergites 4—5 and 5—6. The dorsally situated widened parts of ventral laterotergites 5—7 obliquely dorsolaterally raised. Without sclerotized processes on conjunctiva of phallus, helicoid process present. The 7th zygosternum of female very short medially, without remnants of longitudinal sulcus, the whole 1st valvifers visible externally. The 9th ventral laterotergite contacting 2nd valvifer, the 9th tergum partly hidden by 8th tergum, but otherwise normally developed. The sclerotization of gynatrial glands unpaired, spermatheca with very short uone-coiled ductus and with both flanges. Nymphs of lygaeoid appearance, without spinous processes, the orifices of dorsal abdominal glands as in adults, semicircular sclerotized evaporatoria present. Mid-gut subdivided into 3 portions, without gastric coeca.

Genera included: *Chauliops* Scott, 1874 (type-species: *Chauliops fallax* Scott, 1874), distribution: Oriental region, Japan, Equatorial Africa, and *Neochauliops* Štys, 1963 (type species *Chauliops laciniata* Bergroth, 1916), distribution: Equatorial Africa.

Remarks: The taxonomy of this subfamily is not revised in this paper. The morphology has been described and discussed in chapter Morphology; in historical parts of that chapter (p. 420) and of the chapter dealing with phylogeny etc. (p. 421) the respective literature is reviewed. The survey of distribution of Chauliopinae, key to genera and species-groups, list of described species, and some remarks on evolution at genus and species level may be found in Štys (1963).

VIII. Malcinae — references and diagnosis*

Malcinae Stål, 1866

- Lygaeidae part.: Stål 1859: 241; Horváth 1914: 635; Esaki 1932: 1621; Kato 1933: p. 30
 Esaki 1950: 223; Esaki 1959: 223; Hidaka 1960: 47.
 Malcida Stål, 1866: 121.
 Colobathristidae part.: Lethierry and Severin 1894: 175; Brues and Melander 1932: 148;
 Brues, Melander and Carpenter 1932: 148.
 Colobathristinae part.: Distant 1901: 473; Distant 1904a: 32; Banks 1909: 573; Distant
 1910: 30; Esaki 1922: 60.
 Malcinae: Horváth 1904: 118; Breddin 1907: 40, 41; Bergroth 1910: 297; Bergroth 1918:
 66; Handlirsch 1925: 1072, 1075; Esaki 1926: 161; Beier 1937: 2176, 2177; Ishihara
 and Hasegawa 1941: 106; Poisson 1951: 1788; China and Miller 1955: 260; Miller
 1956: 5, 62; Slater and Hurlbutt 1957: 72, 75, 76; Ashlock 1957: 421, 425; Oben-
 berger 1958: 116, 194; China and Miller 1959: 7, 41; Stichel 1959: 319; Scudder
 1959: 420, 421; Drake and Davis 1959: 24; Stichel 1960: 156; Miyamoto 1961: 215;
 Slater, Woodward and Sweet 1962: 598; Scudder 1963: 5, 12, 14; Štys 1963: 209,
 212, 213; Štys 1964b: 239.
 Malcinae part.: Bergroth 1916: 215.

There are some different opinions regarding the authorship of the subfamily and the year of Stål's description of Malcida.

The authorship of the subfamily was ascribed to Horváth, 1904 (by Beier 1937, Ishihara and Hasegawa 1941, Poisson 1951, Stichel 1959, 1960) and to Breddin, 1907 (by Esaki 1926). According to the International Code of Zoological Nomenclature (1961, Articles 11e (ii) and 36) the authorship of Malcinae must be ascribed to Stål, 1866; Horváth (1904) is author of the first emendation of Malcida into Malcinae.

Most authors (Distant 1910, Handlirsch 1925, Ishihara and Hasegawa 1941, China and Miller 1955, Obenberger 1958) recorded the year 1865 as a year of Stål's description of Malcida, only China and Miller (1959) mentioned

*) Various references to Malcinae, *Malcus* and its species, overlooked by me were found when the manuscript had been in press. Some of the omitted references appeared in the excellent Catalogue of the Lygaeidae of the World (Storrs, 1964) by J. A. Slater, some also in newly published papers. None of these papers (i. e. by Bergroth, Breddin, Distant, Hoffman, Horváth, Ishihara, Paiva, Schumacher, Slater, Štys and Walker) is of paramount importance for the study of Malcinae, mostly only names or faunistic records are given. These references cannot be included in the present paper for technical reasons, and will be quoted in full and discussed in my next paper on Malcidae.

the year 1866. The latter opinion is correct according to a bibliographic study by Stichel (1957).

Diagnosis

Body elongate, without scales and without continuous wax-like layers. Proximal part of head horizontal, anterior vertical. Ocelli situated on a common tubercle, eyes sessil. Antenniferous tubercle reduced, changed into antennal sclerite and preantennal plate. Postclypeus proximally limited from frons by a saddle shaped concavity. Antennae long, the 2nd and 3rd segments conspicuously thin. Peritreme of metapleural gland protruding, dorsally perpendicular to metapleura, posterolateral part of metepisternum spinously produced. Legs thin, femora simple, the 1st tarsal segment longest. Clavus not narrowed, its commissure well developed, subequal to the length of scutellum. Corium very narrow, its posterior margin concave, a conspicuous tubercle in apical corial angle present, M distinct. Veins of membrane sclerotized, M and Cu distally fused and forming large basal field. Metathoracic wing without hamus, cubital furrow complete. The 3rd—6th abdominal mediotergites fused into a common plate, the orifices of dorsal abdominal glands hardly distinct. The dorsally situated widened parts of the 5th—7th ventral laterotergites are horizontal. Conjunctiva of phallus with 2 long and some short membranous processes, and with 2 conspicuous sclerotized processes. The 7th zygosternum of female long, partially covering the 1st valvifers, with 2 posterior lobes and remnant of obliterated longitudinal sulcus. The 9th ventral laterotergite remote from 2nd valvifer, the 9th tergum invaginated under the 8th tergum and fused to it. Sclerotization of gynatrial glands paired, spermatheca with very long, many times coiled ductus, without flanges. Nymphs of tingoid appearance, with many spinous processes, the orifices of dorsal abdominal glands paired between the terga 3—4 and 4—5, unpaired between 5—6. Egg with 3 polar, club-shaped micropylar processes, without pseudopericulum. Mid-gut subdivided into 4 portions, gastric coeca present on the 4th one.

A single genus *Malcus* Stål, 1859, distribution: Oriental region, China and Japan.

IX. Revision of the *Malcus* Stål

a) References and history

Malcus Stål, 1859

Type-species *Malcus flavidipes* Stål, 1859: 242, originally indicated by monotypy and cited as type species by Distant (1904: 32) and Banks (1909: 573).

Malcus Stål, 1859: 241; Breddin 1899: 174; Distant 1901: 473; Distant 1904a: 32; Horváth 1904: 118; Banks 1909: 573; Distant 1910: 30; Horváth 1914: 636; Handlirsch 1925: 1075; Beier 1938: 2177; Ishihara and Hasegawa 1941: 107; Poisson 1951: 1788; Obenberger 1958: 194; Stichel 1959: 319; Stichel 1960: 156.

Malcus: Brues and Melander 1932: 148; Brues, Melander and Carpenter 1954: 177.

The diagnosis of the genus is the same as the diagnosis of subfamily.

Historical review:

1. **Taxonomy at species level.** Four species have been described as yet: *Malcus flavidipes* Stål, 1859 from Java, *M. scutellatus* Distant, 1901 from Ceylon (cited as *M. scutellata*!), *M. idoneus* Horváth, 1914 from Taiwan, and *M. japonicus* Ishihara et Hasegawa, 1941 from Japan. "*Malcus flavidipes* Stål var.?" was described in detail by Breddin (1899) from Lombok; this form has been separately recorded in a catalogue of Malcinae by Ishihara and Hasegawa (1941). Redescription of some species may be found by Distant (1904a) and Esaki (1932, 1950, 1959), the differential diagnoses of some species by Distant (1901, 1904a), Horváth (1914) and Ishihara and Hasegawa (1941), and a key to *Malcus*-species by Horváth (1914). The identity of *Malcus scutellatus* Distant and the application of name *Malcus flavidipes* by some authors (Stål 1859, Distant 1901, 1904a, Breddin 1907) was discussed by Breddin (1907), Distant (1910), Horváth (1914), Esaki (1926) and Ishihara and Hasegawa (1941). This problem and opinions of various authors are discussed under *Malcus flavidipes flavidipes* Stål.

2. **Distribution.** Not taking into account the above mentioned descriptive papers by Stål (1859), Breddin (1899), Distant (1901), Horváth (1914) and Ishihara and Hasegawa (1941), some new data on distribution of Malcinae were given only by Lethierry and Severin (1894), Distant (1904a), Breddin (1907), Banks (1909), Bergroth (1918), Esaki (1922, 1926) and Hidaka (1960). Many of these records were based on erroneously identified specimens, and they are discussed under the respective species. The distribution of Malcinae has been reviewed and compared with that of Chauliopininae by Štys (1963).

3. **Figures.** The total figures of some species may be found by Stål (1859), Distant (1904a), Esaki (1932, 1950, 1959), and Ishihara and Hasegawa (1941); the total photograph by Kato (1933). The dorsum of abdomen of *Malcus flavidipes* Stål was figured by Breddin (1907), the metathoracic wing of this species by Slater and Hurlbutt (1957).

4. **Diagnoses of *Malcus* and Malcinae, inclusion of Malcinae into keys.** The genus *Malcus* has been diagnosed by Stål (1859) and Distant (1904a); short definitions of Malcinae may be found (either in text or in keys) by Stål (1866), Breddin (1907), Handlirsch (1925), Beier (1937), Poisson (1951), Miller (1956), Obenberger (1958) and China and Miller (1959); the subfamily Malcinae has been included in keys to subfamilies of Lygaeidae by Stål (1866), Handlirsch (1925), Beier (1937), Obenberger (1958), China and Miller (1959), and in a key to "Lygaeoid-Coreoid complex" based on abdominal characters by Scudder (1963).

5. **Morphology of Malcinae, their relationship and rank.** The respective papers are reviewed in the chapters Morphology (p. 358) and Phylogeny and rank of Malcinae etc. (p. 420).

b) Systematic characters

Colour (figs. 56—60) is rather variable, but a very useful character has been found in the contrast or non-contrast of the darkened parts of pronotum to the light ones. "Contrast" means sharp limitation of dark part and its at

first glance conspicuous colour difference in comparison with the light parts. Also the colouring of membrane can be sometimes used as a supplementary character. "General ground colour" means always the predominant colour of non-darkened parts of dorsum of body (not of extremities), apparent at first glance.

Pilosity. The occurrence of semierect setae on various parts of the body, their density and length as well as the same features of the oblique hairs on the 2nd and 3rd antennal segments (figs. 200, 201) are very different in various species, and were always described. Since these hairs may be easily broken off, these characters have not been usually used in keys and differential diagnoses. The lengths of hairs on antennae were always compared with the diameter of a respective antennal segment, those on the body with length of eye.

The shape of the 1st antennal segment may be used as a supplementary systematic character, but it is very variable.

The shape of pronotum (Figs. 278—299) is a very important character especially the degree of development of posteromedial (*pmt*) and posterolateral (*plt*) tubercles, lateral teeth (*dn*) and the median (*m*). The applied terminology is explained on fig. 6. A term "mid-line" is applied to medial axis of pronotum, term "median" is used only in cases of morphologically distinct mid-line. Also other parts of relief of pronotum seem to be applicable for characterization of species and were described. In descriptions of callar region the expression e. g. "callar region laterally and dorsally convex" means that the outline of lateral margin (in dorsal view) is convex and that the dorsal surface of callar region is also convex.

The posterior pronotal outline (figs. 110—130) is the outline of most highly elevated part of pronotum in frontal view (in species with indicated posterolateral tubercles — exc. in *Malcus japonicus* Ish. et Has. — it is always the part between these tubercles). The terms are explained in fig. 111; inter-tubercular line (*itl*) = part of the outline between the posteromedial (*pmt*) and posterolateral (*plt*) tubercles when these are present, or the corresponding part of the outline when they are not developed.

The shape of pterothoracic sterna is rather similar in all species, very but different in *Malcus elongatus*, n. sp., and it has been always described. The distances between coxae are rather different in various species, but they were mostly not used in keys and differential diagnoses, since the exact data can be ascertained only on specimens with dissected legs (then the distances between the coxal cavities should be considered). This was not possible in scarce material of many species, and the data are only approximate. The expression e. g.: "Intercoxal spaces: 2—2 = $1\frac{1}{4}$ cx; 3—3 = $\frac{3}{4}$ cx; 2—3 = $\frac{3}{4}$ cx" must be understood, as follows: the distance between the middle coxae (2—2) is equal to the width of one and one fourth of the width of one coxa; the distance between the hind coxae (3—3) is equal to $\frac{3}{4}$ of the width of one coxa; the distance between the middle and hind coxae (2—3) is equal to $\frac{3}{4}$ of the width of one coxa.

The length of labium is only slightly different in various species of Malcinae, but strikingly, different in *Malcus setosus*, n. sp., and has been, therefore, always described.

Some features of the venation of membrane seem be utilizable as systematic characters and were mentioned in the descriptions. The always mentioned length of membrane is described according to specimens with pygophore in usual repose position.

The shape and dentation of the widened parts of the dorsally turned parts of ventral laterotergites (figs. 131—156) of the 5th, 6th and especially 7th urites was recognized as an excellent systematic character. Although very variable individually and often different on the left and right side of the same individual, the total patterns are very distinctive for each described taxon. The figures are simple outlines made from ventral view on horizontally situated specimens; in descriptions and keys the ventral view is always mentioned, and the structures are simply referred as "5th, 6th and 7th laterotergites"; always only their widened parts are regarded. On the trapezoidal 7th laterotergite, the anterior, lateral and posterior margins were distinguished in the descriptions; these margins are often recognizable (due to different dentation) also on arch-shaped 7th laterotergites; in otherwise shaped (esp. triangular) 7th laterotergites the margins were referred as anterolateral and posterior, or anterior and latero-posterior.

The shape and situation of the processes of the 7th ventrite in males (figs. 197—199) provide safe distinguishing characters. The presence of these processes itself divides the species of Malcinae into 2 groups.

The shape of 8th male urite (figs. 157—196) has not been, as far as I know, used as a character important for taxonomy at species level in any group of Pentatomomorpha. In Malcinae this structure provides excellent and stable features, which have been many times used in descriptions, keys and differential diagnoses. The shape of the distal part of 8th urite in ventral view (figs. 157—177) was described and figured in standard position, when both anterior and posterior ventral margins of this urite were at the same level. However small the inclination from this level may be, it drastically changes the outline (compare the figs. 165—167 drawn from the same specimen), and, therefore, the characters visible in ventral view are for practical reasons hardly applicable in routine identification. Nevertheless, the curvature of posterior margin (*pm*), spinously produced or non-produced lateral angles (*la*), and degree of development of lateral tubercles (*lt*) (terminology on figs. 171, 172) are very useful characters when observed under standard conditions. (The posterior margin of the 8th urite is in natural position on the animal always slightly inclined ventrally — compare the figs. 21 and 22 with figs. 165—167. This fact causes the lateral angles in all specimens to look slightly spine-like, although in fact 2 distinct groups of species occur under observation in described standard position: 1. with spinously produced lateral angles, 2. with non-spinous lateral angles. This sharp division is confirmed by the shape of this angle in lateral view — compare both sets of figures! It follows, that extreme caution is necessary when this character in ventral view is considered, and that observation of the 8th urite in natural position on the body of animal is not recommended). Much more important is the outline of the distal part of 8th urite observed in lateral view (figs. 178—196). The differences between the species are more striking, and it is easier to attain the strictly lateral standard position of the

urite. The shape of lateral (*la*) and medial (*ma*) angles and of dorsal elevation (*de*) (terminology on fig. 178, the most important terms indicated on each figure) is very different even in otherwise very similar species; especially the spinously produced or non-produced lateral angle (corresponding to the same character observed in ventral view) is important and divides the species into 2 groups. (The terms "lateral angle" and "medial angle" represent the same structures both in ventral and in lateral views.)

The shape of pygophore (figs. 202—220, terminology on figs. 202, 203) is also a very useful character. The presence or lack of parandria (*pra*), correlated with occurrence or absence of processes on the 7th ventrite, divides *Malcus*-species into 2 groups. Also the curvature of distal margin (*dm*), shape of hypandrium (*hy*), and demarcation of hypandrium from proximal part (*pp*) expressed by the curvature of the lateral outline (*lo*) of pygophore are useful supplementary characters. The pygophores were figured and described in the same standard position as described for the 8th urite in ventral view. Similar precautions must also be taken in account if the minute characters of pygophore are to be employed. The pygophores were studied always on specimens cleared in KOH; in such specimens the hypandrium is conspicuously transparent and thus different from the proximal part (the expression e. g. "hypandrium not distinguished from proximal part . . ." is always applicable to the demarcation of these regions by the curvature of lateral outline, and not to their absolute recognition).

The shape of gonostylus (figs. 221—277, terminology in figs. 29 and 30) is very similar in all species, but some features, especially the shape of blade (*blg*) and its apex (*ax*) can be used in systematics of *Malcus* (roughly 2 groups of species may be distinguished: 1. with uniformly thick blade and rounded apex, 2. with distally narrowed and apically pointed blade). In descriptions only the conspicuous or peculiar features of gonostyli were mentioned. All gonostyli were figured in a standard horizontal position. Both gonostyli of the same specimen were figured, one in anterior, the other in posterior view, these figures well represent also the variability of shapes of gonostyli. The highly magnified apex of gonostylus was figured in each species: the density and form of dentation are very different in various species.

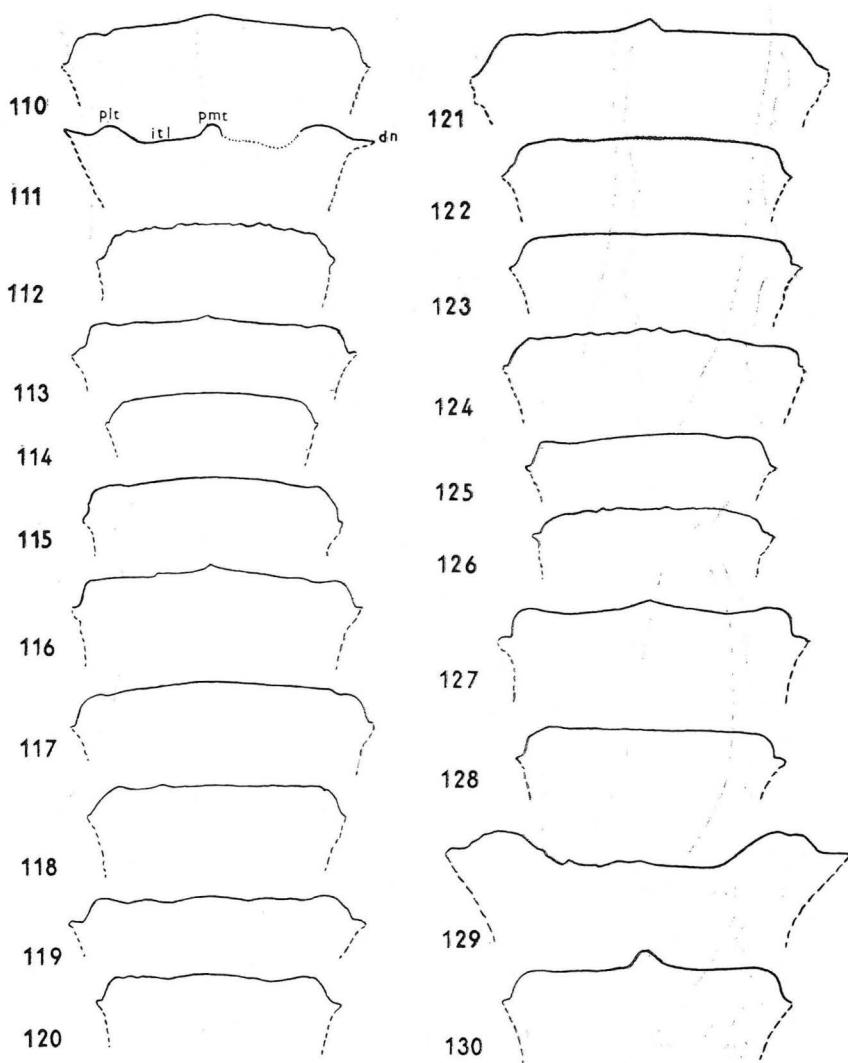
In no applied systematic character (except the shape of 7th zygosternum and genitalia proper) is sexual dimorphism exhibited.

c) Biometrics

On each studied specimen of Malcinae 10 dimensions were measured and 9 ratios were calculated. The results are summarized in tables; for each species the minimal and maximal rates, mean value, and number of measurements or calculated ratios is given (this number is often smaller than the number of examined specimens due to the damage of some parts of body, esp. of antennae, in some specimens).

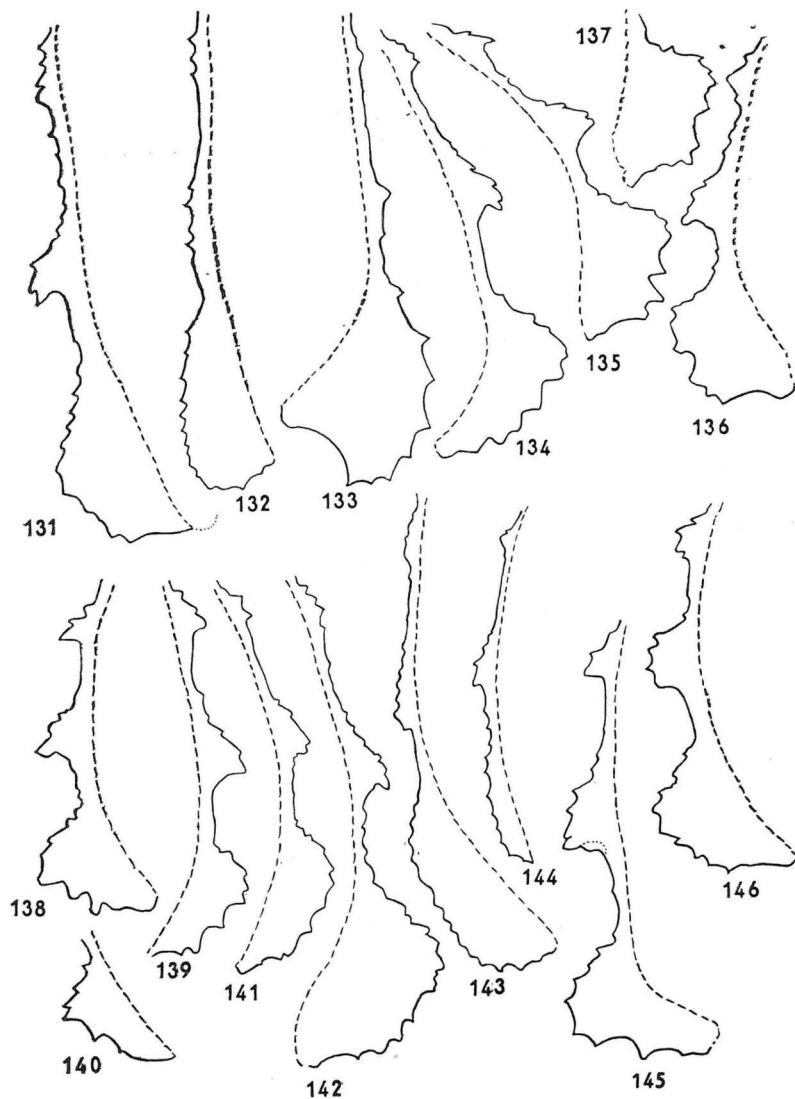
The following dimensions were measured:

1. The length of body: from the apex of head to the apex of membrane (if surpassing the abdomen), or to the tip of abdomen (if not surpassing)

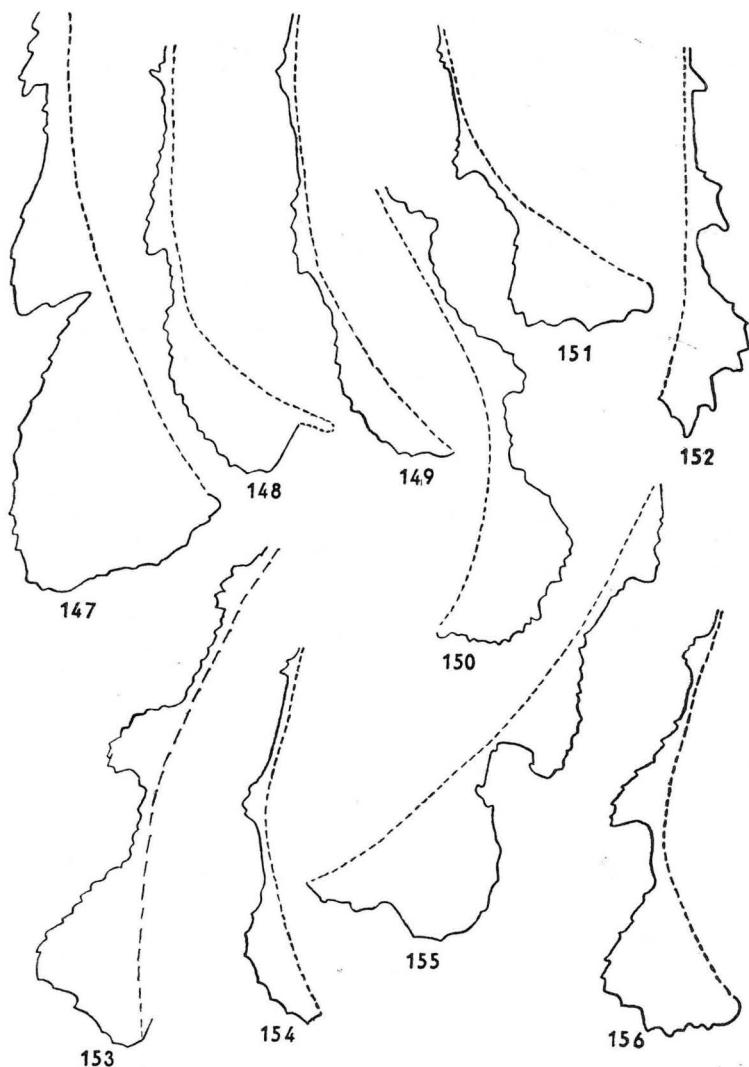


Posterior pronotal outline in *Malcus* spp. (anterior view).

Fig. 110. *M. auriculatus*, n. sp. (no. 103). Fig. 111. *M. dentatus*, n. sp. (no. 100). Fig. 112. *M. elongatus*, n. sp. (no. 76). Fig. 113. *M. flavidipes asper*, n. subsp. (no. 13). Fig. 114. *M. flavidipes flavidipes* Stål (no. 49). Fig. 115. *M. flavidipes kumaunensis*, n. subsp. (no. 117). Fig. 116. *M. furcatus*, n. sp. (no. 15). Fig. 117. *M. idoneus* Horv. (no. 35). Fig. 118. *M. inconspicuus*, n. sp. (no. 23). Fig. 119. *M. indicus*, n. sp. (no. 28). Fig. 120. *M. insularis*, n. sp. (no. 145). Fig. 121. *M. japonicus* Ish. et Has. (no. 143). Fig. 122. *M. mishmi*, n. sp. (no. 148). Fig. 123. *M. nigrescens* n. sp. (no. 104). Fig. 124. *M. nigro-fasciatus*, n. sp. (no. 83). Fig. 125. *M. pallidus*, n. sp. (no. 155). Fig. 126. *M. setosus*, n. sp. (no. 21). Fig. 127. *M. similis*, n. sp. (no. 147). Fig. 128. *M. sinicus*, n. sp. (no. 136). Fig. 129. *M. thoracicus*, n. sp. (no. 169). Fig. 130. *M. tuberculatus*, n. sp. (no. 81).



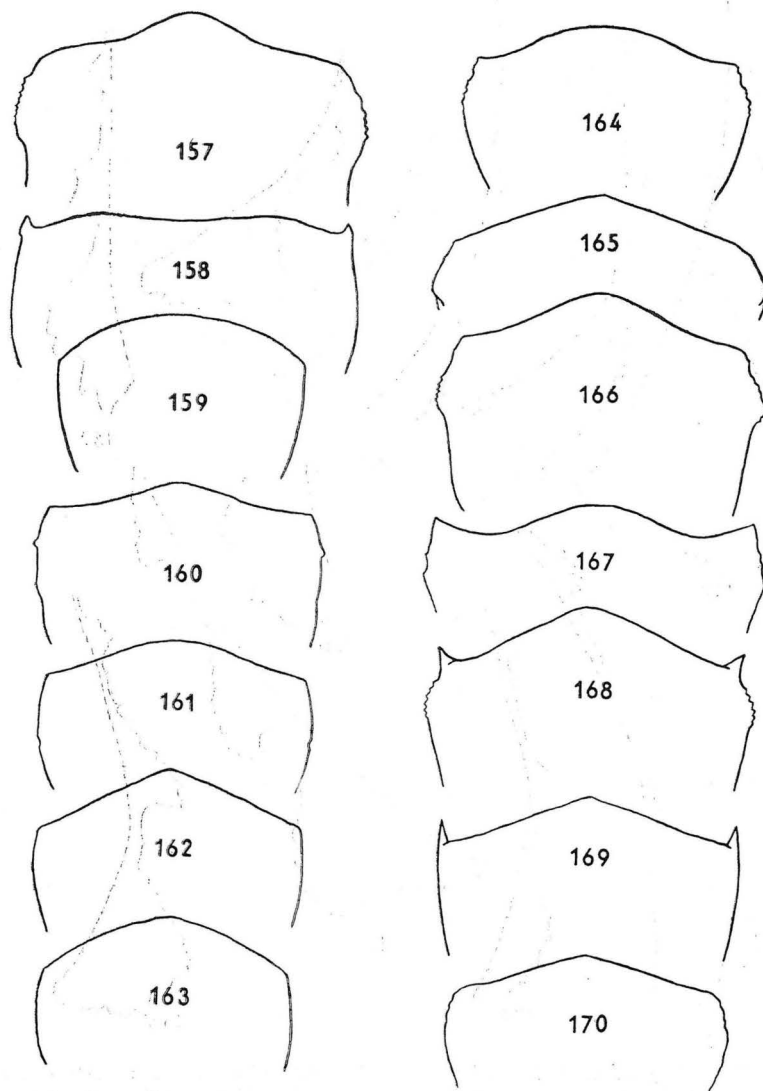
Ventral outline of margins of ventral laterotergites 5-7 in *Malcus* spp.
 Fig. 131. *M. auriculatus*, n. sp. (no. 103). Fig. 132. *M. dentatus*, n. sp. (no. 100). Fig. 133. *M. elongatus*, n. sp. (no. 76). Fig. 134. *M. flavidipes asper*, n. subsp. (no. 68). Fig. 135. *M. flavidipes flavidipes* Stål from Java (no. 134). Fig. 136. *M. flavidipes flavidipes* Stål from Tenasserim (no. 152). Fig. 137. The same specimen as in fig. 136., opposite side of the body. Fig. 138. *M. flavidipes flavidipes* Stål from Ceylon (no. 96). Fig. 139. *M. flavidipes flavidipes* Stål from Laos (no. 75). Fig. 140. The same specimen as in fig. 139, the 7th laterotergite of the opposite side of body. Fig. 141. *M. flavidipes kumaunensis*, n. subsp. (no. 97). Fig. 142. *M. furcatus*, n. sp. (no. 66). Fig. 143. *M. idoneus* Horv. (no. 30). Fig. 144. *M. inconspicuus*, n. sp. (no. 82). Fig. 145. *M. indicus*, n. sp. (no. 52). Fig. 146. *M. insularis*, n. sp. (no. 145).



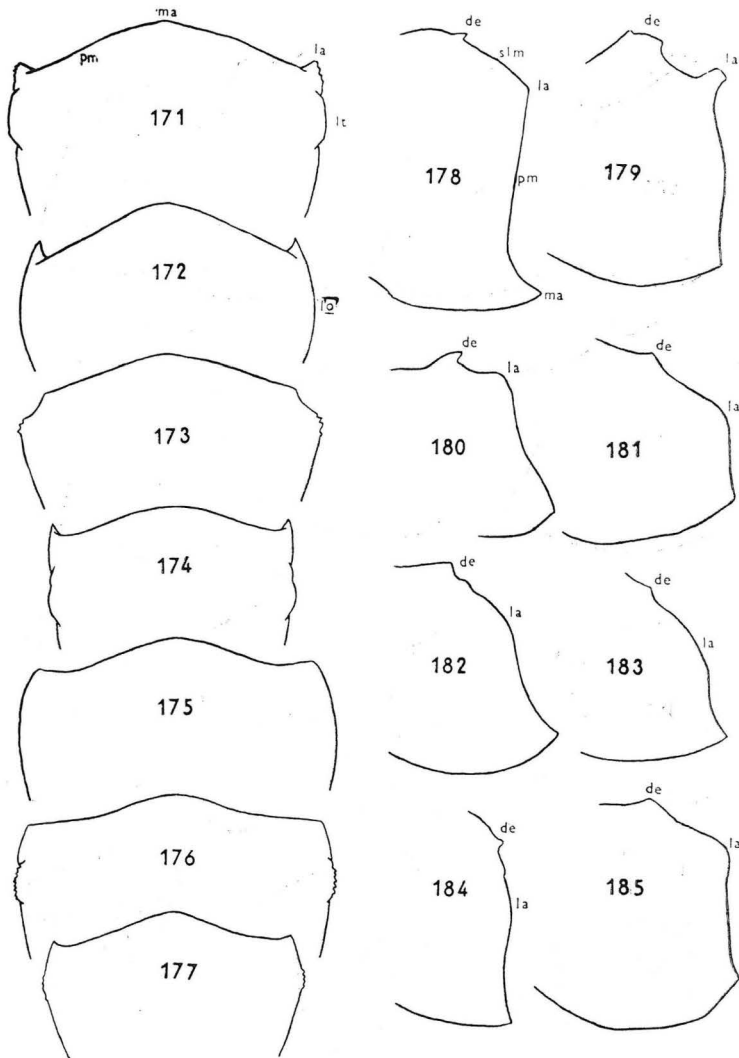
Ventral outline of margins of ventral laterotergites 5-7 in *Malcus* spp.
 Fig. 147. *M. japonicus* Ish. et Has. (no. 142). Fig. 148. *M. mishmi*, n. sp. (no. 148). Fig. 149. *M. nigrescens*, n. sp. (no. 104). Fig. 150. *M. nigrofasciatus*, n. sp. (no. 159). Fig. 151. *M. pallidus*, n. sp. (no. 64). Fig. 152. *M. setosus*, n. sp. (no. 21). Fig. 153. *M. similis*, n. sp. (no. 147). Fig. 154. *M. sinicus*, n. sp. (no. 136). Fig. 155. *M. thoracicus*, n. sp. (no. 169). Fig. 156. *M. tuberculatus*, n. sp. (no. 133).

— then always the pygophore in repose position (parandria, if present, not taken in account).

2. The length of membrane (fig. 61): measured from the notch formed by innermost angle of corium and subapical margin of clavus to the level of apex of membrane (not direct to apex).



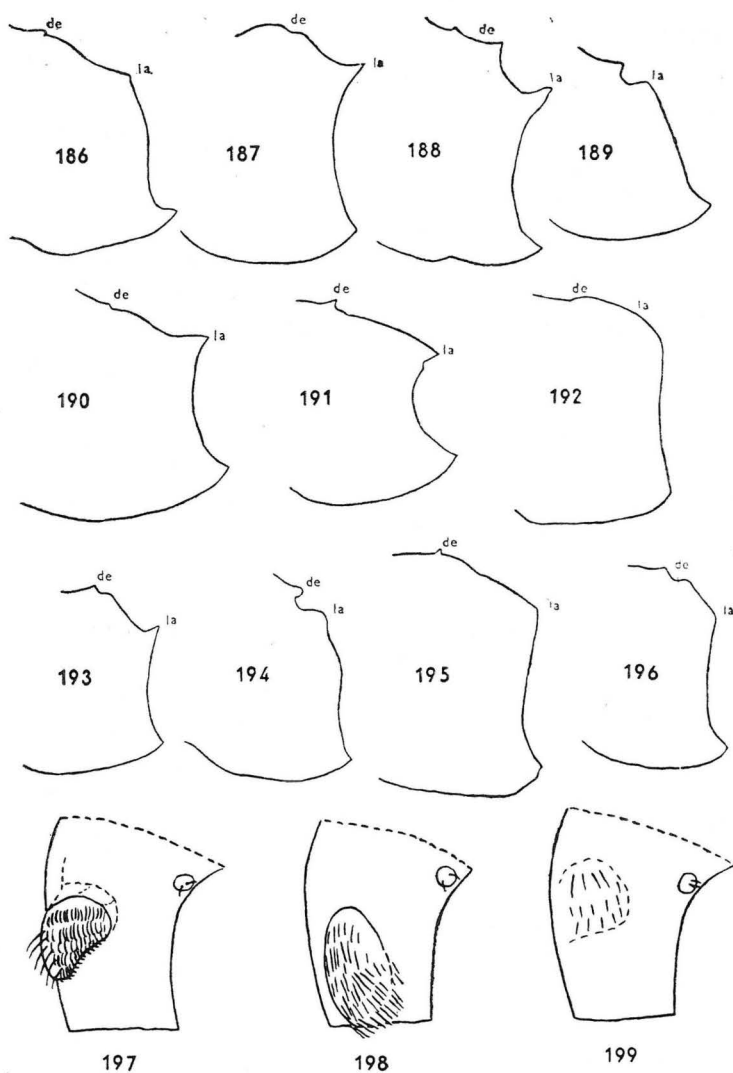
The outline of distal part of the 8th urite in ♂♂ of *Malcus* spp., ventral view.
 Fig. 157. *M. auriculatus*, n. sp. (no. 103). Fig. 158. *M. dentatus*, n. sp. (no. 100). Fig. 159. *M. elongatus*, n. sp. (no. 76). Fig. 160. *M. flavidipes asper*, n. subsp. (no. 68). Fig. 161. *M. flavidipes flavidipes* Stål from Java (no. 134). Fig. 162. *M. flavidipes flavidipes* Stål from Tenasserim (no. 152). Fig. 163. *M. flavidipes flavidipes* Stål from Ceylon (no. 96). Fig. 164. *M. flavidipes kumaunensis*, n. subsp. (no. 97). Fig. 165. *M. furcatus*, n. sp. (no. 66), the posterior part of 8th urite turned slightly dorsally. Fig. 166. *M. furcatus*, n. sp., the same specimen in standard position. Fig. 167. *M. furcatus*, n. sp., the same specimen, the posterior part of 8th urite turned slightly ventrally. Fig. 168. *M. idoneus* Horv. (no. 30). Fig. 169. *M. indicus*, n. sp. (no. 52). Fig. 170. *M. insularis*, n. sp. (no. 145).



Figs. 171—177. The outline of distal part of the 8th urite in ♂♂ of *Malcus* spp., ventral view.

Fig. 171. *M. japonicus* Ish. et Has. (no. 142). Fig. 172. *M. mishmi*, n. sp. (no. 148). Fig. 173. *M. nigrofasciatus*, n. sp. (no. 159). Fig. 174. *M. pallidus*, n. sp. (no. 64). Fig. 175. *M. similis*, n. sp. (no. 147). Fig. 176. *M. sinicus*, n. sp. (no. 136). Fig. 177. *M. tuberculatus*, n. sp. (no. 133). Figs. 178—185. The outline of distal part of the 8th urite in ♂♂ of *Malcus* spp., lateral view.

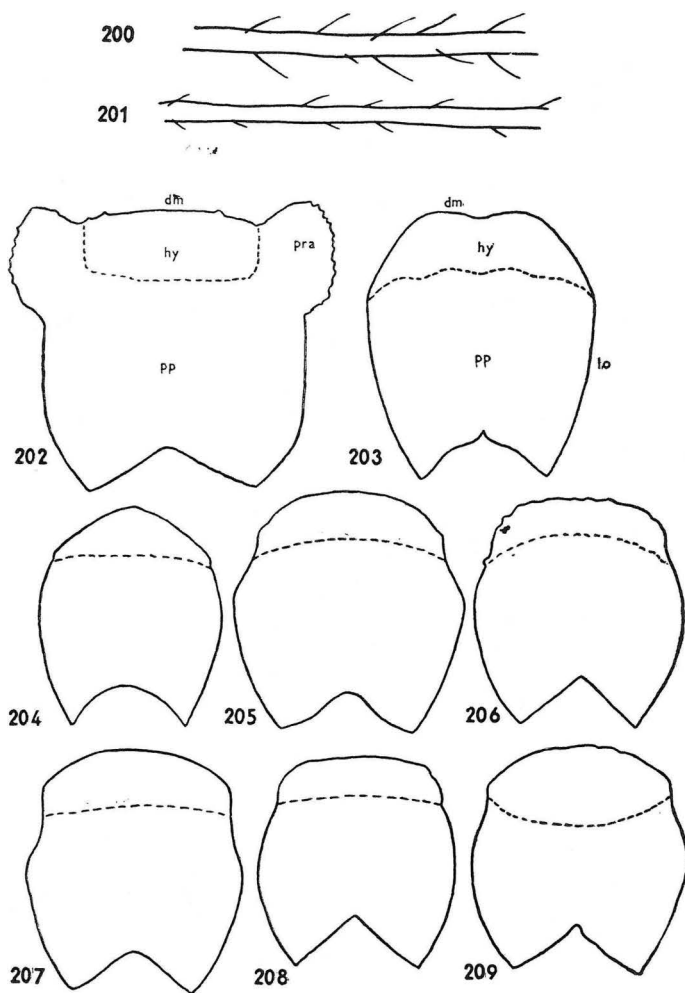
Fig. 178. *M. auriculatus*, n. sp. (no. 103). Fig. 179. *M. dentatus*, n. sp. (no. 100). Fig. 180. *M. elongatus*, n. sp. (no. 76). Fig. 181. *M. flavidipes asper*, n. subsp. (no. 68). Fig. 182. *M. flavidipes flavidipes* Stål from Java (no. 134). Fig. 183. *M. flavidipes flavidipes* Stål from Tenasserim (no. 152). Fig. 184. *M. flavidipes flavidipes* Stål from Ceylon (no. 96). Fig. 185. *M. flavidipes kumaunensis*, n. subsp. (no. 97).



Figs. 186—196. The outline of distal part the of 8th urite in ♂♂ of *Malcus* spp., lateral view

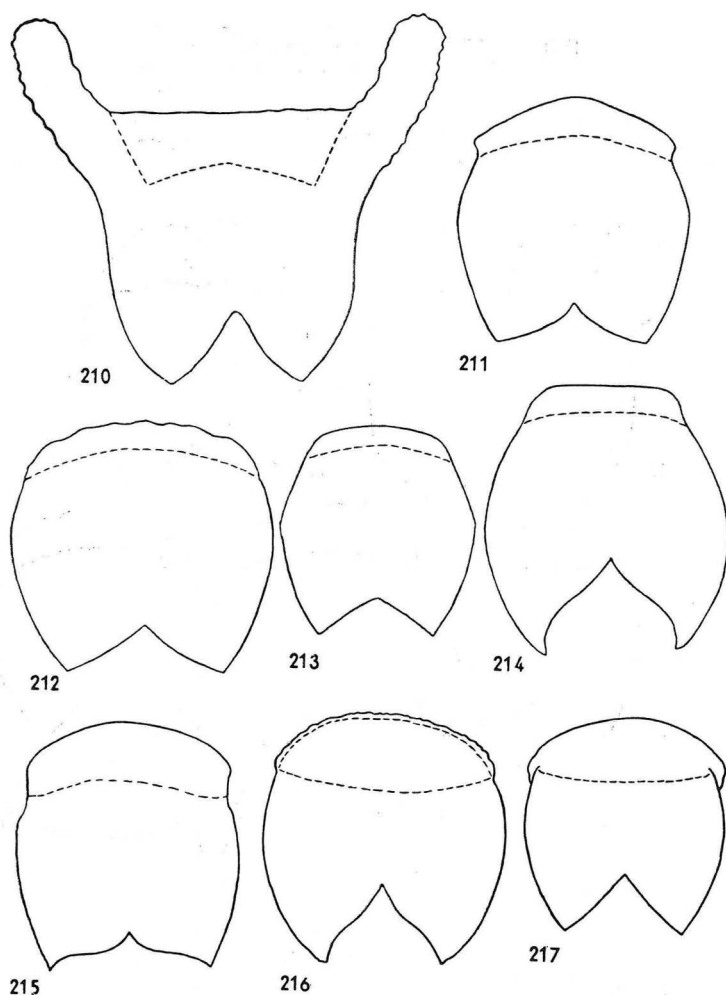
Fig. 186. *M. furcatus*, n. sp. (no. 66). Fig. 187. *M. idoneus* Horv. (no. 30). Fig. 188. *M. indicus*, n. sp. (no. 52). Fig. 189. *M. insularis*, n. sp. (no. 145). Fig. 190. *M. japonicus* Ish. et Has. (no. 142). Fig. 191. *M. mishmi*, n. sp. (no. 148). Fig. 192. *M. nigrofasciatus*, n. sp. (no. 159). Fig. 193. *M. pallidus*, n. sp. (no. 64). Fig. 194. *M. similis*, n. sp. (no. 147). Fig. 195. *M. sinicus*, n. sp. (no. 136). Fig. 196. *M. tuberculatus*, n. sp. (no. 133). Figs. 197—199. The processes of the 7th zygosternum in ♂♂ of some *Malcus* spp., lateral view, schematized.

Fig. 197. *M. furcatus*, n. sp. Fig. 198. *M. auriculatus*, n. sp. Fig. 199. *M. similis*, n. sp.



Figs. 200—201. Part of the 3rd antennal segment in *Malcus* spp.
 Fig. 200. *M. insularis*, n. sp. (no. 145). Fig. 201. *M. flavidipes flavidipes* Stål from Banggi (no. 43) — the most pilose specimen.

Figs. 202—209. Outline of pygophore in *Malcus* spp., ventral view.
 Fig. 202. *M. auriculatus*, n. sp. (no. 103). Fig. 203. *M. dentatus*, n. sp. (no. 100). Fig. 204. *M. elongatus*, n. sp. (no. 76). Fig. 205. *M. flavidipes asper*, n. subsp. (no. 68). Fig. 206. *M. flavidipes flavidipes* Stål from Java (no. 134). Fig. 207. *M. flavidipes flavidipes* Stål from Tenasserim (no. 152). Fig. 208. *M. flavidipes flavidipes* Stål from Ceylon (no. 96). Fig. 209. *M. flavidipes kumaunensis*, n. subsp. (no. 97).

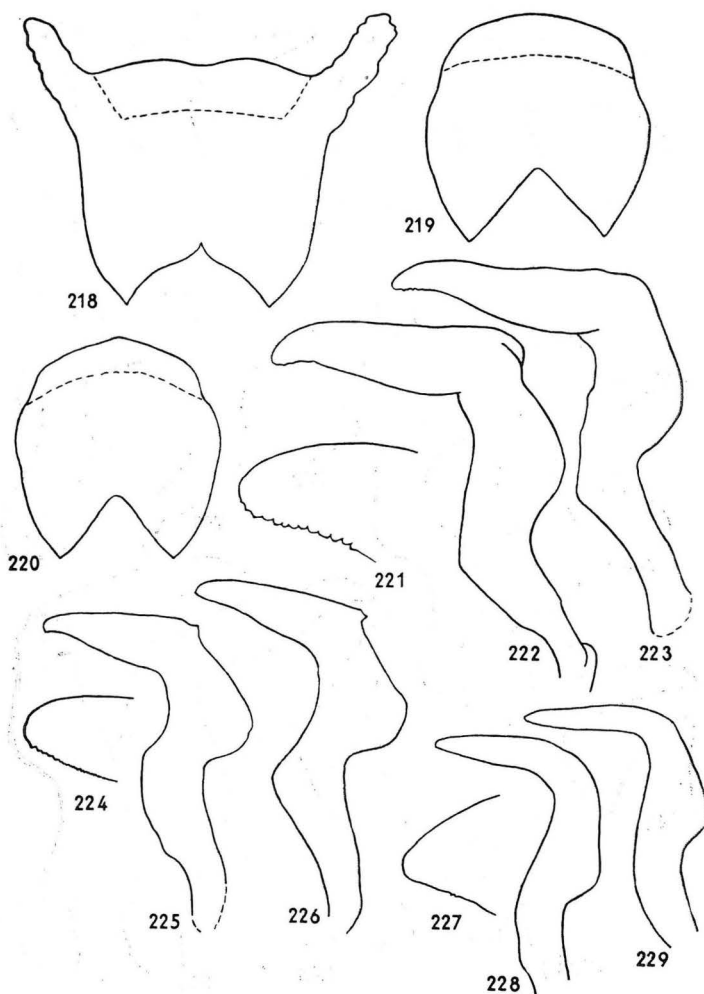


Outline of pygophore in *Malcus* spp., ventral view.

Fig. 210. *M. furcatus*, n. sp. (no. 66). Fig. 211. *M. idoneus* Horv. (no. 30). Fig. 212. *M. indicus*, n. sp. (no. 52). Fig. 213. *M. insularis*, n. sp. (no. 145). Fig. 214. *M. japonicus* Ish. et Has. (no. 142). Fig. 215. *M. mishmi*, n. sp. (no. 148). Fig. 216. *M. nigrofasciatus*, n. sp. (no. 159). Fig. 217. *M. pallidus*, n. sp. (no. 64).

3.—6. The lengths of individual antennal segments: the measurements are simply referred as 1st antennal segment etc. The length of 1st segment is very variable.

7. The total length of antenna = the sum of lengths of individual segments.



Figs. 218—220. Outline of pygophore in *Malcus* spp., ventral view.

Fig. 218. *M. similis*, n. sp. (no. 147). Fig. 219. *M. sinicus*, n. sp. (no. 136). Fig. 220. *M. tuberculatus*, n. sp. (no. 133).

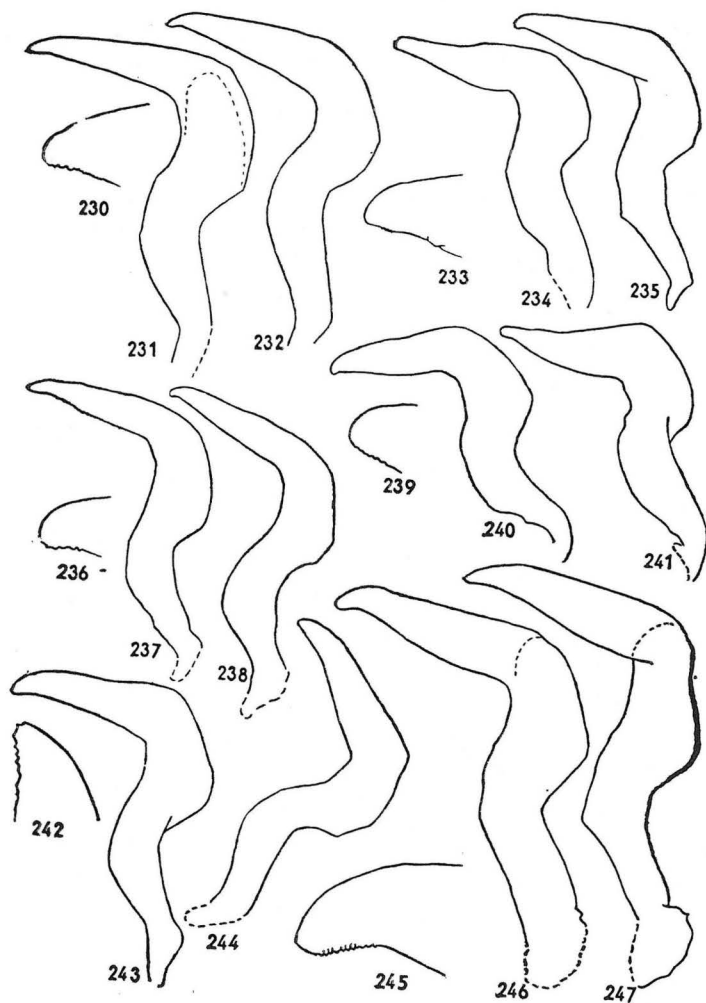
Figs. 221—229. Outlines of gonostyli in *Malcus* spp. (Both gonostyli of the same specimen are figured: one in anterior, the other in posterior view; apex figured under high magnification).

Figs. 221—223. *M. auriculatus*, n. sp. (no 103). Figs. 224—226. *M. dentatus*, n. sp. (no. 100). Figs. 227—229. *M. elongatus*, n. sp. (no. 76).

8. The width of head: across the eyes.

9. The maximum width of pronotum (fig. 61): measured always including the lateral dentes.

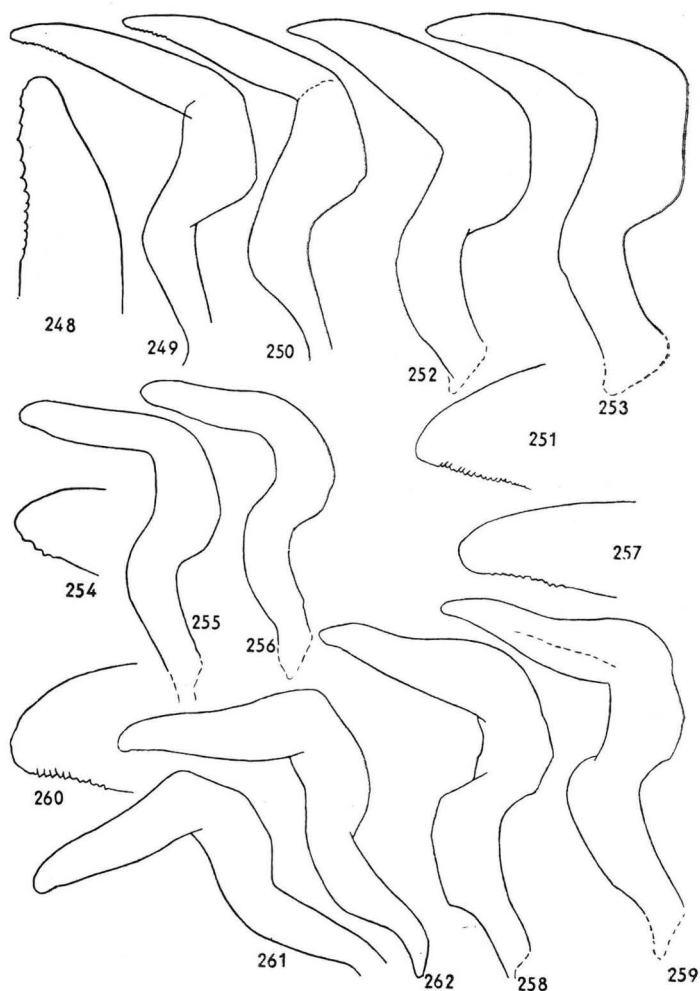
10. The minimum width of combined hemelytra (fig. 61):



Outlines of gonostyli in *Malcus* spp. (Both gonostyli of the same specimen are figured: one in anterior, the other in posterior view; apex figured under high magnification). Figs. 230—232. *M. flavidipes asper*, n. subsp. (no. 68). Figs 233—235. *M. flavidipes flavidipes* Stål from Java (no. 134). Figs. 236—238. *M. flavidipes flavidipes* Stål from Tenasserim (no. 152). Figs. 239—241. *M. flavidipes flavidipes* Stål from Ceylon (no. 96). Figs. 242—244. *M. flavidipes kumaunensis*, n subsp. (no. 97). Figs 245—247. *M. furcatus*, n. sp. (no. 66).

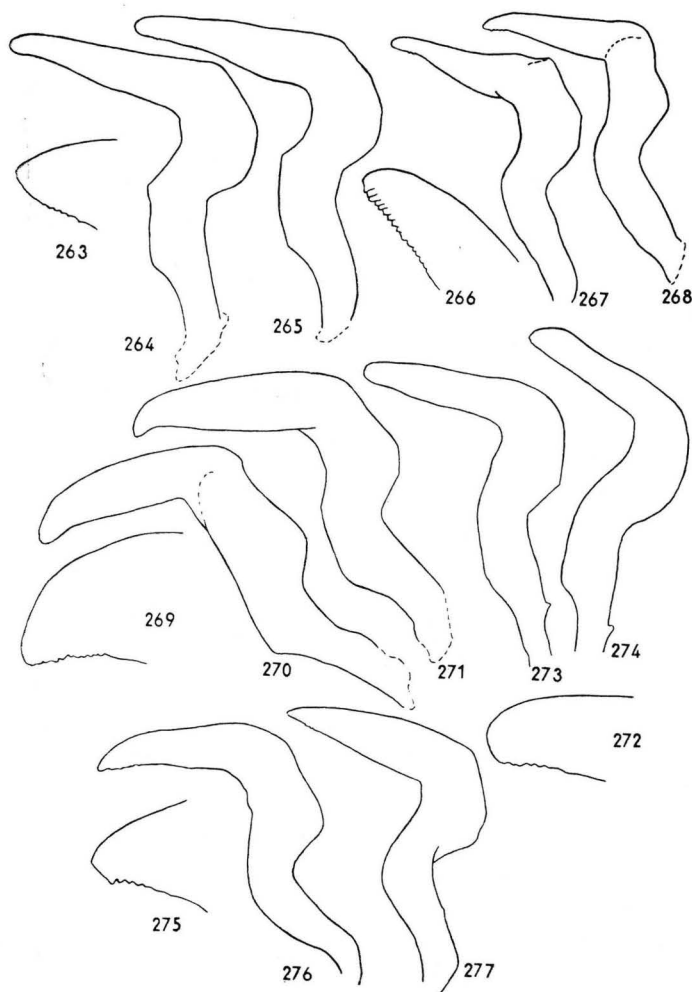
measured at the level of the innermost part of the concavity of costal margin (usually slightly before the tips of clavi).

As may be seen from the keys and differential diagnoses many calculated ratios are very useful in discrimination of species. The preliminary checking of ocular index showed that this often used ratio is of a little value in Malcinae,



Outlines of gonostyli in *Malcus* spp. (Both gonostyli of the same specimen are figured: one in anterior, the other in posterior view; apex figured under high magnification). Figs. 248–250. *M. idoneus* Horv. (no. 30). Figs. 251–253. *M. indicus*, n. sp. (no. 52). Figs. 254–256. *M. insularis*, n. sp. (no. 145). Figs. 257–259. *M. japonicus* Ish. et Has. (no. 142). Figs 260–262. *M. mishmi*, n. sp. (no. 148).

and it was not applied. Initially, of course, both measurements and ratios were summarized for males and females separately. Since, however, absolutely no differences between males and females were found in any species (for *Malcus tuberculatus*, n. sp. see the paragraph Geographical variability on p. XXX), the results were summarized for both sexes together.



Outlines of gonostyli in *Malcus* spp. (Both gonostyli of the same specimen are figured: one in anterior, the other in posterior view; apex figured under high magnification). Figs. 263–265. *M. nigrofasciatus*, n. sp. (no. 159). Figs. 266–268. *M. pallidus*, n. sp. (no. 64). Figs. 269–271. *M. similis*, n. sp. (no. 147). Figs. 272–274. *M. sinicus*, n. sp. (no. 136). Figs. 275–277. *M. tuberculatus*, n. sp. (no. 133).

The material was inadequate for more exact statistical evaluation; it will have been done after accumulation of further material.

The data contained in following tables must be taken as integral parts of descriptions of the respective taxa; in order to facilitate the comparison they were summarized in tables and not included in descriptions.

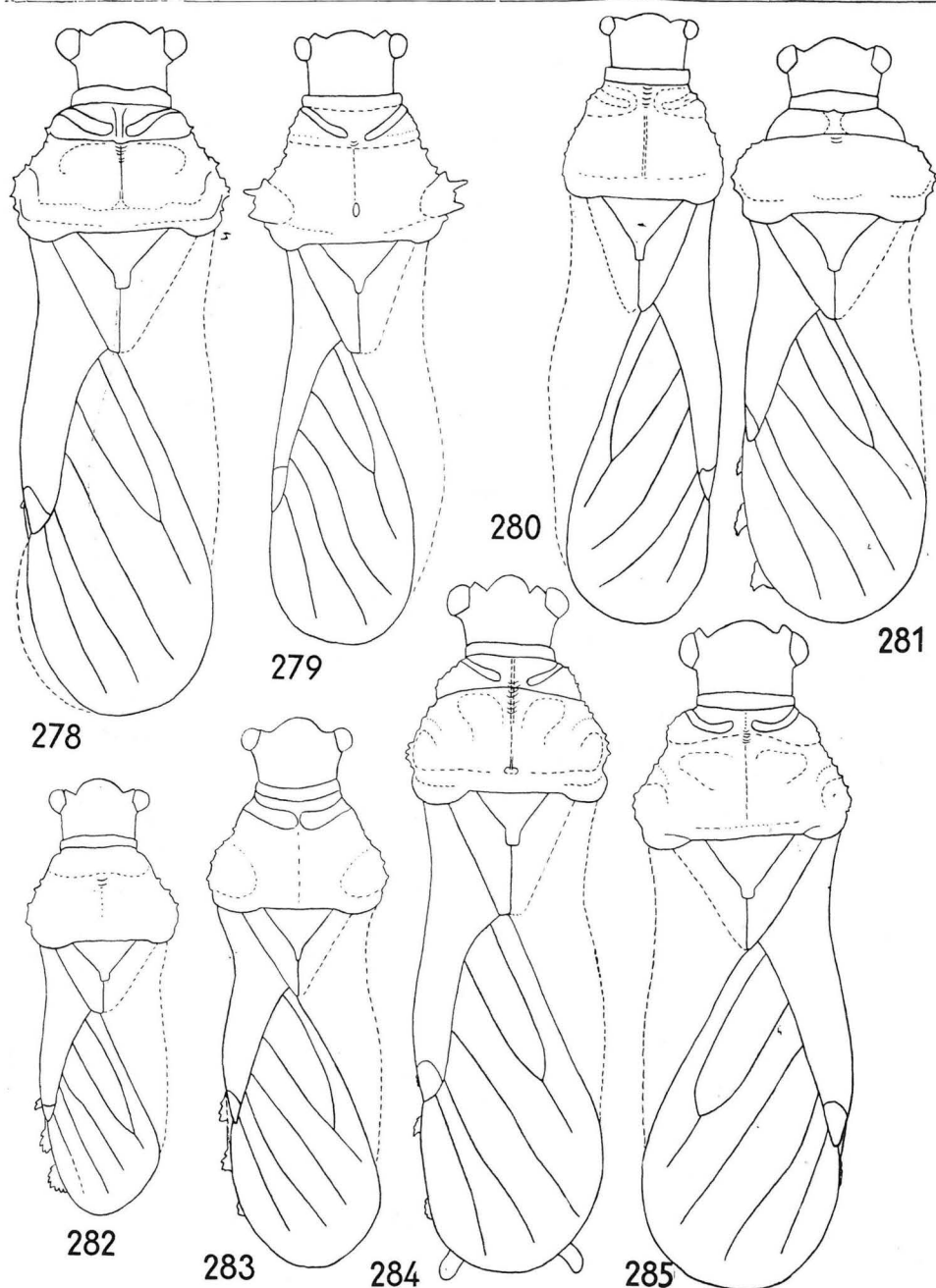
Body outline of *Malcus* spp.

Fig. 278. *M. auriculatus*, n. sp. (no. 103). Fig. 279. *M. dentatus*, n. sp. (no. 100.). Fig. 280. *M. elongatus*, n. sp. (no. 76). Fig. 281. *M. flavidipes asper*, n. subsp. (no. 13). Fig. 282. *M. flavidipes flavidipes* Stål (no. 49) from Philippines. Fig. 283. *M. flavidipes kumunensis*, n. subsp. (no. 117). Fig. 284. *M. furcatus*, n. sp., ♂, (no. 15). Fig. 285. *M. idoneus* Horv. (no. 56).

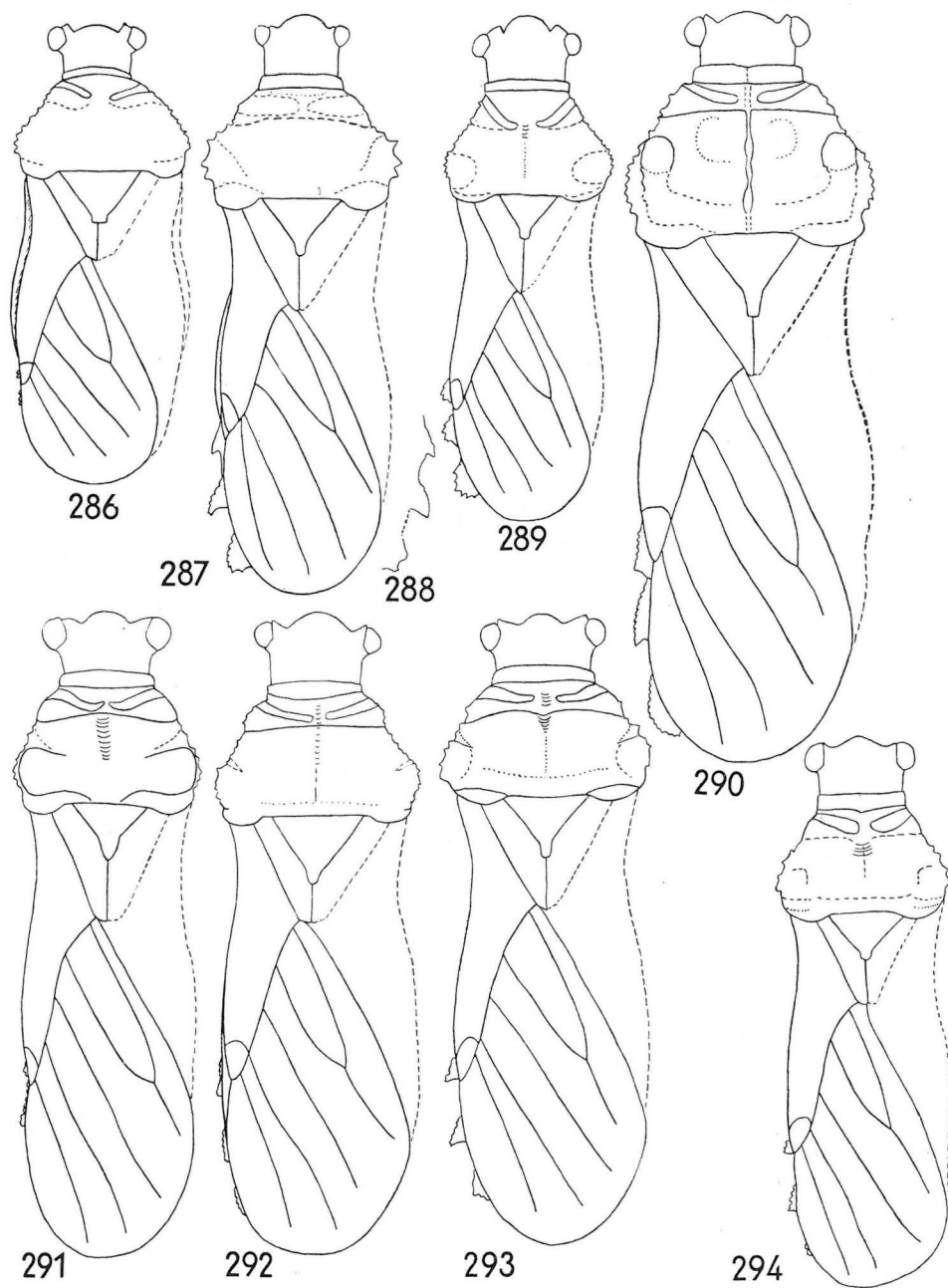
Body outline of *Malcus* spp.

Fig. 286. *M. inconspicuus*, n. sp. (no. 23). Fig. 287. *M. indicus*, n. sp. (no. 28). Fig. 288. The dorsal outline of the ventral laterotergites from the opposite side of body of specimen figured in fig. 287. Fig. 289. *M. insularis*, n. sp. (no. 145). Fig. 290. *M. japonicus* Ish. et Has. (no. 143). Fig. 291. *M. mishmi*, n. sp. (no. 148). Fig. 292. *M. nigrescens*, n. sp. (no. 104). Fig. 293. *M. nigrofasciatus*, n. sp. (no. 83). Fig. 294. *M. pallidus*, n. sp. (no. 155).

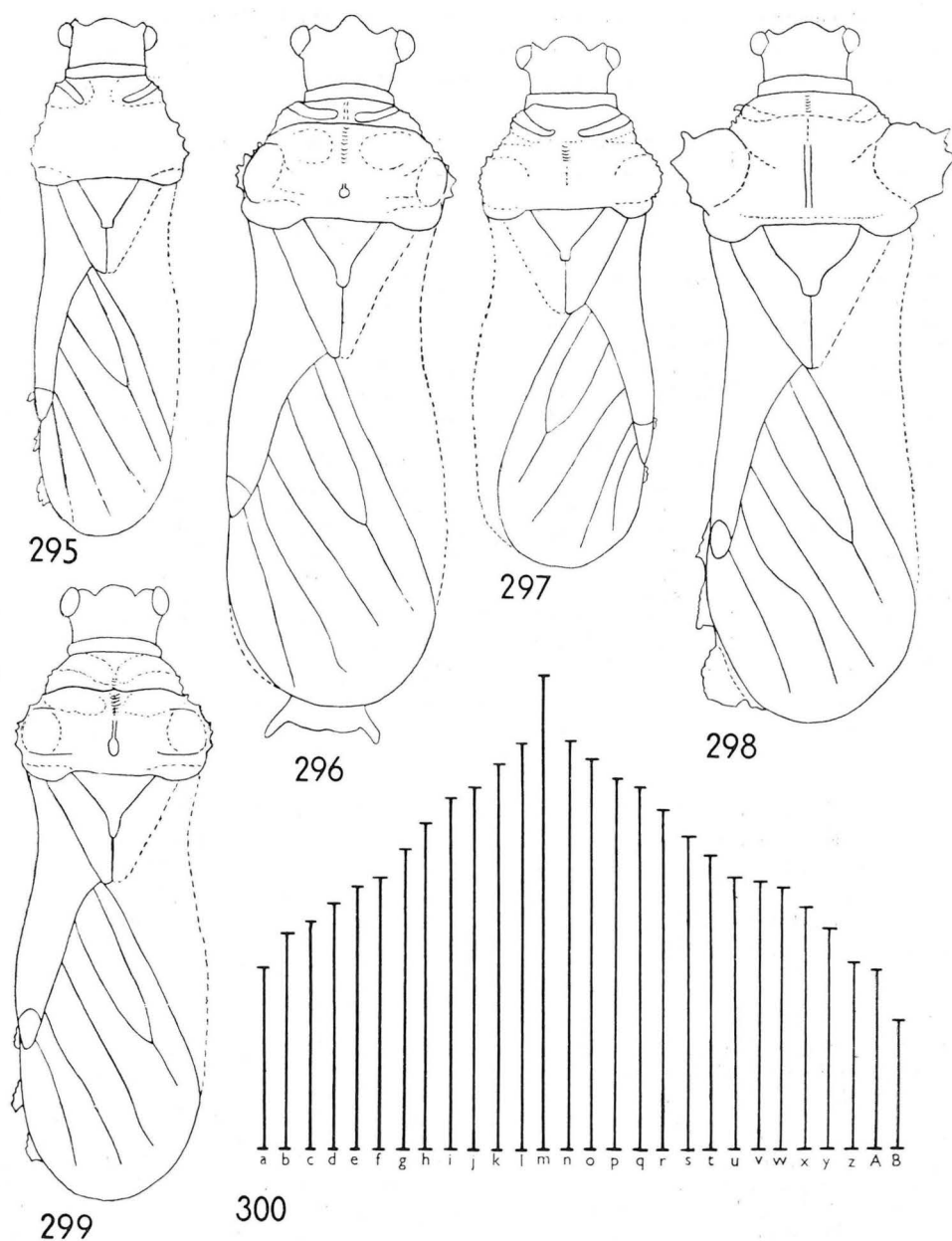
Body outline of *Malcus* spp.

Fig. 295. *M. setosus*, n. sp. (no. 21). Fig. 296. *M. similis*, n. sp., ♂ (no. 147). Fig. 297. *M. sinicus*, n. sp. (no. 136). Fig. 298. *M. thoracicus*, n. sp. (no. 169). Fig. 299. *M. tuberculatus*, n. sp. (no. 81).

Biometrical table 1. Absolute measurements (given in mm) in *Malcus*-species. A.

| | Length of body | | | Length of membrane | | | 1st ant. segment | | |
|-----------------------|----------------|------|----|--------------------|------|----|------------------|------|----|
| | min.—max. | M | N | min.—max. | M | N | min.—max. | M | N |
| <i>auriculatus</i> | 4.50 | 4.50 | 1 | 2.40 | 2.40 | 1 | 0.66 | 0.66 | 1 |
| <i>dentatus</i> | 4.02 | 4.02 | 1 | 1.92 | 1.92 | 1 | 0.80 | 0.80 | 1 |
| <i>elongatus</i> | 4.05 | 4.05 | 1 | 2.10 | 2.10 | 1 | 0.60 | 0.60 | 1 |
| <i>fl. asper</i> | 3.72—4.14 | 3.96 | 9 | 1.89—2.04 | 2.00 | 8 | 0.60—0.72 | 0.66 | 8 |
| <i>fl. flavidipes</i> | 2.79—3.56 | 3.19 | 74 | 1.26—1.73 | 1.58 | 76 | 0.47—0.69 | 0.57 | 72 |
| <i>fl. kumauensis</i> | 3.36—3.90 | 3.63 | 26 | 1.65—1.94 | 1.80 | 26 | 0.48—0.60 | 0.52 | 25 |
| <i>furcatus</i> | 4.29—4.65 | 4.43 | 17 | 2.24—2.43 | 2.33 | 17 | 0.59—0.63 | 0.61 | 17 |
| <i>idoneus</i> | 3.90—4.62 | 4.34 | 13 | 1.86—2.28 | 2.19 | 13 | 0.59—0.75 | 0.62 | 13 |
| <i>inconspicuous</i> | 3.12—3.39 | 3.23 | 3 | 1.47—1.62 | 1.58 | 3 | 0.63 | 0.63 | 3 |
| <i>indicus</i> | 3.60—3.84 | 3.71 | 6 | 1.74—1.89 | 1.81 | 6 | 0.54—0.65 | 0.58 | 6 |
| <i>insularis</i> | 3.27 | 3.27 | 1 | 1.53 | 1.53 | 1 | 0.56 | 0.56 | 1 |
| <i>japonicus</i> | 4.92—5.04 | 4.98 | 2 | 2.49—2.55 | 2.52 | 2 | 0.54 | 0.54 | 2 |
| <i>mishmi</i> | 4.26 | 4.26 | 1 | 2.22 | 2.22 | 1 | 0.60 | 0.60 | 1 |
| <i>nigrescens</i> | 4.41 | 4.41 | 1 | 2.28 | 2.28 | 1 | 0.72 | 0.72 | 1 |
| <i>nigrofasciatus</i> | 4.17—4.32 | 4.24 | 3 | 2.13—2.22 | 2.19 | 4 | 0.66 | 0.66 | 1 |
| <i>pallidus</i> | 3.51—3.81 | 3.67 | 7 | 1.77—1.98 | 1.88 | 7 | 0.54—0.59 | 0.56 | 6 |
| <i>setosus</i> | 3.42 | 3.42 | 1 | 1.77 | 1.77 | 1 | 0.68 | 0.68 | 1 |
| <i>similis</i> | 4.74 | 4.74 | 1 | 2.31 | 2.31 | 1 | 0.66 | 0.66 | 1 |
| <i>sinicus</i> | 3.36—3.50 | 3.43 | 7 | 1.59—1.68 | 1.64 | 7 | 0.53—0.57 | 0.56 | 7 |
| <i>thoracicus</i> | 4.50 | 4.50 | 1 | 2.25 | 2.25 | 1 | 0.59 | 0.59 | 1 |
| <i>tuberculatus</i> | 3.78—4.32 | 4.00 | 12 | 1.92—2.25 | 2.05 | 12 | 0.54—0.63 | 0.58 | 12 |

d) Keys

Two keys have been constructed: one for males, based only on the characters of 8th urite, pygophore and gonostyli, the other for both sexes, based entirely on externally visible characters (incl. biometrical). The application of both keys may considerably facilitate the identification and shows, moreover, how external resemblance of some species is in many cases in discordance with resemblance of genital characters and vice versa.

Fig. 300. Scales indicating actual lengths in the preceding figures. a) Scale represents actual length of 1 mm and is applicable to figs. 110—130; b) Scale 0.2 mm — figs. 18, 19, 24; c) Scale 1 mm — fig. 5; d) Scale 0.2 mm — fig. 46; e) Scale 0.5 mm — figs. 2—4; f) Scale 1 mm — figs. 9, 20, 21; g) Scale 0.2 mm — figs. 86, 97, 99, 100, 109 and outlines of gonostyli in figs. 222—277; h) Scale 0.5 mm — figs. 43, 44; i) Scale 0.2 mm — figs. 29, 31, 35, 45; j) Scale 0.2 mm — fig. 101; k) Scale 0.5 mm — figs. 76, 93—96, 98, 107, 108; l) Scale 0.2 mm — figs. 83, 84; m) Scale 0.1 mm — apices of gonostyli in figs. 221—275; n) Scale 1 mm — figs. 82, 91, 92, 103, 104, 106; o) Scale 0.5 mm — fig. 26; p) Scale 0.5 mm — fig. 7; q) Scale 1 mm — figs. 6, 8, 10, 11, 36—38; r) Scale 0.5 mm — figs. 27, 28; s) Scale 0.1 mm — figs. 73—75; t) Scale 0.5 mm — figs. 200, 201; u) Scale 0.5 mm — figs. 22, 23; v) Scale 1 mm — figs. 88, 89; w) Scale 0.2 mm — figs. 12—14, 41; x) Scale 0.5 mm — figs. 72, 78—81, 85, 87, 157—196, 202—220; y) Scale 0.5 mm — figs. 131—156; z) Scale 1 mm — figs. 15—17; A) Scale 0.2 mm — figs. 32, 34, 40; B) Scale 1 mm — figs. 61—70, 278—299.

Biometrical table 2. Absolute measurements (given in mm) in *Malcus*-species. B.

| | 2nd ant. segment | | | 3rd ant. segment | | | 4th ant. segment | | |
|------------------------|------------------|------|----|------------------|------|----|------------------|------|----|
| | min. — max. | M | N | min. — max. | M | N | min. — max. | M | N |
| <i>auriculatus</i> | 1.01 | 1.01 | 1 | 1.71 | 1.71 | 1 | 0.66 | 0.66 | 1 |
| <i>dentatus</i> | 1.23 | 1.23 | 1 | 1.86 | 1.86 | 1 | — | — | — |
| <i>elongatus</i> | 1.05 | 1.05 | 1 | 1.35 | 1.35 | 1 | 0.57 | 0.57 | 1 |
| <i>fl. asper</i> | 0.89—1.05 | 0.98 | 8 | 1.56—1.79 | 1.65 | 6 | 0.53—0.63 | 0.58 | 5 |
| <i>fl. flavidipes</i> | 0.81—1.05 | 0.93 | 70 | 1.38—1.86 | 1.61 | 67 | 0.45—0.59 | 0.50 | 62 |
| <i>fl. kumaunensis</i> | 0.74—0.87 | 0.81 | 24 | 1.22—1.47 | 1.34 | 22 | 0.42—0.54 | 0.47 | 18 |
| <i>furcatus</i> | 0.96—1.14 | 1.05 | 17 | 1.44—1.68 | 1.54 | 16 | 0.56—0.63 | 0.60 | 14 |
| <i>idoneus</i> | 1.01—1.16 | 1.10 | 13 | 1.62—1.89 | 1.81 | 13 | 0.56—0.66 | 0.59 | 13 |
| <i>inconspicuus</i> | 0.81—0.93 | 0.87 | 3 | 1.32—1.53 | 1.40 | 3 | 0.47—0.50 | 0.47 | 3 |
| <i>indicus</i> | 0.84—1.02 | 0.91 | 6 | 1.28—1.53 | 1.41 | 5 | 0.45—0.51 | 0.48 | 5 |
| <i>insularis</i> | 0.77 | 0.77 | 1 | 1.35 | 1.35 | 1 | 0.50 | 0.50 | 1 |
| <i>japonicus</i> | 1.02—1.05 | 1.04 | 2 | 1.17—1.20 | 1.19 | 2 | 0.56—0.63 | 0.59 | 2 |
| <i>mishmi</i> | 0.93 | 0.93 | 1 | 1.46 | 1.46 | 1 | — | — | — |
| <i>nigrescens</i> | 1.05 | 1.05 | 1 | 1.47 | 1.47 | 1 | 0.59 | 0.59 | 1 |
| <i>nigrofasciatus</i> | 1.01 | 1.01 | 1 | 1.56 | 1.56 | 1 | 0.60 | 0.60 | 1 |
| <i>pallidus</i> | 0.90—0.96 | 0.92 | 6 | 1.38—1.53 | 1.47 | 6 | 0.54—0.59 | 0.56 | 4 |
| <i>setosus</i> | 0.99 | 0.99 | 1 | 1.29 | 1.29 | 1 | 0.45 | 0.45 | 1 |
| <i>similis</i> | 1.05 | 1.05 | 1 | 1.61 | 1.61 | 1 | 0.62 | 0.62 | 1 |
| <i>sinicus</i> | 0.62—0.69 | 0.66 | 7 | 1.23—1.41 | 1.32 | 7 | 0.44—0.50 | 0.47 | 7 |
| <i>thoracicus</i> | 1.10 | 1.10 | 1 | 1.55 | 1.55 | 1 | 0.54 | 0.54 | 1 |
| <i>tuberculatus</i> | 0.93—1.07 | 1.00 | 10 | 1.49—1.67 | 1.55 | 9 | 0.51—0.59 | 0.54 | 7 |

The species externally similar to *Malcus flavidipes* Stål and to its subspecies (i. e. *M. indicus*, n. sp. *M. pallidus*, n. sp. and *M. insularis*, n. sp.), although very different in genital characters, can be hardly safely distinguished in an ordinary key based on external characters, since in practically none of these taxa any peculiar character, not shared by some other taxon, is present. Therefore, beginning with couplet 33, each taxon is distinguished by a single character (often geographical; sometimes a supplementary, but not exclusive character is added). Safe external characters distinguishing the respective taxon from individual following taxa are presented in brackets under the name of the identified taxon.

It is advised to use also the key, based on male genitalia, biometrical tables and differential diagnoses in identification of these taxa.

Key to *Malcus*-species based on externally visible characters

- 1 (2) Ratio 3rd antennal segment : 2nd antennal segment less than 1.20. Ratio 3rd antennal segment : maximum width of pronotum less than 0.80. Ratio length of body : length of antenna more than 1.40. Length of body more than 4.80 mm. Distribution: Japan *japonicus*
- 2 (1) Ratio 3rd antenna lsegment : 2nd antennal segment at least 1.30. Ratio 3rd antennal segment : maximum width of pronotum at least 1.03 (exception: *thoracicus*: 0.83 — then pronotum with extremely large, swollen, protrusion)

Biometrical table 3. Absolute measurements (given in mm) in *Malcus*-species. C.

| | Length of antenna | | | Width of head | | | Maximal width of pronotum | | |
|------------------------|-------------------|------|-----|---------------|------|----|---------------------------|------|----|
| | min.—max. | M | N | min.—max. | M | N | min.—max. | M | N |
| <i>auriculatus</i> | 4.14 | 4.14 | 1 | 0.81 | 0.81 | 1 | 1.41 | 1.41 | 1 |
| <i>dentatus</i> | ? (about 4.4—4.5) | ? | (1) | 0.71 | 0.71 | 1 | 1.41 | 1.41 | 1 |
| <i>elongatus</i> | 3.45 | 3.45 | 1 | 0.66 | 0.66 | 1 | 1.05 | 1.05 | 1 |
| <i>fl. asper</i> | 3.57—4.19 | 3.81 | 5 | 0.72—0.77 | 0.74 | 9 | 1.31—1.46 | 1.39 | 9 |
| <i>fl. flavidipes</i> | 3.14—4.04 | 3.60 | 62 | 0.66—0.80 | 0.71 | 74 | 0.99—1.26 | 1.13 | 75 |
| <i>fl. kumaunensis</i> | 2.94—3.42 | 3.16 | 18 | 0.65—0.74 | 0.69 | 26 | 1.13—1.34 | 1.23 | 26 |
| <i>furcatus</i> | 3.62—4.02 | 3.78 | 14 | 0.78—0.81 | 0.80 | 17 | 1.26—1.44 | 1.32 | 17 |
| <i>idoneus</i> | 3.78—4.38 | 4.12 | 13 | 0.83—0.87 | 0.85 | 13 | 1.25—1.41 | 1.37 | 13 |
| <i>inconspicuus</i> | 3.23—3.56 | 3.36 | 3 | 0.74—0.78 | 0.76 | 3 | 1.17—1.28 | 1.22 | 3 |
| <i>indicus</i> | 3.11—3.71 | 3.38 | 5 | 0.72—0.75 | 0.73 | 6 | 1.23—1.34 | 1.28 | 6 |
| <i>insularis</i> | 3.15 | 3.15 | 1 | 0.72 | 0.72 | 1 | 1.11 | 1.11 | 1 |
| <i>japonicus</i> | 3.35—3.36 | 3.35 | 2 | 0.78 | 0.78 | 2 | 1.59—1.67 | 1.63 | 2 |
| <i>mishmi</i> | ? (about 3.5—3.6) | ? | (1) | 0.81 | 0.81 | 1 | 1.35 | 1.35 | 1 |
| <i>nigrescens</i> | 3.86 | 3.86 | 1 | 0.84 | 0.84 | 1 | 1.34 | 1.34 | 1 |
| <i>nigrofasciatus</i> | 3.83 | 3.83 | 1 | 0.75—0.80 | 0.77 | 3 | 1.37—1.44 | 1.40 | 3 |
| <i>pallidus</i> | 3.41—3.63 | 3.55 | 4 | 0.69—0.77 | 0.72 | 7 | 1.11—1.23 | 1.16 | 7 |
| <i>setosus</i> | 3.41 | 3.41 | 1 | 0.69 | 0.69 | 1 | 1.05 | 1.05 | 1 |
| <i>similis</i> | 3.93 | 3.93 | 1 | 0.84 | 0.84 | 1 | 1.46 | 1.46 | 1 |
| <i>sinicus</i> | 2.97—3.15 | 3.05 | 7 | 0.72—0.77 | 0.75 | 7 | 1.16—1.28 | 1.20 | 7 |
| <i>thoracicus</i> | 3.77 | 3.77 | 1 | 0.80 | 0.80 | 1 | 1.86 | 1.86 | 1 |
| <i>tuberculatus</i> | 3.50—3.84 | 3.61 | 7 | 0.66—0.80 | 0.73 | 12 | 1.19—1.38 | 1.28 | 12 |

Biometrical table 4. Absolute measurements (given in mm) in *Malcus*-species. D.

| | Minimal width of combined hemelytra | | | | | | |
|------------------------|-------------------------------------|------|----|-----------------------|-----------|------|----|
| | min.—max. | M | N | | min.—max. | M | N |
| <i>auriculatus</i> | 1.10 | 1.10 | 1 | <i>japonicus</i> | 1.23—1.25 | 1.24 | 2 |
| <i>dentatus</i> | 0.84 | 0.84 | 1 | <i>mishmi</i> | 1.01 | 1.01 | 1 |
| <i>elongatus</i> | 0.87 | 0.87 | 1 | <i>nigrescens</i> | 1.02 | 1.02 | 1 |
| <i>fl. asper</i> | 0.98—1.07 | 1.01 | 8 | <i>nigrofasciatus</i> | 1.04—1.11 | 1.07 | 4 |
| <i>fl. flavidipes</i> | 0.75—0.95 | 0.84 | 76 | <i>pallidus</i> | 0.84—0.92 | 0.87 | 7 |
| <i>fl. kumaunensis</i> | 0.80—1.01 | 0.91 | 26 | <i>setosus</i> | 0.80 | 0.80 | 1 |
| <i>furcatus</i> | 0.99—1.14 | 1.07 | 17 | <i>similis</i> | 1.05 | 1.05 | 1 |
| <i>idoneus</i> | 0.99—1.14 | 1.07 | 13 | <i>sinicus</i> | 0.90—0.98 | 0.94 | 7 |
| <i>inconspicuus</i> | 0.92—0.96 | 0.94 | 3 | <i>thoracicus</i> | 1.10 | 1.10 | 1 |
| <i>indicus</i> | 0.90—0.96 | 0.93 | 6 | <i>tuberculatus</i> | 0.86—1.07 | 0.98 | 12 |
| <i>insularis</i> | 0.86 | 0.86 | 1 | | | | |

Biometrical table 5. Calculated ratios in *Malcus*-species. A

| | Length of body: length of antenna | | | Length of membrane: length of body | | | Length of membrane: min. width of com- bined hemelytra | | |
|------------------------|--------------------------------------|-------|----|---------------------------------------|------|----|--|------|----|
| | min.—max. | M | N | min.—max. | M | N | min.—max. | M | N |
| <i>auriculatus</i> | 1.09 | 1.09 | 1 | 0.53 | 0.53 | 1 | 2.19 | 2.19 | 1 |
| <i>dentatus</i> | ? (about 0.90) | ? (1) | | 0.48 | 0.48 | 1 | 2.28 | 2.28 | 1 |
| <i>elongatus</i> | 1.17 | 1.17 | 1 | 0.52 | 0.52 | 1 | 2.42 | 2.42 | 1 |
| <i>fl. asper</i> | 0.96—1.04 | 1.02 | 5 | 0.48—0.52 | 0.50 | 8 | 1.90—2.08 | 1.99 | 8 |
| <i>fl. flavidipes</i> | 0.79—1.01 | 0.88 | 62 | 0.43—0.51 | 0.47 | 73 | 1.56—1.98 | 1.76 | 75 |
| <i>fl. kumaunensis</i> | 1.02—1.25 | 1.14 | 18 | 0.47—0.52 | 0.50 | 26 | 1.75—2.11 | 1.96 | 26 |
| <i>furcatus</i> | 1.11—1.23 | 1.17 | 14 | 0.51—0.53 | 0.52 | 17 | 2.13—2.32 | 2.25 | 17 |
| <i>idoneus</i> | 1.01—1.16 | 1.06 | 13 | 0.48—0.52 | 0.50 | 13 | 1.87—2.13 | 2.05 | 13 |
| <i>inconspicuus</i> | 0.93—0.97 | 0.96 | 3 | 0.47—0.49 | 0.48 | 3 | 1.61—1.69 | 1.66 | 3 |
| <i>indicus</i> | 1.06—1.16 | 1.10 | 5 | 0.48—0.49 | 0.48 | 6 | 1.87—2.03 | 1.94 | 6 |
| <i>insularis</i> | 1.03 | 1.03 | 1 | 0.47 | 0.47 | 1 | 1.79 | 1.79 | 1 |
| <i>japonicus</i> | 1.47—1.50 | 1.49 | 2 | 0.51 | 0.51 | 2 | 2.00—2.07 | 2.04 | 2 |
| <i>mishmi</i> | ? (about 1.20) | ? (1) | | 0.52 | 0.52 | 1 | 2.21 | 2.21 | 1 |
| <i>nigrescens</i> | 1.15 | 1.15 | 1 | 0.52 | 0.52 | 1 | 2.23 | 2.23 | 1 |
| <i>nigrofasciatus</i> | 1.09 | 1.09 | 1 | 0.51—0.52 | 0.51 | 3 | 2.00—2.12 | 2.06 | 4 |
| <i>pallidus</i> | 0.99—1.05 | 1.03 | 4 | 0.50—0.53 | 0.52 | 7 | 2.11—2.21 | 2.15 | 7 |
| <i>setosus</i> | 1.00 | 1.00 | 1 | 0.52 | 0.52 | 1 | 2.22 | 2.22 | 1 |
| <i>similis</i> | 1.21 | 1.21 | 1 | 0.49 | 0.49 | 1 | 2.20 | 2.20 | 1 |
| <i>sinicus</i> | 1.04—1.17 | 1.12 | 7 | 0.47—0.49 | 0.48 | 7 | 1.71—1.80 | 1.76 | 7 |
| <i>thoracicus</i> | 1.20 | 1.20 | 1 | 0.50 | 0.50 | 1 | 2.06 | 2.06 | 1 |
| <i>tuberculatus</i> | 1.07—1.14 | 1.09 | 7 | 0.50—0.52 | 0.52 | 12 | 2.03—2.27 | 2.15 | 12 |

ding posterolateral tubercles). Ratio length of body: length of antenna at most 1.23. Length of body at most 4.74 mm, mostly much shorter. Not in Japan.

- 3 (6) Posterolateral tubercles on pronotum (figs. 279, 299) very conspicuous, swollen, laterally strongly dentate, conspicuously produced above the intertubercular line (in posterior pronotal outline — figs. 111, 129). Ratio maximum width of pronotum : minimum width of combined hemelytra more than 1.60.
- 4 (5) Body shorter than antennae (ratio about 0.90). Ratio 3rd antennal segment: maximum width of pronotum = 1.32. Posterolateral tubercles of pronotum (fig. 279) not conspicuously semiglobular on inner side; posteromedial tubercle present (fig. 111). The 5th—7th laterotergites (fig. 132) narrow, inconspicuous *dentatus*.
- 5 (4) Body distinctly longer than antennae (ratio 1.20). Ratio 3rd antennal segment : maximum width of pronotum = 0.83. Posterolateral tubercles of pronotum (fig. 299) conspicuously semiglobular on inner side; posteromedial tubercle lacking (fig. 129). The 5th—7th laterotergites (fig. 156) conspicuously protruding, wide *thoracicus*

Biometrical table 6. Calculated ratios in *Malcus*-species. B.

| | Length of body: min. width of combined hemelytra | | | Max. width of pronotum: min. width of combined hemelytra | | | Max. width of pronotum: width of head | | |
|-------------------------|--|------|----|--|------|----|---------------------------------------|------|----|
| | max.—min. | M | N | max.—min. | M | N | max.—min. | M | N |
| <i>auriculatus</i> | 4.12 | 4.12 | 1 | 1.29 | 1.29 | 1 | 1.74 | 1.74 | 1 |
| <i>dentatus</i> | 4.77 | 4.77 | 1 | 1.68 | 1.68 | 1 | 2.00 | 2.00 | 1 |
| <i>elongatus</i> | 4.65 | 4.65 | 1 | 1.21 | 1.21 | 1 | 1.59 | 1.59 | 1 |
| <i>fl. asper</i> | 3.77—4.15 | 3.96 | 8 | 1.29—1.43 | 1.38 | 8 | 1.77—1.94 | 1.86 | 9 |
| <i>fl. flavidipes</i> | 3.45—4.08 | 3.74 | 74 | 1.24—1.47 | 1.34 | 75 | 1.44—1.71 | 1.58 | 74 |
| <i>fl. kumavunensis</i> | 3.50—4.41 | 3.95 | 26 | 1.23—1.42 | 1.34 | 26 | 1.70—1.86 | 1.77 | 26 |
| <i>furcatus</i> | 4.09—4.38 | 4.29 | 17 | 1.21—1.31 | 1.27 | 17 | 1.59—1.75 | 1.64 | 17 |
| <i>idoneus</i> | 3.82—4.27 | 4.05 | 13 | 1.23—1.31 | 1.27 | 13 | 1.53—1.65 | 1.62 | 13 |
| <i>inconspicuus</i> | 3.28—3.53 | 3.41 | 3 | 1.28—1.33 | 1.31 | 3 | 1.59—1.63 | 1.61 | 3 |
| <i>indicus</i> | 3.87—4.13 | 3.99 | 6 | 1.34—1.43 | 1.37 | 6 | 1.67—1.85 | 1.75 | 6 |
| <i>insularis</i> | 3.82 | 3.82 | 1 | 1.29 | 1.29 | 1 | 1.54 | 1.54 | 1 |
| <i>japonicus</i> | 3.95—4.10 | 4.03 | 2 | 1.29—1.34 | 1.32 | 2 | 2.04—2.14 | 2.09 | 2 |
| <i>mishmi</i> | 4.24 | 4.24 | 1 | 1.34 | 1.34 | 1 | 1.67 | 1.67 | 1 |
| <i>nigrescens</i> | 4.33 | 4.33 | 1 | 1.31 | 1.31 | 1 | 1.69 | 1.69 | 1 |
| <i>nigrofasciatus</i> | 3.81—4.12 | 3.99 | 3 | 1.30—1.35 | 1.32 | 3 | 1.81—1.85 | 1.83 | 3 |
| <i>pallidus</i> | 4.07—4.28 | 4.17 | 7 | 1.29—1.35 | 1.32 | 7 | 1.56—1.65 | 1.61 | 7 |
| <i>setosus</i> | 4.31 | 4.31 | 1 | 1.32 | 1.32 | 1 | 1.52 | 1.52 | 1 |
| <i>similis</i> | 4.53 | 4.53 | 1 | 1.39 | 1.39 | 1 | 1.73 | 1.73 | 1 |
| <i>sinicus</i> | 3.48—3.76 | 3.68 | 7 | 1.23—1.35 | 1.28 | 7 | 1.55—1.66 | 1.60 | 7 |
| <i>thoracicus</i> | 4.12 | 4.12 | 1 | 1.70 | 1.70 | 1 | 2.34 | 2.34 | 1 |
| <i>tuberculatus</i> | 4.00—4.46 | 4.22 | 12 | 1.29—1.42 | 1.35 | 12 | 1.67—1.84 | 1.76 | 12 |

- 6 (3) Pronotum without posterolateral tubercles, or these small, less dentate and not conspicuously produced above the intertubercular line (in posterior pronotal outline). Ratio maximum width of pronotum : minimum width of combined hemelytra less than 1.50.
- 7 (12) Males with parandria on pygophore (figs. 202, 210, 218) and with more or less distinct paired processes on the 7th ventrite, covered by conspicuous tufts of hairs (figs. 197—199).
- 8 (9) Parandria short, ear-shaped (fig. 202). The tuft of hairs on the 7th ventrite situated more ventrally and occupying about 3/4 of length of the segment (fig. 198) *auriculatus*
- 9 (8) Parandria long, divergent, fork-like (figs. 210, 218). The tuft of hairs on the 7th ventrite situated more dorsally and occupying about 1/2 of length of the segment (figs. 197, 199).
- 10 (11) The tuft of hairs on the 7th ventrite (fig. 197) situated on a distinct process (well visible in posterior view), the hairs densely clustered. Parandria (fig. 210) strong and long, half as long as the distal margin of pygophore. Pronotum light yellow-brown with black transverse band in callar region, only small parts of pronotal lobe may be darkened. Membrane silvery light

Biometrical table 7. Calculated ratios in *Malcus*-species. C.

| | 3 rd antenn. segment: max. width of pro- notum | | | 3 rd ant. segment: 2 nd ant. segment | | | Length of body: max. width of pronotum | | |
|------------------------|---|------|----|---|------|----|---|------|----|
| | min.—max. | M | N | min.—max. | M | N | min.—max. | M | N |
| <i>auriculatus</i> | 1.21 | 1.21 | 1 | 1.54 | 1.54 | 1 | 3.20 | 3.20 | 1 |
| <i>dentatus</i> | 1.32 | 1.32 | 1 | 1.52 | 1.52 | 1 | 2.86 | 2.86 | 1 |
| <i>elongatus</i> | 1.29 | 1.29 | 1 | 1.45 | 1.45 | 1 | 3.85 | 3.85 | 1 |
| <i>fl. asper</i> | 1.14—1.27 | 1.20 | 6 | 1.59—1.76 | 1.69 | 6 | 2.72—2.96 | 2.86 | 9 |
| <i>fl. flavidipes</i> | 1.23—1.63 | 1.43 | 67 | 1.56—2.07 | 1.75 | 67 | 2.62—3.04 | 2.82 | 74 |
| <i>fl. kumaunensis</i> | 0.96—1.31 | 1.12 | 22 | 1.55—1.75 | 1.66 | 22 | 2.81—3.14 | 2.95 | 26 |
| <i>furcatus</i> | 1.08—1.24 | 1.17 | 16 | 1.41—1.56 | 1.48 | 16 | 3.22—3.55 | 3.37 | 17 |
| <i>idoneus</i> | 1.23—1.39 | 1.32 | 13 | 1.53—1.80 | 1.65 | 13 | 3.10—3.35 | 3.17 | 13 |
| <i>inconspicuous</i> | 1.10—1.20 | 1.14 | 3 | 1.53—1.64 | 1.60 | 3 | 2.62—2.67 | 2.65 | 3 |
| <i>indicus</i> | 1.03—1.17 | 1.10 | 5 | 1.50—1.63 | 1.55 | 5 | 2.87—2.98 | 2.91 | 6 |
| <i>insularis</i> | 1.21 | 1.21 | 1 | 1.76 | 1.76 | 1 | 2.94 | 2.94 | 1 |
| <i>japonicus</i> | 0.74 | 0.74 | 2 | 1.14—1.15 | 1.15 | 2 | 3.08—3.17 | 3.13 | 2 |
| <i>mishmi</i> | 1.08 | 1.08 | 1 | 1.56 | 1.56 | 1 | 3.16 | 3.16 | 1 |
| <i>nigrescens</i> | 1.10 | 1.10 | 1 | 1.40 | 1.40 | 1 | 3.32 | 3.32 | 1 |
| <i>nigrofasciatus</i> | 1.14 | 1.14 | 1 | 1.55 | 1.55 | 1 | 2.92—3.06 | 3.01 | 3 |
| <i>pallidus</i> | 1.21—1.35 | 1.28 | 6 | 1.53—1.65 | 1.59 | 6 | 3.11—3.27 | 3.18 | 7 |
| <i>setosus</i> | 1.23 | 1.23 | 1 | 1.30 | 1.30 | 1 | 3.26 | 3.26 | 1 |
| <i>similis</i> | 1.10 | 1.10 | 1 | 1.53 | 1.53 | 1 | 3.26 | 3.26 | 1 |
| <i>sinicus</i> | 1.04—1.14 | 1.10 | 7 | 1.91—2.05 | 2.00 | 7 | 2.74—2.98 | 2.85 | 7 |
| <i>thoracicus</i> | 0.83 | 0.83 | 1 | 1.41 | 1.41 | 1 | 2.42 | 2.42 | 1 |
| <i>tuberculatus</i> | 1.15—1.27 | 1.24 | 9 | 1.47—1.61 | 1.56 | 9 | 3.04—3.22 | 3.13 | 12 |

- brown, in some places with brown spots. 7th laterotergite trapezoidal (fig. 142) *furcatus*
- 11 (10) The tuft of hairs on the 7th ventrite (fig. 199) situated on hardly discernible non-produced tubercle, the hairs very sparse. Parandria (fig. 218) more slender and shorter, as long as one third of the distal margin of pygophore. The whole pronotum (exc. collum and posterior margin) black. Membrane black-brown. 7th laterotergite triangular (fig. 153) *similis*
- 12 (7) Males without parandria on pygophore, and without any peculiarities on the 7th ventrite. Females of all species.
- 13 (14) Pronotum with high, conspicuous (sometimes even keel-like) posteromedial tubercle (figs. 299, 130). (Length of body 3.78—4.32 mm, ratio length of body : maximum width of pronotum 3.04—3.22) *tuberculatus*
- 14 (13) Pronotum without posteromedial tubercle, or this hardly recognizably indicated (this tubercle very minute, but always distinct in females of *furcatus* — as in figs. 116, 284; then length of body 4.29—4.65 mm, ratio length of body : maximum width of pronotum 3.22—3.55).
- 15 (18) The dorsal surface of pronotum flattened, pronotum practically non-declivent, its lateral margins very conspicuous (in dorsal view). General appearance (figs. 280, 295) (non-expressible numerically) conspicuously narrow,

- parallel, hemelytra laterally slightly concave, membrane very long. The whole body, including extremities, with very long and dense hairs. (The characters unique for *setosus* or *elongatus* are spaced out.)
- 16 (17) Ratio length of body: maximum width of pronotum = 3.20. Body as long as antennae (ratio 1.00). Veins R and Rs on membrane straight (fig. 295). Metasternum slightly concave. Labium reaching the anterior margin of 3rd abdominal ventrite. Ratio length of body: minimum width of combined hemelytra = 4.31 *setosus*
- 17 (16) Ratio length of body: maximum width of pronotum = 3.85. Body distinctly longer than antennae (ratio 1.17). Veins R and Rs on membrane considerably bent (fig. 280). Metasternum convex. Labium reaching before the middle coxae. Ratio length of body: minimum width of combined hemelytra = 4.65 *elongatus*
- 18 (15) Pronotum vaulted, anteriorly distinctly declivent, without conspicuous lateral margins in dorsal view. General appearance not so elongate and parallel, hemelytra laterally more concave, membrane relatively shorter. Body and extremities not so conspicuously pilose.
- 19 (26) The 7th laterotergite poorly developed, narrowly arch-shaped, not conspicuously protruding either laterally or posteriorly, very finely and rather regularly dentate (figs. 143, 144, 149, 154). Not occurring in W. Himalayas.
- 20 (23) Shorter (length of body 3.12—3.50 mm), but more robust species (figs. 285, 297). Ratio length of body: minimum width of pronotum 2.62—2.98. Ratio length of body: maximum width of combined hemelytra 3.28—3.76. Ratio length of membrane: minimum width of combined hemelytra 1.61—1.80. Distribution: N. Vietnam and continental China.
- 21 (22) Ratio 3rd antennal segment: 2nd antennal segment 1.91—2.05. Body a little longer than antennae (ratio 1.04—1.17). More elongate species (fig. 297) (ratio length of body: maximum width of pronotum 2.74—2.98). Intercoxal space 2—2: 1 ex. The 7th laterotergite wider (fig. 154) *sinicus*
- 22 (21) Ratio 3rd antennal segment: 2nd antennal segment 1.53—1.64. Body a little shorter than antennae (ratio 0.93—0.97). Less elongate species (fig. 285) (ratio length of body: maximum width of pronotum 2.62—2.67). Intercoxal space 2—2: 1 3/4 ex. The 7th laterotergite narrower (fig. 143) ... *inconspicuus*
- 23 (20) Longer (length of body 3.90—4.62 mm), but more slender species (figs. 286, 292). Ratio length of body: maximum width of pronotum 3.10—3.35. Ratio length of body: minimum width of combined hemelytra 3.82—4.33. Ratio length of membrane: minimum width of combined hemelytra 1.87—2.23. Distribution: Taiwan and N. E. Burma.
- 24 (25) The 3rd antennal segment longer (length 1.62—1.89 mm; ratio 3rd antennal segment: 2nd antennal segment 1.53—1.80; ratio 3rd antennal segment: maximum width of pronotum 1.23—1.39). Ratio length of membrane: minimum width of combined hemelytra 1.87—2.13. General ground colour variable, some parts non-contrastingly darkened. Proximal part of pronotal lobe without grooved mediane. The 7th laterotergite more densely dentate (fig. 144). Distribution: Taiwan *idoneus*

- 25 (24) The 3rd antennal segment shorter (length 1.47 mm; ratio 3rd antennal segment: 2nd antennal segment 1.40; ratio 3rd antennal segment: maximum width of pronotum 1.10). Ratio length of membrane: minimum width of combined hemelytra 2.33. General ground colour light brown, some extensive parts very contrastingly darkened. Proximal part of pronotal lobe with shallowly grooved mediane (well visible in posterior view). The 7th laterotergite with less numerous dentes (fig. 149). Distribution: N. E. Burma *nigrescens*
- 26 (19) The 7th laterotergite strongly developed, broadly arch-shaped, or triangularly or trapezoidally protruding, laterally or posteriorly mostly more irregularly and more strongly dentate (figs. 134—140, 142, 145, 146, 150, 151). (The 7th laterotergite rather narrow, very finely and regularly dentate but conspicuously posteriorly protruding in *mishmi* — fig. 148; this laterotergite not very wide, and often rather finely and rather regularly dentate in *flavidipes kumaunensis* — fig. 141, occurring only in W. Himalayas).
- 27 (28) The 7th laterotergite (fig. 148) rather narrow, gradually widened posteriorly, very finely, regularly and densely dentate, conspicuously posteriorly protruding, its posterior margin non-dentate *mishmi*
- 28 (27) The 7th laterotergite of other shape (figs. 134—142, 145, 146, 150, 151).
- 29 (32) Larger species (length of body 4.17—4.65 mm). Pronotum light yellow-brown to brown, with very contrasting and sharply limited black transverse band in callar region (sometimes the posterolateral angles and mid-line are a little non-contrastingly darkened).
- 30 (31) Pronotum more robust and wider (ratio length of body: maximum width of pronotum 2.92—3.06; ratio maximum width of pronotum: width of head 1.81—1.85). Pronotum without any indication of posteromedial tubercle (figs. 124, 293). Smaller species (length of body 4.17—4.32 mm) *nigrofasciatus*
- 31 (30) Pronotum less robust and narrower (ratio length of body: maximum width of pronotum 3.22—3.55; ratio maximum width of pronotum: width of head 1.59—1.75). Pronotum with small, inconspicuous posteromedial tubercle (as in figs. 116, 284). Larger species (length of body 4.29—4.65 mm) *furcatus*, ♀♀
- 32 (29) Smaller species (length of body 2.73—4.14 mm). The ground colour of pronotum variously shaded brown; pronotum unicolours or more or less non-contrastingly darkened (till blackened; mostly on pronotal lobe: some specimens of *flavidipes flavidipes*); the callar region sometimes non-contrastingly darkened (rarely — 1 specimen of *flavidipes asper* — with a sharply limited black transverse band, then also other parts of pronotum blackened, but not sharply limited, and the rusty brown ground colour does not contrast with the black band).
- 33 (34) Membrane relatively long, body rather narrow (fig. 294), ratio length of membrane: minimum width of combined hemelytra 2.11—2.21. Ground colour yellow brown, sometimes with rusty shades. Distribution: N. Burma *pallidus*
[Larger ratio length of membrane: minimum width of combined hemelytra

- (2.11—2.21) distinguishes this species safely from *flavidipes flavidipes* (1.56—1.98) and *insularis* (1.79); smaller ratio maximum width of pronotum: width of head (1.56—1.65) from *flavidipes asper* (1.77—1.94) and *flavidipes kumaunensis* (1.70—1.86); larger ratio 3rd antennal segment: maximum width of pronotum (1.21—1.35) from *indicus* (1.03—1.17)].
- 34 (33) Membrane relatively shorter, body less narrow, ratio length of membrane: minimum width of combined hemelytra 1.56—2.11.
- 35 (36) Distribution: S. India. The posterolateral angles of pronotal lobe mostly strongly dentate (fig. 287). The 6th and 7th laterotergites strongly developed, conspicuously protruding and conspicuously strongly and irregularly dentate (fig. 145) *indicus* [Smaller ratio 3rd antennal segment: maximum width of pronotum (1.03—1.17), shorter antennae — ratio length of body: length of antenna (1.06—1.16) — and longer body (3.60—3.84 mm) distinguish this species safely from *flavidipes flavidipes* (1.23—1.63; 0.79—1.01; 2.79—3.56 mm); more developed and more strongly and irregularly dentate laterotergites from *flavidipes kumaunensis* (fig. 141); smaller width of combined hemelytra (0.90—0.96 mm) from *flavidipes asper* (0.98—1.07 mm); longer membrane (1.74—1.89 mm) from *insularis* (1.53 mm)].
- 36 (35) Not occurring in S. India.
- 37 (40) Distribution: Himalayas.
- 38 (39) The 7th laterotergite less wide and less strongly, but more regularly dentate (fig. 141). Antennae shorter (length of the 2nd segment 0.74—0.87 mm; of the 3rd segment 1.22—1.47 mm; of the whole antenna 2.94—3.42 mm). Distribution: W. Himalayas *flavidipes kumaunensis* [Larger ratio length of body: length of antenna (1.02—1.25) distinguishes this subspecies safely from *flavidipes flavidipes* (0.79—1.01); larger ratio maximum width of pronotum: width of head (1.70—1.86) from *insularis* (1.54)].
- 39 (38) The 7th laterotergite wider, more strongly and more irregularly dentate (fig. 134). Antennae longer (length of the 2nd segment 0.89—1.05 mm; of the 3rd segment 1.56—1.79 mm; of the whole antenna 3.57—4.19 mm). Distribution: E. Himalayas *flavidipes asper* [Longer body (3.72—4.14 mm) and larger ratio maximum width of pronotum: width of head (1.77—1.94) distinguish this subspecies safely both from *flavidipes flavidipes* (2.79—3.56 mm; 1.44—1.71) and from *insularis* (3.27 mm; 1.54)].
- 40 (37) Not occurring in Himalayas.
- 41 (42) Body more shortly pilose. The hairs on the 2nd and 3rd antennal segment sparse, shorter than the diameter of the segment, or at most subequal to it (fig. 201). Not known from Taiwan *flavidipes flavidipes*
- 42 (41) Pilosity longer. The hairs on the 2nd and 3rd antennal segments longer than the diameter of the segment (fig. 200). Distribution: Taiwan .. *insularis*

Key to the males based on the characters of 8th urite, pygophore and gonostyli

- 1 (6) Pygophore with parandria (figs. 202, 210, 218).
- 2 (3) Parandria short, ear-shaped (fig. 202) *auriculatus*
- 3 (2) Parandria long, divergent, fork-like (figs. 210, 218).
- 4 (5) Parandria strong and long, half as long as the distal margin of pygophore (fig. 210). Lateral angle of the 8th urite (in lateral view, fig. 186) obtusely angulate, distant from dorsal elevation, the sublateral margin slightly sinuate. Blade of gonostylus more slender (figs. 245—247) *furcatus*
- 5 (4) Parandria more slender and shorter, as long as one third of the distal margin of pygophore (fig. 218). Lateral angle of 8th urite (in lateral view, fig. 194) rounded, situated closely to dorsal elevation, the sublateral margin deeply semicircularly concave. Blade of gonostylus thicker (figs. 269—271)
..... *similis*
- 6 (1) Pygophore without parandria.
- 7 (18) Lateral angle of 8th urite (in lateral view) posteriorly produced, spinous or truncate (figs. 179, 187, 188, 190, 191, 193); this angle also spinously produced in ventral view (figs. 158, 168, 169, 171, 172, 174).
- 8 (9) Lateral angle of 8th urite (in lateral view) truncate produced, dorsal elevation long, oblong, low truncate (fig. 179). Posterior margin of 8th urite (in ventral view, fig. 158) slightly bisinuate, not at all produced. Gonostylus (figs. 224—226) with conspicuously angular dorsal angle. Pygophore (fig. 203) remarkably long, hypandrium non-distinguishable from the proximal part by any incurvation of lateral outline *dentatus*
- 9 (8) Lateral angle of 8th urite (in lateral view) spinously produced, dorsal elevation sinuate, tuberculate or shortly spinous, never oblong truncate. Posterior margin of 8th urite (in ventral view) at least slightly medially produced, convex or straight. Gonostylus with rounded or indistinctly angulate dorsal angle. Pygophore not remarkably long, hypandrium distinguished from the proximal part by an incurvation of lateral outline; if not, the pygophore remarkably broad (fig. 212).
- 10 (11) The sublateral margin of 8th urite (in lateral view, fig. 188) deeply and uniformly concave, dorsal elevation large, acuteangularly produced. The posterior margin of 8th urite (in ventral view, fig. 169) nearly triangularly produced, without lateral tubercles, the lateral outline feebly convex. Pygophore (fig. 212) conspicuously broad, hypandrium not distinguished from the proximal part in the lateral outline; the distal margin conspicuously undulate. Gonostyli (figs. 251—253) remarkably large, blade very wide proximally, conspicuously pointed, and uniformly and gradually narrowed to the apex *indicus*
- 11 (10) The sublateral margin of 8th urite (in lateral view, figs. 187, 190, 191, 193) at most feebly concave, dorsal elevation at most very slightly spinously prominent. The posterior margin of 8th urite (in ventral view, figs. 168, 171, 172, 174) rounded, convex, the lateral tubercles indicated, or the lateral outline strongly convex. Pygophore (figs. 211, 214, 215, 217) not conspicuously broad, hypandrium distinguished from the proximal part by an incurvation of the lateral outline; the distal margin not conspicuously undulated. Gonostyli (figs. 248—250, 257—262, 266—268) not remarkably

- large, blade proximally more slender and not so gradually narrowed to the apex.
- 12 (13) The sublateral margin of 8th urite (in lateral view, fig. 191) nearly straight, the distance between lateral angle and dorsal elevation shorter than distance between lateral and medial angles. The lateral outline of 8th urite (in ventral view, fig. 172) strongly convex, without any indications of lateral tubercles. Gonostylus (figs. 260—262) with thick and rounded apex, blade practically not pointed *mishmi*
- 13 (12) The sublateral margin of 8th urite (in lateral view, figs. 187, 190, 193) slightly concave and sinuate, lateral angle nearer to dorsal elevation than to medial angle. The lateral outline of 8th urite (in ventral view, figs. 168, 171, 174) not strikingly convex, with indicated lateral tubercles. Gonostylus with thin, more or less pointed apex (figs. 248—250, 257—259, 266—268).
- 14 (15) Hypandrium long and wide, as wide as the proximal part (fig. 217). The sublateral margin of 8th urite (in lateral view, fig. 193) strikingly sloping towards dorsal elevation *pallidus*
- 15 (14) Hypandrium short and narrow, narrower than the proximal part (figs. 211, 214). The sublateral margin of 8th urite (in lateral view, figs. 187, 190) moderately sloping towards dorsal elevation.
- 16 (17) The distal margin of pygophore (fig. 211) distinctly convex, hypandrium distinguished from the proximal part by distinct indentation of the lateral outline. Gonostylus (fig. 248—250) with very slender, long, dorsally uniformly convex, narrow and acutely pointed blade; the apex conspicuously dentate *idoneus*
- 15 (16) The distal margin of pygophore (fig. 214) straight, hypandrium distinguishable from the proximal part by a very shallow incurvation of lateral outline. Gonostylus (figs. 257—259) with moderately long and thick, dorsally curved and apically not remarkably pointed blade; the apex less distinctly dentate *japonicus*
- 18 (7) Lateral angle of the 8th urite (in lateral view) angulate, rounded (until nearly indistinct), never spinously produced (figs. 180—185, 189, 192, 195, 196).
- 19 (22) Blade of gonostylus not markedly narrowed to the apex, practically of the same width throughout, the apex rounded (figs. 254—256, 272—274).
- 20 (21) Lateral angle of 8th urite (in lateral view, fig. 189) rounded, closely situated to dorsal elevation, the sublateral margin deeply semicircularly concave. The 8th urite (in ventral view, fig. 170) without lateral tubercles. *insularis*
- 21 (20) Lateral angle of 8th urite (in lateral view, fig. 195) obtusely angulate, very distant from dorsal elevation, the sublateral margin nearly straight. The 8th urite (in ventral view, fig. 176) with dentate lateral tubercles. *sinicus*
- 22 (19) Blade of gonostylus distinctly narrowed to the apex, more or less pointed (figs. 227—244, 263—265, 275—277).
- 23 (24) Dorsal elevation of 8th urite (in lateral view, fig. 180) spinously hook-like, very conspicuous. The distal margin of pygophore (fig. 204) considerably

- convex, subtriangularly produced, hypandrium distinguished from the proximal part by a very small and inconspicuous notch in the lateral outline. Pygophore rather slender. The dorsal and ventral outlines of the blade of gonostylus of the same curvature (figs. 227—229); the margin of shank between the posterior tubercle and dorsal angle remarkably long . *elongatus*
- 24 (23) Dorsal elevation of 8th urite (in lateral view, figs. 181—185, 192, 196) in form of a small tubercle, or angular, or nearly indistinct, never hook-like. The distal margin of pygophore not so much produced, hypandrium distinguished from the proximal part by a feeble but distinct concave incurvation of the lateral outline (figs. 205—209, 220) (if distinguished by a small inconspicuous notch, the pygophore remarkably broad — fig. 216). The blade of gonostylus with different dorsal and ventral curvatures (figs. 230—244, 263—265, 275—277), the margin of shank between the posterior tubercle and dorsal angle much shorter and more curved.
- 25 (26) Lateral angle of the 8th urite (in lateral view, figs. 182—184) indistinct, in form of a very long, feebly convex tubercle — the direction of curvature of the outline of this segment is not changed essentially at this place. *flavidipes flavidipes*
- 26 (25) Lateral angle of the 8th urite (in lateral view, figs. 181, 185, 192, 196) rounded or subangulate, but very distinct as a point of a radical change of the direction of curvature of the outline.
- 27 (28) Pygophore remarkably broad (fig. 216), its distal margin undulated, hypandrium distinguished from the proximal part by an inconspicuous notch in the lateral outline. A shallow indentation present between the lateral angle and lateral tubercle on the 8th urite (in ventral view, fig. 173). Lateral angle of the 8th urite (in lateral view, fig. 192) nearly at the same level as the dorsal elevation. The anterior tubercle on the shank of gonostylus conspicuously angular (figs. 263—265) *nigrofasciatus*
- 28 (27) Pygophore not remarkably broad (figs. 205, 209, 220), its distal margin not undulated. Hypandrium distinguished from the proximal part by a long shallow incurvation of the lateral outline. No indentation between the lateral angle and lateral tubercle on the 8th urite (in ventral view, figs. 160, 164, 177). Lateral angle of the 8th urite (in lateral view, figs. 181, 185, 196) distinctly more ventral than the dorsal elevation. The anterior tubercle on the shank of gonostylus not markedly angular (figs. 230—232, 242—244, 275—277).
- 29 (30) Dorsal elevation of the 8th urite (in lateral view, fig. 196) in form of 2 tubercles (the proximal one angulate) divided by a concavity . . *tuberculatus*
- 30 (29) Dorsal elevation of the 8th urite (in lateral view, figs. 181, 185) in form of a single angulate tubercle.
- 31 (32) Blade of gonostylus more slender and more pointed (figs. 230—232). Lateral angle of the 8th urite (in lateral view) as distant from dorsal elevation as from the medial angle (fig. 181) *flavidipes asper*
- 32 (31) Blade of gonostylus thicker and less pointed (figs. 242—244). Lateral angle of the 8th urite (in lateral view) nearer to the dorsal elevation than to medial angle (fig. 185) *flavidipes kumaunensis*

Since sexual dimorphism (except the presence of processes on 7th ventrite in males of some species) does not appear in external morphology and biometrical patterns of Malcinae, it is highly probable that as yet unknown females of *Malcus dentatus*, n. sp., *M. elongatus*, n. sp., *M. insularis*, n. sp. and *M. mishmi*, n. sp., and the unknown males of *M. inconspicuus*, n. sp., *M. nigrescens*, n. sp., *M. setosus*, n. sp. and *M. thoracicus*, n. sp. would fit the key based on external characters, provided that the males have no peculiar characters on the 7th ventrite and no parandria. This however, can be expected only in *Malcus nigrescens*, n. sp.

The as yet unknown females of *Malcus auriculatus*, n. sp. and *M. similis*, n. sp. would run under the couplet 29 of the key according to their size, but not exactly according to their colouring of pronotum. Both species would then fit the key characters of females of *Malcus furcatus*, n. sp. (couplet 31); *Malcus similis* n. sp. could be easily distinguished according to the colouring of pronotum, but the females of *M. furcatus*, n. sp. and *M. auriculatus*, n. sp. will be probably extraordinarily similar.

e) Descriptive part

Remarks

Practically all material of Malcinae known to me has been borrowed and studied, only some material from islands inhabited only by *Malcus flavidipes flavidipes* Stål was not desired. Nearly all published material has been studied (again excepting some specimens of *Malcus flavidipes flavidipes* Stål undoubtedly correctly identified). Published and doubtfully identified material which could not be examined is discussed under the respective species.

Since many new characters were used, many expressions in descriptions have their special meaning, and many figures were made from a specified standard view, the consultation of the chapter Systematic characters and Biometrics is strongly recommended before using the descriptions and keys. The data given in biometrical tables should be considered as integral parts of the descriptions of all taxa.

The Times Atlas (Bartholomew 1958, 1959) was used for the spelling of the localities. When not found there, the Andrees Allgemeiner Handatlas (Scobel 1899) was used. Some other sources of information on the localities are mentioned in descriptions. In less known places the geographical coordinates are always given. The localities are cited, as follows:

1. The geographical name used without any special punctuation (see below) is the correct name of the locality.
2. (.) indicates spelling on locality label, if different from the name considered as correct.
3. " " = unidentified locality, or unintelligible remark on the label.
4. (? " ") means alternative possibility of reading of a poorly legible hand-written locality.
5. [.] = any explanation (not present on the original label — as geographical coordinates, other well known spelling, etc.)
6. The data written in the Cyrillic alphabet are transliterated according to Almasov and Boltovskoy (1955).

7. The following abbreviations are used for the collections preserving the respective specimens: BM = Department of Entomology, British Museum, London; DEI = Deutsches Entomologisches Institut, Berlin; JAS = J. A. Slater, University of Connecticut, Storrs; KU = Entomological Laboratory of Kyushu University, Fukuoka; MGA = Muzeul de Istorie Naturală "Grigore Antipa", București; MNHN = Museum National d'Histoire Naturelle, Paris; MNM = Magyar Nemzeti Múzeum, Természettudományi Múzeum, Budapest; NR = Naturhistoriske Riksmuseet, Stockholm; PŠ = P. Štys, Department of Systematic Zoology, Charles University, Praha; RLU = R. L. Usinger, University of California, Berkeley; ZI = Zoologicheskij Institut AN SSSR, Leningrad.

Each examined species has been provided with author's identification label and with the labels Holotype, Allotype, Paratype and Homotype (in cases of *Malcus flavidipes flavidipes* Stål and *M. idoneus* Horv., which were compared with original types). On each label the specimen number of the author's record is mentioned; this number is also recorded in the review of material in descriptions and in the figures pertaining to the systematic part of this paper. The genitalia of examined males (8th urite, pygophore, gonostyli) were mounted on a strip of celluloid in a drop of Canada balsam, and pinned under the respective specimens.

1. *Malcus auriculatus*, n. sp.

(Figs. 110, 131, 157, 178, 190, 202, 221—223, 278)

Derivatio nominis: auricula, lat. = small ear (named according to the shape of pygophore).

Holotype: ♂ (no. 103), N. E. Burma, Kambaiti [Lat. N. 25.25, Long. E. 98.06], Alt. 7000 ft., 22. 3. 1934, lgt. R. Malaise (coll. BM). The genitalia mounted separately.

Description. Large, not very robust, subparallel, conspicuously shiny species.

General ground colour brown. The 1st and 4th antennal segments, head, callar region of pronotum, mid-line in the anterior half of pronotal lobe, scutellum and corial tubercle are contrastingly black. Claval commissure black-brown. The medial part of corium dark brown, the anterior and posterior parts light olive-brown. Membrane silvery brownish, with indistinctly limited and brown medium-sized spots tending to confluence. Legs and light parts of antennae stramineous.

Pilosity: The 2nd and 3rd antennal segments with moderately dense oblique hairs, their length equal to (on the base of the 2nd segment) or longer (on the end of 3rd) than the diameter of segment. Head, pronotum, scutellum and hemelytra without erect hairs.

The 1st antennal segment long, thin, inconspicuously narrower distally, with a straight inner margin.

Pronotum (fig. 278) rather strongly declivent, not very robust. The callar region convex laterally, its dorsal surface convex posterolaterally, its discal part rather flat, but with a rampart-like median. Lateral margin of callar region with 1 small proximal tooth. Pronotal lobe with a rather plastic relief, its

lateral margin with 6 medium-sized teeth. Posterorateral tubercles distinct, rather narrow, longitudinal, posteriorly connected by an indistinct transverse keel. Disc slightly convex anteriorly, flat posteriorly. Median distinct, anteriorly slightly concave, posteriorly slightly rampart-like, ending in a very slightly elevated and not distinctly demarcated posteromedial tubercle.

Posterior pronotal outline (fig. 110): medially distinctly elevated and slightly angulate, the poorly elevated posterolateral tubercles are recognizable.

Thoracic sterna: both meso- and metasternum slightly concave. Intercostal spaces: 2—2 = $1\frac{1}{4}$ cx; 3—3 = $\frac{3}{4}$ cx; 2—3 = $\frac{3}{4}$ cx.

Labium reaching between the middle coxae.

Membrane large, considerably surpassing the tip of abdomen.

Laterotergites (fig. 131): the 5th strongly dentate, but narrow. The 6th a little hook-like, considerably produced, sharply dentate. The 7th more or less trapezoidal, widest in the middle of its length; the anterior margin finely and regularly dentate, the lateral margin more sparsely, more acutely and more strongly dentate, the posterior margin slightly concave, non-dentate.

The 7th ventrite, ♂ (fig. 198): with very slightly elevated and flattened, but large, paired processes, situated submedially in anterior $\frac{2}{3}$ of the segment, and extremely densely covered with strong, adpressed, straight hairs, which are directed ventro-posteriorly.

The 8th urite, ♂: ventral view (fig. 157): medial angle distinctly produced but rounded, lateral angles subangulately rounded, lateral tubercles distinct, finely dentate. Lateral view (fig. 178): medial angle produced, acutangulate, lateral angle obtusely angulate, dorsal elevation short spine-shaped, sublateral margin straight.

Pygophore (fig. 202) very large and robust, with ear-shaped subdentate parandria. Hypandrium oblong, distal margin very feebly convex, with some small lateral dentes.

Gonostyli as in figs. 221—223. Shank rather wide at level of the posterior tubercle, with angular anterior tubercle.

Differential diagnosis. *Malcus auriculatus* is biometrically and in external morphology similar to *M. furcatus*, *M. similis*, *M. mishmi* and *M. nigrescens*, but it differs from all species by male sexual characters. It differs profoundly from *M. mishmi* and *M. nigrescens* (and in a lesser degree from *M. similis*) by shape of the 7th laterotergite, and from these species and *M. similis* by a relatively light pronotum combined with black transverse band in callar region. *M. auriculatus* agrees in this character with *M. furcatus* (the females of both species are probably only slightly different) and *M. nigrofasciatus*; the species is smaller, has wider and more robust pronotum, and quite different latter male genitalia.

2. *Malcus dentatus*, n. sp.

(Figs. 111, 132, 158, 179, 203, 224—226, 279)

Derivatio nominis: *dentatus*, lat. = toothed (named according to the shape of pronotum).

Holotype: ♂ (no. 100), S. W. Thai, Biserat [Lat. N. 6. 35, Long. E. 101. 12 — according to information by Dr China], 24. 10. 1901 (coll. BM). Poorly

preserved, originally pinned specimen, with both 4th antennal segments missing and damaged posteromedial part of pronotum. Genitalia are mounted separately.

Description. Medium-sized, elongate, finely built species, with conspicuous posterolateral pronotal tubercles. Moderately shiny.

General ground colour yellow-brown. Dark parts of antennae, head, callar region of pronotum, the swollen posterolateral pronotal tubercles and scutellum light red-brown. Corial tubercles blackish. Membrane grey-brown, with irregularly distributed small, irregular dark brown spots, and with a milky spot behind the corial tubercle. Legs and light parts of antennae stramineous.

Pilosity: The 2nd and 3rd antennal segments with very dense, short, oblique hairs, shorter than the diameter of segment (subequal on the distal end of 3rd segment). Head and anterior part of pronotum with dispersed erect hairs about the length of longitudinal diameter of eye. Hemelytra without erect hairs.

The 1st antennal segment conspicuously long, thin, cylindrical, its inner margin only very feebly convex.

Pronotum (fig. 279) moderately declivent, not very robust, but very wide if also lateral teeth are taken in account. The callar region indistinctly limited anteriorly as well as posteriorly, and slightly convex both laterally and dorsally; the cicatrical impressions very narrow. Lateral margin of callar region finely dentate. Pronotal lobe comparatively small, with large and sharply limited wart-like posterolateral tubercles having 3 large, strongly protruding teeth. The lateral margin of pronotal lobe with 2 moderately large teeth before the tubercle and 1 behind it. The disc rather flat, median not very distinct, ending by a posteromedial tubercle. Posterior lobuli very feebly developed.

Posterior pronotal outline (fig. 111): medial tubercle distinctly elevated, intertubercular lines concave, posterolateral tubercles large, strongly convex, lateral teeth long and acute, the lateral margins sloping under a very acute angle.

Thoracic sterna: both meso- and metasternum shallowly concave. Intercoxal spaces: 2—2 = $1\frac{1}{2}$ cx; 3—3 = less than 1 cx; 2—3 = $\frac{1}{2}$ cx.

Labium reaching the bases of hind coxae.

Membrane only very slightly surpassing the tip of abdomen.

Laterotergites (fig. 132): The 5th and 6th linear, non-produced, their widened parts minute, with only 3—4 small teeth. The 7th narrowly bow-shaped, widest in $\frac{4}{5}$ of its length, regularly and finely dentate; the anterior margin with stronger and more acute teeth, the lateral margin with finer and denser teeth, the teeth of posterior margin less distinct.

The abdomen conspicuously bent ventrally.

The 7th ventrite of male without particularities.

The 8th urite, ♂: ventral view (fig. 158): posterior margin slightly bisinuate, medial angle not developed, lateral angles spinously produced, but obliquely truncate, lateral tubercles not developed. Lateral view (fig. 179): medial angle non-produced, nearly rectangular, lateral angle produced, truncate dorsal elevation in form of low, wide, oblong, truncate process, the sublateral margin deeply concave.

Pygophore (fig. 203) rather elongate, without parandria, distal margin slightly concave medially, hypandrium rather long, distinguished from the proximal part by the point of maximal convexity of lateral outline.

Gonostyli as in figs. 224—226. Dorsal angle conspicuous, angular. Shank very wide at level of posterior tubercle.

Differential diagnosis. The shape of genitalia distinguishes this species safely from all other Malcinae. The conspicuous dentate posterolateral pronotal tubercles are comparable with *M. thoracicus* only; they are, however, more developed and of different shape in the latter species; both species differ also by many characters mentioned in the key. Long antennae of *M. dentatus*, distinctly longer than the body, relate this species to *M. flavidipes flavidipes*—both taxa have, however, otherwise nothing in common.

3. *Malcus elongatus*, n. sp.

(Figs. 112, 133, 159, 180, 204, 227—229, 280.)

Derivatio nominis: from longus, lat. = long (named according to elongate appearance).

Holotype: ♂ (no. 76), N. E. Burma, Sadon [Lat. N. 25. 21, Long. E. 97.54], 17. 3. 1934, lgt. R. Malaise (coll. BM). The right 3rd and 4th antennal segments are missing, genitalia are mounted separately.

Description. Medium-sized, conspicuously narrow, flat and elongate species, with strikingly flat pronotum. Moderately shiny.

General ground colour light yellow-brown, in some places with reddish shades. The 1st antennal segment of the ground colour, the 4th black. Anterior margin of collum, the very lateral margins of pronotum and medial part of corium slightly darkened. Corial tubercles pitchy brown. Membrane light brownish, with large blackish (anteriorly) or brown (posteriorly), spots tending to confluence and not sharply limited and with silvery shade on the base. Legs and light parts of antennae stramineous.

Pilosity: The 2nd and 3rd antennal segments densely pilose, the hairs on the base of 2nd segment about $1\frac{1}{2}$ times as long as the diameter of segment, the more distal hairs are shorter, on the distal end of 3rd segment slightly shorter than the diameter of the segment. Head with some erect hairs much longer than length of eye. Pronotum with erect setae longer than length of eye on collum and in callar region, some erect setae on the disc are subequal to or shorter than eye length. Erect setae of the lateral pronotal margins situated on small tubercles, anteriorly longer, posteriorly subequal to eye length. Scutellum with erect setae slightly longer than eye length, the inner margin of corium with a row of erect setae subequal to eye length.

The 1st antennal segment strikingly long and thin, the whole segment slightly externally bent.

Pronotum (fig. 280) very feebly declivent, practically quite flat, with conspicuously distinct lateral margins—these without true teeth, but with 9—10 minute, seta-bearing tubercles. Collum very distinct, sharply limited from callar region and conspicuously margined anteriorly. Callar region posteriorly not divided from pronotal lobe; laterally only feebly convex, medially slightly concave. Pronotal lobe without indications of any tubercles, the disc

quite flat, the extreme hind margin only gradually declivent, posterior lobuli very minute. Median distinct, but not elevated.

Posterior pronotal outline (fig. 112): feebly convex, slightly tuberculate, laterally not sharply limited, the teeth very small. Without any indications of posterolateral or posteromedial tubercles.

Thoracic sterna: mesosternum shallowly concave, metasternum wide and convex. Intercoxal spaces: 2—2 = 2 cx; 3—3 = 1 cx; 2—3 = 1 cx.

Labium reaching slightly before the middle coxae.

Membrane (fig. 280) long, narrow, distinctly surpassing the tip of abdomen. Veins R and Rs markedly bent inwards.

Laterotergites (fig. 133): The 5th and 6th minute, the widened part of 5th practically undeveloped, that of the 6th represented by a small tubercle. The 7th strikingly large, widest at $\frac{3}{4}$ of its length, strikingly posteriorly protruding; the anterior and lateral margins sharply, strongly and sparsely dentate, the posterior margin concave, without teeth.

The 7th ventrite of male without particularities.

The 8th urite, ♂: ventral view (fig. 159): posterior margin simply uniformly rounded, without medial angle, lateral angles subangulate, without lateral tubercles. Lateral view (fig. 180): medial angle feebly produced, lateral angle rounded, dorsal elevation large, sharply hook-like.

Pygophore (fig. 204) very small, without parandria, distal margin rather convex, subtriangularly produced, hypandrium distinguished from the proximal part by a small notch in the lateral outline.

Gonostyli as in figs. 227—229. Blade straight but pointed, its dorsal and ventral outlines identical, apex practically non-dentate. The margin of shank between the dorsal angle and posterior tubercle very long and straight. The general appearance of gonostylus rounded.

Differential diagnosis. The elongate, narrow and flat appearance, and the dense and long pubescence distinguish this species at first glance from all other Malcinae excepting *M. setosus*. The latter species differs profoundly from *M. elongatus* by the shape of laterotergites and by the characters mentioned in the key. *Malcus elongatus* is the only species of Malcinae having the dorsal elevation of the 8th urite conspicuously hook-like and having convex metasternum; also the general shape of gonostylus is quite peculiar.

4. *Malcus flavidipes* Stål, 1859

The nominate subspecies, *Malcus flavidipes asper*, n. subsp. and *M. flavidipes kumaunensis*, n. subsp. are included in this taxon. All 3 subspecies are allopatric and no intermediate forms are known. The differences between these taxa in external morphology are distinct, and although they are smaller than between the majority of Malcus-species, they are, nevertheless, not conspicuously less marked than among such species as *M. indicus*, n. sp., *M. insularis*, n. sp., *M. nigrofasciatus*, n. sp. and *M. pallidus*, n. sp. The reason of giving them only a subspecific rank is that they are not only very similar in external morphology and biometrical patterns, but that they have also very similar genitalia, and that in the continental specimens of *M. flavidipes flavidipes* Stål such clines occur, which link the nominate subspecies to other

subspecies. A single other species, *M. nigrofasciatus*, n. sp., does not differ essentially from *M. flavidipes* Stål either in external morphology or in genital characters, but it occurs sympatrically with *M. flavidipes asper*, n. subsp. It is probable that after filling the gaps in distribution of *Malcus flavidipes* Stål, the intermediate forms between its subspecies will be found.

Since this polytypic species is very variable, all 3 subspecies are considered separately, and here only a review of characters distinguishing in their combination *Malcus flavidipes* Stål from any other species is given:

Pronotum not flattened, without posteromedial tubercle, at most with inconspicuous posterolateral tubercles, without contrasting black band in callar region. Abdominal laterotergites not markedly reduced. Pygophore without parandria. Lateral angle of 8th male urite (in lateral view) without spinous projection, rounded, dorsal elevation inconspicuous, sublateral margin not conspicuously concave. Blade of gonostylus narrowed apically, more or less pointed.

4a. *Malcus flavidipes asper*, n. subsp.

(Figs. 113, 134, 160, 181, 205, 230—232, 281.)

Derivatio nominis: asper, lat. = rough (named according to appearance of pronotum).

Holotype: ♂ (no. 68), India, N. W. Bengal, Darjeeling [Lat. N. 27. 02, Long. E. 88.20], "Gopaldhara", Alt. 3440—4720 ft., 9.9. 1917, lgt. H. Stevens (coll. BM). The left fore wing, the right antenna and the right membrane are missing, the genitalia are mounted separately. (This badly damaged specimen had to be selected as a holotype, since it was the only male with antenna and exact locality.)

Allotype: ♀ (no. 13), Sikkim, "Singhik", Alt. 5000 ft., 24. 4. 1924, lgt. Maj. R. W. Higgins, Everest Exp. Brit. Mus. 1924—386 (coll. BM). The right middle tarsus is missing.

Paratype: ♂ (no. 70), the same data as the holotype, 13. 9. 1917 (coll. PŠ).

Other examined material: 6 specimens (no. 62, 72, 125—128, coll. BM and PŠ) with dates "29-7-18" (1 ♂), "V-18" (1 ♂) and "9-8-18" (4 ♀♀) are due to lack of exact locality not considered as paratypes.

In total 9 specimens were examined.

Distribution. East Himalaya in India and Sikkim. Undoubtedly more widely distributed, the geographic relations of this subspecies to West Himalayan *Malcus flavidipes kumaunensis* (nearest locality about 900 km westward) and to the nominal subspecies (nearest known locality — Margherita — about 750 km eastward) are yet to be investigated.

Description. Medium-sized, little elongate and rather robust subspecies. Nearly dull to moderately shiny.

General ground colour brown, with more or less expressed rusty shade. 4th antennal segment black, the 1st rusty to rusty black, head rusty, sometimes with some parts black-brown to black, or head entirely black. Scutellum rusty black-brown to black, corial tubercle black. Pronotum mostly rusty with darkened (rufous, dark brown, black-brown, black) callar region, and mostly

with darkened (dark brown, rusty black, black-brown) posterolateral angles and surrounding areas, sometimes also with darkened mid-line. The darkened regions are not sharply limited and do not contrast with other parts of pronotum (in 1 case the black colour of callar region sharply limited, but not contrasting). Corium with slightly lighter anterior and posterior parts of costal margin, and sometimes with slightly blackened medial part. Membrane silvery-grey with brownish shade and piceous spots; tending to confluence sometimes nearly entire membrane dark piceous, with silvery anterior and hind margins and with some silvery spots. Legs and light parts of antennae stramineous to darkish dirty yellow.

Pilosity: The 2nd and 3rd antennal segments with sparse oblique hairs slightly longer than the diameter of the segment. Head and anterior part of pronotum with few erect hairs, approximately as long as the length of eye. Hemelytra without erect hairs.

The 1st antennal segment long, slender, its inner margin uniformly convex.

Pronotum (fig. 281) very heavily built, moderately declivent, and of very rough appearance. Callar region slightly convex dorsally, distinctly laterally, conspicuously well limited. Pronotal lobe without median, or this slightly indicated anteriorly — the respective parts always slightly concave. The posterolateral tubercles poorly developed but the pronotal lobe markedly robust and wide at their level. Posterior part of pronotal lobe slightly convex in the middle; lateral margins with 2—4 smaller anterior and 3—4 larger posterior small teeth.

Posterior pronotal outline (fig. 113): posterolateral tubercles slightly indicated, intertubercular lines nearly straight, meeting in the middle under a distinct angle.

Thoracic sterna: both meso- and metasternum slightly concave. Intercoxal spaces: 2—2 = $1\frac{1}{4}$ cx; 3—3 = 1 cx; 2—3 = 1 cx.

Labium reaching slightly behind the middle coxae.

Membrane slightly surpassing the tip of abdomen.

Laterotergites (fig. 134): The 5th finely and regularly dentate, moderately produced. The 6th strongly posteriorly produced, rather hook-like. The 7th strongly laterally protruding, more or less triangular, widest at $\frac{2}{5}$ of its length; teeth strong, moderately dense, lobe-like.

The 7th ventrite of male without particularities.

The 8th urite, ♂: ventral view (fig. 160): medial angle slightly produced, rounded, lateral angles conspicuously angulate, non-produced, lateral tubercles feebly indicated by a scarcely distinct tooth. Lateral view (fig. 181): medial angle not produced, lateral angle widely rounded, dorsal elevation in form of an obtusely angular tubercle.

Pygophore (fig. 205) small, without parandria, distal margin moderately convex, hypandrium short, divided from strikingly convex (nearly subangular) proximal part by a shallow incurvation of the lateral outline.

Gonostyli as in figs. 230—232. Blade long, rather straight (exc. the apex) and conspicuously pointed. General appearance of gonostylus rounded.

Differential diagnosis. *Malcus flavidipes asper* differs from similar taxa by large and robust size and by very rough appearance of pronotum. It

differs from *M. flavidipes kumaunensis* by a set of characters mentioned in key. *M. flavidipes asper* differs from *M. flavidipes flavidipes* and *M. insularis* by longer body (3.72—4.14 mm X 2.79—3.56 mm X 3.27 mm), by longer membrane (1.89—2.04 mm X 1.26—1.73 mm X 1.53 mm), by wider pronotum (1.31—1.46 mm X 0.99—1.26 mm X 1.11 mm) and by larger minimum width of combined hemelytra (0.98—1.07 mm X 0.75—0.95 X 0.85 mm). It is further well distinguished from the southern populations of *M. flavidipes flavidipes* by invariably relatively shorter antennae and by indicated posterolateral pronotal tubercles. *M. flavidipes asper* differs from *M. pallidus* by longer 3rd antennal segment (1.56—1.79 mm X 1.38—1.53 mm), by larger maximum width of pronotum (1.31—1.46 mm X 1.38—1.53 mm), by larger minimum width of combined hemelytra (0.98—1.07 mm X 0.84—0.92 mm), by smaller ratio length of membrane: minimum width of combined hemelytra (1.90—2.08 X 2.11—2.21), by larger ratio of maximum width of pronotum: width of head (1.77—1.94 X 1.56—1.65) and by smaller ratio of length of body: maximum width of pronotum (2.72—2.96 X 3.11—3.27). *M. flavidipes asper* differs from *M. indicus* by smaller ratio of length of body: length of antenna (0.96—1.04 X 1.06—1.16), by longer membrane (1.89—2.04 mm X 1.74—1.89 mm), by longer 3rd antennal segment (1.56—1.79 mm X 1.28—1.53 mm) and by larger minimum width of combined hemelytra (0.98—1.07 mm X 0.90—0.96 mm).

The genitalia of *M. flavidipes asper* differ profoundly from those of *M. pallidus* and *M. indicus* by lack of spinous projection of lateral angle of 8th urite, and from *M. insularis* by different shape of sublateral margin of 8th urite, by more distant lateral elevation and lateral angle (in lateral view), and by a quite different shape of gonostylus. The differences between the genitalia of *M. flavidipes asper* and other subspecies are apparent from the key; they are slight as to *M. flavidipes kumaunensis*, but well marked regarding the nominate subspecies.

M. flavidipes asper may superficially resemble *M. nigrofasciatus*, but both taxa differ not only in size, colouring and genital characters mentioned in the key, but also in some biometrical characters and appearance of pronotum.

4b. *Malcus flavidipes flavidipes* Stål, 1859

(Figs. 114, 135—140, 161—163, 182—184, 206—208, 233—241, 281)

Malcus flavidipes Stål, 1859: 242, Pl. III, figs. 2a, 2b.

Malcus flavidipes: Lethierry and Severin 1894: 175; Distant 1901: 473; Distant 1904a: 33, fig. 22 part. (not the specimen from Karennee); Breddin 1907: 41, fig. 2; Banks 1909: 573; Distant 1910: 32; Horváth 1914: 636; Bergroth 1918: 66; Esaki 1926: 161; Ishihara and Hasegawa 1941: 106, 107; Slater and Hurlbutt 1957: 72, fig. 5 (p. 77); Ashlock 1957: 421; Scudder 1963: 14.

Malcus flavidipes flavidipes: Štys 1963: 213.

Malcus flavidipes Stål var.?: Breddin 1899: 173; Ishihara and Hasegawa 1941: 107.

Malcus scutellata (sic!) Distant, 1901: 473. **New Synonym.**

Malcus scutellatus: Distant 1904a: 33 part. (not the specimens from Shillong and Kurseong); Breddin 1907: 41; Distant 1910: 32; Ishihara and Hasegawa 1941: 106, 107 part. (only the reference from Ceylon.)

Erroneous references:

Malcus flavidipes: Distant 1904a: 33 part. (specimen from Karennee) = *Malcus setosus*, n. sp.

- Malcus scutellatus*: Distant 1904a: 33 part. (specimens from Kurseong) = *Malcus nigrofasciatus*, n. sp.
Malcus scutellatus: Distant 1904a: 33 part. (specimens from Shillong) = *Malcus tuberculatus*, n. sp.
Malcus scutellatus: Horváth 1914: 636 part. (specimens from Kulu) = *Malcus flavidipes kumaunensis*, n. subsp.
Malcus scutellatus: Horváth 1914: 636 part. (specimens from Trichinopoly) = *Malcus indicus*, n. sp.
Malcus scutellatus: Esaki 1922: 59; 1926: 161; 1932: 1621, fig. 3202; Kato 1933: pl. 30, phot. 3 = ? *Malcus insularis*, n. sp.
Malcus scutellatus: Ishihara and Hasegawa 1941: 107 part. (reference from Formosa) = ? *Malcus insularis*, n. sp.
Malcus scutellatus: Ishihara and Hasegawa 1941: 107 part. (reference from India) = *Malcus indicus*, n. sp. and *M. flavidipes kumaunensis*, n. subsp.
Malcus scutellatus: Ishihara and Hasegawa 1941: 107 part. (reference from Assam) = *Malcus tuberculatus*, n. sp.
Malcus scutellatus: Ishihara and Hasegawa 1941: 107 part. (reference from Sikkim) = ? *Malcus nigrofasciatus*, n. sp.

Holotype: ♀ (no. 41), Indonesia, Java, "Kinb." (coll. NR). The left 4th antennal segment missing, pinned specimen, bearing a hand-written label "*flavidipes* Stål" and a printed red label "Typus", undoubtedly the original Stål specimen.

Allotype: ♂ (no. 134), Indonesia, Java, Banjuwangi (= Banjoewangi) [Lat. S. 8. 12, Long. E. 114. 22], lgt. Lucht (coll. ZI). The genitalia are mounted separately. No allotype has been as yet designated for this species. Since Stål described *Malcus flavidipes* apparently from the holotype only (the male in his collection—see the paragraph "Origin unknown" below — has an unidentifiable locality label, and is probably of later origin), the allotype had been selected from other material. By this designation also the terra typica is specified.

Other materials examined:

Indonesia: Java: 3 ♀♀ (no. 40, 192, 193), "Ostabh." (coll. MNM and MGA); 1 ♀ (no. 186), lgt. Biró (coll. MNM); Sumatra: 1 ♂ (no. 161), Medan [Lat. N. 3. 35, Long. E. 98. 39], lgt. Corporaal (coll. BM); 1 ♂ and 2 ♀♀ (no. 10, 11, 154), Bukittinggi (= Fort de Kock) [Lat. S. 0. 18, Long. E. 100. 20], 920 m, lgt. E. Jacobson (coll. BM and PŠ); 1 ♂ (no. 149), the same data, 4. 1921 (coll. BM); Borneo: 1 ♂ (No. 43), Banggi (= Banguay) [an island northward from Borneo], coll. Breddin (coll. DEI); Lombok: 1 ♀ (no. 46), "Sapit", Alt. 2000 ft., 4. 1896, lgt. H. Fruhstorfer, coll. Breddin (coll. DEI) — the specimen described as "*Malcus flavidipes* Stål var.?" by Breddin (1899).

Pronotum (fig. 282) rather wide, moderately swollen. Callar region slightly convex laterally and very little dorsally, the lateral margin nearly smooth, only with approx. 2 tubercles. Pronotal lobe slightly convex or slightly flattened, without median, or with its slight sculptural indication Lateral margins with 4—6 small teeth. Without any indications of posterolateral tubercles in specimens from Indonesia, Philippines, Malaya and Ceylon, these tubercles slightly indicated in specimens from Assam, Laos and Hainan, and in some specimens from N. Vietnam.

Posterior pronotal outline (fig. 114) slightly convex, without any indica-

tions of posterolateral and posteromedial tubercles, the lateral parts rounded, the teeth very small.

Thoracic sterna: both meso- and metasternum slightly concave. Intercoxal spaces: 2—2 = about $1\frac{1}{4}$ cx; 3—3 = 1 cx; 2—3 = $\frac{2}{5}$ cx.

Labium reaching minimally between the middle coxae, maximally between the hind coxae (a specimen from Laos).

Membrane slightly surpassing the tip of abdomen. Sc often markedly more weakly developed than other veins.

Laterotergites (figs. 145—140) rather variable in shape and the number and form of teeth, these generally very irregular, rather regular in specimens from Laos only. The 5th and 6th laterotergites conspicuously protruding, with large teeth; the most posterior tooth always the largest and mostly posteriorly (rarely laterally) directed — then the laterotergite hook-like. The 7th laterotergite large, strongly laterally protruding, trapezoidal or triangular, widest in $\frac{1}{4}$ to $\frac{1}{2}$ of its length, conspicuously irregularly and strongly dentate (exc. Laos specimens); the anterior margin with small inconspicuous teeth, lateral margin with variable number (2—5) of conspicuously protruding, large irregular teeth, the posterior margin moderately long to very short and inconspicuous, mostly concave and mostly with 1 inconspicuous small dens.

The 7th ventrite of male without particularities.

The 8th ventrite, ♂: ventral view (figs. 161—163): Posterior margin slightly and uniformly convex, or the medial angle slightly produced, rounded or subangular, in latter case both parts of posterior margin nearly straight. Lateral angles subangular, without lateral tubercles. Lateral view (figs. 182—184): medial angle slightly produced, moderately acuteangular, lateral angle indistinct, rounded, very long and low, dorsal elevation variously tuberculate.

Pygophore (figs. 206—208) small to moderately large, without parandria, distal margin slightly convex to nearly straight, undulate or simple; hypandrium short or rather long, its lateral margins nearly perpendicular to the distal margin; hypandrium distinguished from proximal part by a short to long incurvation of the lateral outline, or by ist short indentation

Gonostyli as in figs. 233—241, very variable.

Geographical variability. The biometrical patterns of *Malcus flavidipes flavidipes* have the widest rangewithin the whole of the Malcinae. There exist slight biometrical differences between the studied samples from various regions, they are, however, overlapping and concern the mean values only. Since the studied samples were inadequate for exact statistical evaluation, this has had to be postponed until a richer material has been gathered. Unfortunately, especially material from continental Asia, which is most interesting in these respects, is very scarce. Nevertheless, some preliminary observations are worthy of mention.

Whilst the samples from southern islands (Indonesia, Philippines, Ceylon) and from Malaya are rather homogeneous and very different from the other subspecies and species of Malcinae, the continental specimens (and to a certain degree the specimen from Hainan) seem to exhibit some clines linking them morphologically and biometrically to other subspecies of *Malcus flavidipes* Stål and also to other species of the genus. E.g., the posterolateral pronotal

tubercles are lacking in southern specimens, but indicated in specimens from Laos, Assam, Hainan and some from N. Vietnam; some of the continental specimens have relatively shorter antennae and wider pronotum — this results in larger ratio of maximal width of pronotum: width of head (specimens from Vietnam, Tenasserim, Laos — not from Assam and Hainan), in larger ratio length of body: length of antenna (specimens from Tenasserim and Laos), in smaller ratio 3rd antennal segment: maximum width of pronotum (specimens from Tenasserim and Laos), etc. These facts rather complicate the identification of *Malcus flavidipes flavidipes*, but all mentioned deviations are within the limits of infrasubspecific variability, and highly probably of only a clinal nature. Their evolutionary significance is shortly discussed in the chapter Geographical distribution and speciation (p. 508). *Malcus flavidipes flavidipes* is also a taxon with highest variability of genitalia and laterotergites within Malcinae (compare the figures) — the scarcity of continental specimens did not allow the study of their variability with regard to geographical distribution.

Differential diagnosis. The populations of *Malcus flavidipes flavidipes* from Ceylon, Philippines, Indonesia and Malaya are easily distinguishable by the body being distinctly shorter than antennae, shortness of body, well developed and strongly dentate abdominal laterotergites and lack of posterolateral and posteromedial pronotal tubercles. In the respective regions also no other species of Malcinae occur. The discrimination of *M. flavidipes flavidipes* is more difficult, when its morphological and biometrical patterns from the whole range are taken into account.

Malcus flavidipes flavidipes differs from *M. flavidipes asper* by shorter body (2.79—3.56 mm X 3.72—4.14 mm), by shorter membrane (1.26—1.73 X 1.89—2.04 mm), by narrower pronotum (0.99—1.26 X 1.31—1.46 mm) of less rough appearance, by smaller minimum width of combined hemelytra (0.75—0.95 X 0.98—1.07 mm) and by generally relatively longer antennae. *M. flavidipes flavidipes* differs from *M. flavidipes kumaunensis* by more developed, strongly and irregularly dentate abdominal laterotergites, by smaller ratio length of body: length of antenna (0.79—1.01 X 1.02—1.25), mostly by

Philippines: 2 ♀♀ (No. 167, 168), Balabac [an island south of Palawan], coll. Noualhier 1898 (coll. MNHN); 1 ♀ (No. 1), Luzon, Mt. Maquiling [Lat. N. 14.08, Long. E. 121.31], Alt. 50 m, 5. 1. 1949, lgt. G. Crul (coll. JAS); 1 ♀ (No. 4), Luzon, Mt. Banakao (Lat. N. 14.05, Long. E. 121.31), Alt. 2000 ft., 13. 4. 1914, lgt. G. Bötcher (coll. BM); 2 ♂♂ and 1 ♀ (No. 5—7), Luzon, Manila [Lat. N. 14.36, Long. E. 120.59], 3. 11. 1914, or 10. 1913, or no date, lgt. G. Boettcher, Taeuber Coll. (coll. BM and PŠ); 1 ♂ (No. 2), Luzon, Paete (= Paeta) [Lat. N. 12.21, Long. E. 121.30], Taeuber Coll. (coll. BM); 1 ♂ (no. 3), N. Luzon, Lubuagan Alt. 3500 ft., 15. 2. 1917, lgt. G. Böttcher (coll. BM); 2 ♂♂ (no. 48, 49), S. Luzon, Los Banos, lgt. Baker (coll. MNM); 1 ♂ and 1 ♀ (no. 25, 27), the same data, 17. 7. 1936, lgt. R. L. Usinger (coll. RLU); 2 ♀♀ (No. 24, 26), "Balbalin, Kal." [situated in Philippines according to a letter by Dr Usinger] (coll. RLU).

Ceylon: 4 ♂♂, 8 ♀♀, 1 5th stage nymph (no. 65, 87—89, 94, 96, 105, 106, 109, 110, 112, 115, 116), lgt. Green (coll. BM and PŠ); 1 ♂ and 2 ♀♀ (no. 17—19), Peradeniya [Lat. N. 7.16 Long. E. 80.37], 3. 1. 1902, or 5. 1. 1902, or 14. 1.

1902, lgt. Dr Uzel (coll. PŠ); 1 ♀ (no. 45), Kandy [= Mahanuyara, Lat. N. 7. 17, Long E. 80.40], lgt. Horn, coll. Breddin (coll. DEI).

Malaya: 1 ♂, 4 ♀♀ (no. 181—185), Singapore (coll. MNM); 2 ♂♂, 5 ♀♀, 1 5th stage nymph (no. 47, 50, 51, 187—191), Kuala-Lumpur (=Kwala Lumpur) [Lat. N. 3. 08, Long. E. 101. 42], lgt. Biró (coll. MNM and PŠ); 1 ♂ (no. 8), the same data, 12. 8. 1922 (coll. PŠ); 1 ♀ (no. 44), Kelantan (= Kelanton), coll. Breddin (coll. DEI) — abdomen of this specimen is missing and was probably figured by Breddin (1907); 1 ♀ (no. 9), Selangor, "Gombak Valley", 11. 10. 1921 (coll. BM).

Burma: 1 ♂ (no. 152), Tenasserim, "Tenass Val" [? = Tenasserim River Valley], Myitta [approx. Lat. N. 14. 10, Long. E. 98. 31], lgt. Doherty, Distant coll. 1911—383 (coll. BM).

India: 2 ♂♂ (no. 150. 151), Assam, Margherita [Lat. N. 27. 17, Long. E. 95. 40], "9280" or "9294", Distant coll. 1911—383 (coll. BM).

S. Vietnam: 1 ♀ (no. 141), Phu Son (= ? Phuc-son) [= Phuo-Son, S. W. from Tri Binh = Binh Son, Lat. N. 15. 10, Long. E. 108.35], 11. 12, lgt. H. Fruhstorfer, coll. Breddin (coll. DEI).

N. Vietnam: 2 ♂♂ and 2 ♀♀ (no. 59, 73, 79, 84), Hoa Binh (= Hoabinh) [Lat. N. 20. 49, Long E. 105. 20], 8. 1918, lgt. R. V. de Salvaza (coll. BM and PŠ); 1 ♂ (no. 164), the same data, lgt. J. de Cooman, coll. R. Oberthur 1919 (coll. MNHN); 1 ♂ and 1 ♀ (no. 165, 166), Region of Hoa Binh, 1927, or 1928, lgt. A. de Cooman (coll. MNHN); 1 ♀ (no. 162), vicinity of Tuyen Quang (=Tuyen-Quan) [= Tüyen-quang, Lat. N. 21. 48, Long. E. 105. 18], 1901, lgt. A. Weiss (coll. MNHN); 1 ♀ (no. 163), vicinity of Yen Bay (= Yen-Bai) [Lat. N. 21.43, Long. E. 104. 54], 1901, lgt. A. Weiss (coll. MNHN).

Laos: 1 ♀ (no. 85), Lauang (= Luang) Prabang [Lat. N. 19.53, Long. E. 102. 10], "poui Hai Katoui", 6. 4. 1918, lgt. R. V. de Salvaza (coll. BM); 1 ♀ (no. 75), Upper Mekong (=Haut Mékong), 13. 4. 1918, lgt. R. V. de Salvaza (coll. BM).

China: 1 ♂ (no. 20), Hainan, Na-Ta, 17. 1. 1960, lgt. I. Hrdý, (coll. PŠ).

Origin unknown: 1 ♂ (no. 142), "Deban" (?"Dekan"), lgt. Stevens (coll. NR). This specimen is from Stål's collection and the possible reading "Dekan" might, perhaps, cause the erroneous reference of *M. flavidipes* from India by Leithery and Severin (1894).

In total 76 adults and 2 nymphs were examined.

Distribution: Indonesia: Java, Sumatra, Lombok, Banggi nr. Borneo; Philippines: Balabac, Luzon (add Rizal: Montalban [Lat. N. 14. 44, Long E. 121.08] — Banks 1909; "Benguet" and Baguio [Lat. N. 16. 25, Long. E. 120.37] — Bergroth 1918), Palawan ("Iwahig" — Banks 1909); Ceylon; Malaya; Burma: Tenasserim; India: W. Assam; Laos; Cambodja (information by Dr Carayon); S. and N. Vietnam; Hainan. Probably occurring also in Thai, S. W. Burma and on Borneo. The examination of specimens of *Malcus flavidipes* Stål from Himalayas in Bhutan would be of extreme interest, since westwards already *Malcus flavidipes asper*, n. subsp. occurs.

Description: Small, short, but robust species, with rather wide pronotum. Moderately shiny.

Ground colour very variable: ochraceous, yellow-brown, brown with rusty or olivaceous shades. The 4th antennal segment brown to black-brown. The 1st segment of the ground colour, or a little darker (at most dark brown). Head a little to considerably darkened (at most dark brown with blackish shade). Pronotum mostly of the ground colour, or a little darkened, unicolorous, or with slightly and non-contrastingly darker callar region (at most dark rusty brown), rarely with blackened posterior part of pronotal lobe and posterior half of the mid-line. Scutellum dark rusty brown to black-brown. Corial tubercle dark brown to black. The whole corium of ground-colour, or the middle part slightly darkened (at most dark brown), and the posterior and anterior parts slightly lighter. Membrane silvery grey-ochraceous, with several large dark brown, not sharply limited spots (tending to confluence); in case of extreme development of these spots the whole membrane dark brown, only the anterior and posterior margins silvery-brownish, and some indistinct silvery spots present in the middle. Legs and light parts of antennae stramineous to orange-brownish.

Pilosity. The 2nd and 3rd antennal segments with very sparse oblique hairs (fig. 201), shorter (or at most subequal on the distal end of 2nd segment) than diameter of the segment. Head and anterior part of pronotum with some erect hairs, shorter or subequal to the length of eye. Hemelytra without erect hairs.

The 1st antennal segment moderately long, mostly rather thick, very variable in length, width and curvature of its inner margin. smaller ratio maximum width of pronotum: width of head (1.44—1.71 X 1.70—1.86) and by other overlapping biometrical characters. *M. flavidipes flavidipes* differs from *M. pallidus* by less elongate shape, by smaller ratio length of membrane: minimum width of combined hemelytra (1.56—1.98 X 2.11—2.21), by mostly smaller ratio of length of body: minimum width of combined hemelytra (3.45—4.08 X 4.07—4.28), by smaller ratio length of body: maximum width of pronotum (2.62—3.04 X 3.11—3.27) and by smaller length of membrane (1.26—1.73 X 1.77—1.98 mm). *M. flavidipes flavidipes* differs from *M. indicus* by mostly less developed abdominal laterotergites, by smaller ratio of length of body: length of antenna (0.79—1.01 X 1.06—1.16), by larger ratio of 3rd antennal segment: maximum width of pronotum (1.23—1.63 X 1.03—1.17), by shorter body (2.79—3.56 X 3.60—3.84 mm) and by shorter membrane (1.26—1.73 X 1.74—1.89 mm). *Malcus insularis* may be distinguished according to the key characters.

The genitalia of *M. flavidipes flavidipes* are very distinct from *M. indicus* and *M. pallidus* in the lack of spinous projection of the lateral angle of 8th urite, from *M. insularis* by different shape of sublateral margin of this urite (in lateral view), by more distant lateral angle and dorsal elevation, and by quite different shape of the apex of gonostylus. The differences between the subspecies of *Malcus flavidipes* are well apparent from the key.

Remarks on references and synonymy:

a) References to *Malcus flavidipes* Stål

Material published by Distant (1904a) from Margherita and Myitta, Bredin (1907) from Kandy and Horváth (1914) from Kwala-Lumpur was examined;

the material of Banks (1909), Bergroth (1918) and Ashlock (1957) originated from the Philippines, where only *Malcus flavidipes flavidipes* occurs. The references to this species by Distant (1901, 1910), Esaki (1926), Ishihara and Hasegawa (1941) and Lethierry and Severin (1894) are mere recapitulations of previously published data or mere literary quotations of this taxon (as to the reference from India by the Lethierry and Severin see the paragraph Material examined: origin unknown). There is no reason to doubt that also the specimens examined by Slater and Hurlbutt (1957) and Scudder (1963) actually belonged to this species.

b) References to *Malcus flavidipes* Stål var.?

This form, described from Lombok by Breddin (1907) and quoted as a separate form by Ishihara and Hasegawa (1941), is absolutely identical with *M. flavidipes flavidipes* Stål; the original specimen was examined.

c) Identity of *Malcus scutellatus* Distant, 1901.

The holotype of this species has not been examined, but due to detailed observations and measurements made by Dr. China and kindly communicated to me, the identity of this taxon with *Malcus flavidipes flavidipes* Stål is obvious, and the same, however tentative, opinion by Breddin (1907) is proved. Some remarks:

1. The holotype (♂) was described from Ceylon (lgt. G. Lewis, coll. BM); no other type specimens exist.

2. The holotype agrees in the shape of pronotum, pilosity, absolute dimensions and calculated ratios exactly with *Malcus flavidipes flavidipes* Stål (the ratio length of body: length of antenna = 0.87; this itself shows identity of both taxa).

3. All the examined specimens of *Malcus* Stål from Ceylon belong to *Malcus flavidipes flavidipes* Stål, and do not differ from the populations of this subspecies from Indonesia and Philippines.

4. Distant (1901, 1904a) distinguished *Malcus scutellatus* Dist. from *M. flavidipes* Stål by presence of "prominent ochraceous spots" on scutellum and by "pronotum more tumid posteriorly". The first character is without any systematic importance, the degree of development of tomentose spots is dependendent on the state of preservation and, perhaps, age of specimen. The latter character was well observed by Distant, since the specimens from Ceylon differ slightly in vaulting of pronotum from the specimens from Myitta and Margherita (i. e. the only correctly identified specimens of *Malcus flavidipes flavidipes* Stål having been at the disposal of Distant); this difference is, however, of only local population or clinal nature, and, moreover, the Singhalese specimens agree an this character with specimens of *Malcus flavidipes flavidipes* Stål from Indonesia and Philippines.

d) The subsequent references to *Malcus scutallutus* Distant

Distant's (1901) description of *Malcus scutellatus*, n. sp. caused great confusion in the taxonomy of Malcinae. It may be illustrated by different views of some authors as to the synonymy and meaning of references to this species:

1. Breddin (1907): *Malcus flavidipes* Stål, 1859 = *M. scutellatus* Distant, 1901
2. Distant (1910): *Malcus scutellatus* Distant, 1901 = *M. flavidipes* in Breddin (1907) nec Stål, 1859
3. Horváth (1914): *Malcus scutellatus* Distant, 1901 = *M. flavidipes* in Distant (1904a) nec Stål, 1859
4. Esaki (1926): *Malcus scutellatus* Distant, 1901 = *M. scutellatus* in Distant (1904a), Horváth (1914) = *M. flavidipes* in Distant (1904a), Breddin (1907) nec Stål, 1859

It may be seen in the review of erroneous references (discussed under the respective species) that the name *Malcus scutellatus* was applied to 6 different taxa by subsequent authors, including Distant himself. Only the remarks by Breddin (1907) and Distant (1910), and those parts of references by Distant (1904a) and Ishihara and Hasegawa (1941) concerning Singhalese material can be applied to *Malcus flavidipes flavidipes* Stål. Fortunately, the original material to which the name "*scutellatus*" was applied could have been examined (exc. the Japanese references from Taiwan — see *M. insularis*, n. sp.) and correctly interpreted.

4c. *Malcus flavidipes kumaunensis*, n. subsp.

(Figs. 115, 141, 164, 185, 209, 242—244, 283.)

Malcus scutellatus: Horváth 1914: 636 part. (specimens from Himalaya, Kulu); Ishihara and Hasegawa 1941: 107 part. (reference from India, part.)

Derivatio nominis: Kumaun = mountainous part of Uttar Pradesh in India.

Holotype: ♂ (no. 93), India, Uttar Pradesh, Kumaun (= Kumaon), Haldwani Dist. [Lat. N. 29. 13, Long. E. 79. 31], lgt. H. G. Champion, Champion coll. 1927 — 409 (coll. BM).

Allotype: ♀ (no. 177), India, Punjab, Kangra, Sultanpur (= Kulu) [Lat. N. 31. 59, Long. E. 77. 06, nr. Mandi], Alt. 5000 ft., lgt. C. Rost (coll. PŠ). (Since from no locality a well preserved male as well as a female were accessible, the allotype had to be selected from a locality different from that of the holotype).

Paratypes: India, Uttar Pradesh, Kumaun (= Kumaon): 9 ♂♂ (no. 90, 91, 95, 98, 101, 117—120), the same data as holotype (coll. BM, JAS and PŠ); 1 ♀ (no. 156), "Bhim Tal", Alt. 4500 ft., 27. 9. 1907 (coll. PŠ); 1 ♂, 2 ♀♀ (no. 97, 121, 122), W. Almora [Lat. N. 29. 36, Long. E. 79. 40], lgt. H. G. Champion, Champion coll. 1927 — 409 (coll. BM and PŠ); 1 ♂ and 1 ♀ (no. 123, 124), "Gori Valley", Alt. 4000 ft., lgt. H. G. Champion, Champion coll. 1927 — 409 (coll. PŠ); 1 ♂ (No. 99), Tanakpur [Lat. N. 29. 04, Long. E. 80. 06], lgt. H. G. Champion, Champion coll. 1927 — 409 (coll. PŠ); India, Punjab, Kangra: 2 ♂♂ and 6 ♀♀ (no. 170—176, 178), the same data as allotype, Alt. 5000 ft., or 7000 ft., (coll. MNM and PŠ).

In total 26 specimens were examined.

Distribution: Western Himalayas in India (Punjab and Uttar Pradesh,

undoubtedly also in Himachal Pradesh). The nearest known locality of *Malcus flavidipes asper* is about 900 km eastward.

Description: Small to medium-sized, slender, rather elongate subspecies. Moderately shiny. General ground colour brown with a little rusty shade. The 1st antennal segment rusty brown to dark brown, the 4th piceous black-brown. Head of the ground colour, or a little darkened, with some blackish shades. Pronotum of the ground colour, or a little blackish in posterolateral angles, or the whole pronotum more darkish brown than ground colour. Callar region never darkened. Scutellum dark rusty brown. Medial part of corium slightly darkened, the posterior and anterior parts slightly lighter. Corial tubercle dark brown to piceous. Membrane greyish-brown with silvery shade and with many medium-sized piceous spots, mostly tending to coalesce and mostly very contrasting. Legs and light parts of antennae stramineous.

Pilosity: The 2nd and 3rd antennal segments with oblique, short, inconspicuous hairs, their length subequal to the diameter of segment. Head and anterior part of pronotum with a few erect setae, at most as long as the length of eye, rarely slightly longer. Hemelytra without erect hairs.

The 1st antennal segment rather thin, inner margin slightly convex, outer straight. Distal part slightly and gradually narrowed.

Pronotum (fig. 283) moderately declivent. Callar region poorly convex laterally and dorsally, poorly distinguished from rather large pronotal lobe, this of somewhat tumid-like appearance. Posterolateral tubercles indistinctly developed, lateral margin of pronotal lobe with 4–6 small, little protruding teeth. Without median, or this inconspicuously indicated. The medial part of pronotal lobe slightly concave anteriorly, slightly flattened posteriorly.

Posterior pronotal outline (fig. 115): without posteromedial tubercle, intertubercular line slightly convex, posterolateral tubercles extremely slightly indicated, lateral teeth very small.

Thoracic sterna: mesosternum strongly, metasternum slightly concave. Intercoxal spaces: 2—2 = $1\frac{1}{2}$ cx; 3—3 = 1 cx; 2—3 = $\frac{1}{2}$ cx.

Labium reaching between the middle coxae or slightly behind them.

Membrane surpassing considerably the tip of abdomen.

Laterotergites (fig. 141): The 5th very small, the 6th rather narrow and moderately protruding, with fine irregular teeth. The 7th irregularly low arch-shaped, widest at $\frac{1}{3}$ of its length, very moderately and finely dentate, the teeth of rather regular appearance, but distinctly denser and smaller on the anterior margin; the lateral margin practically indistinguishable from the posterior one.

The 7th ventrite of male without particularities.

The 8th urite, ♂: ventral view (fig. 164): posterior margin slightly convex, medial angle rounded and feebly produced, lateral angles angular, non-produced, lateral tubercles indicated by fine dentation. Lateral view (fig. 185): medial angle not at all produced, obtusely angulate, lateral angle rounded, dorsal elevation in form of a low, angular tubercle.

Pygophore (fig. 209) small, without parandria, distal margin moderately convex, hypandrium medially very long, divided from proximal part by a long shallow incurvation of the lateral outline.

Gonostyli as in figs. 242—244.

Geographical variability. Small biometrical differences exist between the examined specimens from Kumaun and from more western Sultanpur. The measurements and ratios overlap, but their mean values are sometimes rather different, especially as to the minimum width of combined hemelytra (larger in specimens from Sultanpur) and the ratios involving this character. Both populations are, nevertheless, obviously consubspecific.

Differential diagnosis. *Malcus flavidipes kumaunensis* is at first glance distinguishable from other subspecies and from similar species by relatively narrow and finely dentate abdominal laterotergites, which are, however, much more developed than in rather similar *M. sinicus* and *M. inconspicuus*. The narrow and finely dentate laterotergites of *M. idoneus*, *M. mishmi* and *M. nigrescens* are of a different general shape, and these species are in all other respects dissimilar to *M. flavidipes kumaunensis*. This subspecies differs from *M. flavidipes asper* by a set of characters mentioned in the key, from *M. flavidipes flavidipes* by the larger ratio of length of body: length of antenna ($1.02\text{--}1.25 \times 0.79\text{--}1.01$), mostly by large ratio maximum width of pronotum: width of head ($1.70\text{--}1.86 \times 1.44\text{--}1.71$) and by further overlapping biometrical characters of statistical significance only. *M. flavidipes kumaunensis* differs from *M. insularis* by larger ratio of maximum width of pronotum: width of head ($1.70\text{--}1.86 \times 1.54$) and by quite different distribution, from *M. indicus* by definitely and strikingly different shape of abdominal laterotergites. *M. flavidipes kumaunensis* differs from *M. pallidus* by smaller ratio length of membrane: minimum width of combined hemelytra ($1.75\text{--}2.11 \times 2.11\text{--}2.21$) and by larger ratio of maximum width of pronotum: width of head ($1.70\text{--}1.86 \times 1.56\text{--}1.65$).

The genitalia of *M. flavidipes kumaunensis* differ profoundly from *M. indicus* and *M. pallidus* by lack of spinous projection of the lateral angle of 8th urite and from *M. insularis* by greater distance of lateral angle of 8th urite from the dorsal elevation (in lateral view), by different shape of sublateral margin of this urite and differently shaped apex of gonostylus. The differences between the genitalia of the subspecies of *Malcus flavidipes* are expressed in the key — those of *M. flavidipes kumaunensis* are rather similar to *M. flavidipes asper*, but rather different from nominate subspecies.

Remarks on references. The Horváth's Himalayan specimens of *Malcus scutellatus* Dist. were examined, and they all belong to *M. flavidipes kumaunensis* (all from Sultanpur = Kulu; mentioned as "Vallis Kulu" by Horváth 1914). Ishihara and Hasegawa's (1941) record of *Malcus scutellatus* Dist. from India was undoubtedly based on Horváth's references (1914), and concerned also *M. indicus*.

5. *Malcus furcatus*, n. sp.

(Figs. 116, 142, 165—167, 186, 197, 210, 245—247, 284 and many morphological figures.)

Derivation nominis: from furca, lat. = fork (named according to the shape of pygopore).

Holotype: ♂ (no. 15), N. E. Burma, Kambaiti [Lat. N. 25.25, Long. E. 98.06], Alt. 7000 ft., 9. 5. 1934, lgt. R. Malaise (coll. BM).

Allotype: ♀ (no. 107), the same data as the holotype, 9. 5. 1934 (coll. BM).

Paratypes: the same data as the holotype: 5 ♂♂, 2 ♀♀, (no. 22, 36, 58, 66, 67, 102, 114), 30. 4. 1934; 5 ♂♂ (no. 12, 37, 63, 69, 86), 9. 5. 1934; 2 ♂♂, 1 ♀ (no. 62, 92, 113), 20. 5. 1934; all in coll. BM and PS. The paratypes no. 102(♂) and 114 (♀) were dissected, and described and figured in morphological part of this paper.

In total 17 specimens of this species were examined.

Description. Large, rather elongate, not very robust species. Moderately shiny.

General ground colour yellow-brown, with very slight olive shade. 1st and 4th antennal segments, head, collar region of pronotum, scutellum and corial tubercles black. The posterolateral angles of pronotum and the mid-line of pronotal lobe dark brown in some specimens. Medial part of corium mostly slightly darker than its other parts. Membrane light silvery-brown, with some not sharply limited, mostly non-confluent and little conspicuous brown spots.

Pilosity: The 2nd and 3rd antennal segments with moderately dense oblique hairs, on the base of the 2nd segment shorter than its diameter, on the distal end subequal, on the 3rd segment (esp. distally) distinctly longer. Head, pronotum, scutellum and corium without erect hairs.

The 1st antennal segment moderately long. Its external margin straight, the inner margin strikingly widening in its first third, then straight and gradually narrowing.

Pronotum (fig. 284) not very robust, moderately vaulted, with very plastic relief. Collar region distinctly limited, slightly convex dorsally, strongly laterally, with finely tuberculate lateral margins, and a distinct, slightly rampart-like median. Pronotal lobe with well indicated, not sharply limited and slightly elevated posterolateral tubercles. Disc anteriorly slightly swollen, medio-anteriorly concave, with a slight but distinct impression before the posterolateral tubercles. Median distinct, in some specimens slightly rampart-like, in some indicated in sculpture only, but always ending by a minute posteromedial tubercle (sometimes slightly keel-like, or flatly tuberculate, sometimes nearly indistinguishable). The lateral margin of pronotal lobe with 8—10 small teeth.

Posterior pronotal outline (fig. 116): a pointed medial tubercle small, but distinct; intertubercular lines slightly concave, posterolateral tubercles feebly indicated.

Thoracic sterna: both meso- and metasternum shallowly and flatly concave. Intercoxal spaces: 2—2 = 1 cx; 3—3 = $\frac{3}{4}$ cx; 2—3 = $\frac{3}{4}$ cx.

Labium reaching between the bases of hind coxae.

Membrane slightly surpassing the tip of abdomen (♀♀), or considerably surpassing the hind margin of pygophore, but not covering the posterior halves of parandria (♂♂).

Laterotergites (fig. 142): The 5th reduced, its widened part represented by a few small teeth. The 6th large, slightly hook-like, its very distal dens large

and posteriorly directed. The 7th laterotergite widest in the anterior 1/4 or 1/3, nearly semicircular; anterior margin more densely dentate, the teeth rounded, lateral margin with sparse, small, sharp, sometimes nearly disappearing moderately large teeth, posterior margin short, hardly dentate, of concave appearance.

The 7th ventrite of male (fig. 197): anteriorly sublaterally with strongly protruding paired truncate processes. Their apical surface sharply limited and slightly concave, covered by extremely dense, slightly curved and ventrally directed hairs, longer on anterior margin.

The 8th urite, ♂: ventral view (fig. 166): medial angle rounded, distinctly produced, lateral angles subangular, lateral tubercles distinct, finely dentate. (The figs. 165 and 167 show the same specimen, but with posterior margin turned slightly dorsally or ventrally from the standard position). Lateral view (fig. 186): medial angle spinously produced, lateral angle obtusely, but very distinctly angular, dorsal elevation slightly tuberculate, nearly indistinct.

Pygophore (fig. 210) very large and robust, with 2 strong, divergent fork-like parandria, distal margin practically straight or slightly bisinuate, twice as long as the parandrium. Hypandrium oblong, its proximal margin concave.

Gonostyli as in figs. 245—247. Apices conspicuously curved ventrally.

Differential diagnosis. The male genitalia of *M. furcatus* are similar only to *M. similis* — both species differ by key characters, especially the shape of 8th urite is different. The fork-like parandria do not occur elsewhere in Malcidae or Lygaeidae. *M. furcatus* is in biometrical patterns and external morphology similar to *M. similis*, *M. auriculatus*, *M. mishmi* and *M. nigrescens*. It differs from *M. similis*, *M. nigrescens* and *M. mishmi* by less blackened pronotum and membrane, from 2 latter species (in a lesser degree also from *M. similis*) also by quite different shape of the 7th laterotergite. Only inconspicuous differences (exc. male genital characters) exist between *M. furcatus* and *M. auriculatus* their females are in all probability extremely alike. *M. furcatus* is in colour characters very similar to *M. nigrofasciatus*; the latter species is smaller, has relatively wider and more robust pronotum, and quite different male genitalia.

6. *Malcus idoneus* Horváth

(Figs. 117, 143, 168, 187, 211, 248—250, 285.)

Malcus idoneus Horváth, 1914: 635, 636.

Malcus idoneus: Esaki 1926: 162; Ishihara and Hasegawa 1941: 106, 107.

Type material: Horváth (1914) did not indicate any type specimens. There are 4 male syntypes in his collection (coll. MNM), all with the same data. Two specimens are labelled "Typus", apparently subsequently to Horváth, one of these specimens bears another label with an inscription "*Malcus idoneus* Horv." written by Horváth. The latter specimen has been selected for a lectotype, the remaining specimens considered as paralectotypes.

Lectotype: ♂ (no. 57), Taiwan (= Formosa), Kasampo (= Kosempo), 7. 1909, lgt. Sauter (coll. MNM).

Allotype: ♀ (no. 34), the same data as the lectotype, but without date (coll. PŠ). Pinned specimen.

Paralectotypes: 3 ♂♂ (no. 56, 179, 180), the same data as the lectotype (coll. MNM).

Other material examined: 2 ♂♂ and 5 ♀♀ (no. 29, 30—33, 35, 38), the same data as the allotype (coll. JAS and PŠ); 1 ♂ (no. 144), Taiwan, "Hassenzan (Taichû-shû), Kahodai-Reimai", 12. 7. 1932, lgt. Teiso Esaki (coll. KU). All these specimens were compared with the lectotype and labelled as "homotypes".

In total 13 specimens were examined.

Distribution: endemic Taiwan species.

Description. Medium-sized to large species, rather short, not very robust. Nearly dull to shiny.

Colouring very variable. Ground colour brown, red-brown, rusty, light to dark olivaceous brown, or black-brown. 1st and 4th antennal segments, head and scutellum black-brown to black. Pronotum, if extremely light: only callar region non-contrastingly darkened (black-brown to black); if extremely dark: only collum and the parts of pronotal lobe along the mid-line brownish, all other parts black. All degrees of non-contrastingly darkening occur between these extremes (the mid-line and posterolateral angles of pronotum are darkened first). Corium and clavus of the ground colour, rarely the medial part of corium darker, and the anterior and posterior parts a little non-contrastingly lighter than the ground colour. Corial tubercle black. Membrane usually dark brown and without spots, only with dirty silvery hind margin and one spot behind corial tubercle; rarely with some not sharply limited and hardly recognizable light spots in the middle. Legs and light parts of antennae stramineous to olive brown.

Pilosity: The 2nd and 3rd antennal segments with rather dense oblique hairs, equal to the diameter of segment on the base of 2nd segment, slightly longer on its distal end, distinctly longer than the diameter on the 3rd segment. Head and anterior part of pronotum with extremely few, very short erect hairs, considerably shorter than the length of eye. Scutellum and hemelytra without erect hairs.

The 1st antennal segment long, rather narrow, the inner margin convex, the apical part of the segment slightly bent externally.

Pronotum (fig. 285) considerably declivent, of rather robust appearance, with very variable sculpture. Callar region distinctly limited, slightly convex dorsally, distinctly laterally, the lateral margin rugose (esp. posteriorly), median always developed (grooved or slightly rampart-like). Disc of pronotal lobe slightly convex, posteriorly flattened, medioanteriorly slightly convex. Posterolateral tubercles inconspicuously indicated, non-elevated, anteriorly limited by short impressions. Lateral margins finely and irregularly dentate or tuberculate (6—9 tubercles). Median very distinct, but in nowhere elevated.

Posterior pronotal outline (fig. 117): very slightly convex, with inconspicuously indicated posterolateral tubercles.

Thoracic sterna: meso- and metasternum shallowly and flatly concave. Intercoxal spaces: 2—2 = 1 cx; 3—3: $\frac{1}{2}$ cx; 2—3 = less than $\frac{1}{2}$ cx.

Labium reaching between the middle coxae.

Membrane (fig. 285) moderately surpassing the tip of abdomen. The proximal part of R arch-shaped, close to Sc.

Laterotergites (fig. 143): The 5th and 6th hardly produced, finely and densely dentate, the widened parts very long. The 7th regularly arch-shaped, widest nearly distally, finely, densely and very regularly dentate along the whole margin, which is of an undulate appearance.

The 7th ventrite of male without any particularities.

8th urite, ♂: ventral view (fig. 168): posterior margin triangularly produced, medial angle subangular, lateral angles spinously produced, lateral tubercles distinct, finely dentate. Lateral view (fig. 187): medial angle indistinctly produced, rather rectangular, lateral angle spinously produced, dorsal elevation bisinuate.

Pygophore (fig. 211) medium-sized, without parandria, distal margin moderately convex, hypandrium very short, its lateral margins strikingly distinguished from the distal margin. Hypandrium distinguished from the proximal part by a distinct incurvation of lateral outline.

Gonostyli as in figs. 248—250. Blade very long and narrow, ventrally nearly straight, dorsally uniformly convex, conspicuously pointed and very distinctly dentate.

Differential diagnosis. The robust body, narrow, densely, finely and regularly dentate 7th laterotergite and the isolated distribution on Taiwan easily distinguish *M. idoneus*. The superficially similar *M. nigrescens* may be recognized by the key characters. The genitalia of *M. idoneus* are similar to *M. japonicus*, but they differ profoundly by the shape of gonostyli, and both species are quite different as to the biometrical patterns, shape of abdominal laterotergites and structure of pronotum. The other species occurring in Taiwan, *M. insularis*, is in every respect dissimilar to *M. idoneus*.

Remarks on references. The examined Horváth's original series of *Malcusidoneus* Horv. contained only this species. Since no other original material was mentioned by subsequent authors, it is obvious that Esaki (1926) and Ishihara and Hasegawa (1941) based their references to *M. idoneus* solely on the original paper by Horváth (1914). On the other hand, some of the references to *Malcus scutellatus* applied in this paper to *M. insularis* (see the discussion under this species) might, at least partly, involve *Malcus idoneus* Horv., too.

7. *Malcus inconspicuus*, n. sp.

(Figs. 118, 144, 286.)

Derivatio nominis: in + conspicuus, lat. = conspicuous (named according to poorly developed abdominal laterotergites).

Holotype: ♀ (no. 39), N. Vietnam, Ha Lang (= Ho Lang) [eastwards from Cao Bang: Lat. N. 22.35, Long. E. 106.40], "Mt Tonkin", "Fairm" (? "Tai-rns") (coll. MGA). The right middle tarsus is missing.

Paratypes: 2 ♀♀ (no. 23, 82), China, Kwantung, Tunghing (= Haining) [Lat. N. 21.35, Long. E. 107.57], Walker coll. "93—52", "9562" or "9563" (coll. BM and PŠ). (It is uncertain what is the exact position of the locality "Haining", which is the only geographic term printed on the label. It may be

Hai-ning (Lat. N. 30.31, Long. E. 120.35) near Shanghai, or Tunghing (English spelling) = Hai-ninh (German) = Tong Hing (French), situated closely to the N. Vietnam — China boundary. Since the latter locality is very near to the locality of holotype, the latter eventuality seems more probable.

In total 3 specimens were examined.

Distribution: N. Vietnam, S. China. Probably more widely distributed and perhaps connecting the ranges of *M. flavidipes flavidipes* and *M. sinicus*.

Description. A small, wide and robust species. Moderately shiny.

General ground colour yellow-brown, sometimes with slight rufous or olivaceous shade. 1st antennal segment, head and callar region of pronotum of the ground colour or a little darker (dark rufous brown). The 4th antennal segment pitchy black-brown. Scutellum and corial tubercles dark brown to black-brown. Corium unicolorous, only the medial part and inner margin slightly darkened. Membrane milky silver with brownish shades and sharply limited large brown spots. Legs and light parts of antennae stramineous.

Pilosity: The 2nd and 3rd antennal segments with sparse oblique hairs shorter than the diameter of segment, these hairs subequal or slightly longer than the diameter on the distal end of the 3rd segment. Head and anterior part of pronotum with rather dense erect hairs shorter than length of eye. Scutellum and hemelytra without erect hairs; inner margin of corium with some semierect hairs intermixed among the curved hairs, but hardly longer than the latter.

The 1st antennal segment rather long, cylindrical, its inner margin slightly convex, the base of very pedunculate appearance.

Pronotum (fig. 286) strongly declivent, wide and short, robust. Callar region dorsally flat, posteriorly practically non-limited from pronotal lobe, lateral margins nearly straight. Pronotal lobe very large, rather flat, lateral margins with 8—9 regular tubercles. Median practically not-developed, not grooved, without posteromedial tubercle. Posterolateral tubercles absent or very indistinctly indicated.

Posterior pronotal outline (fig. 118): straight, without any distinct tubercles, laterally indistinctly limited due to feebly developed lateral dentes.

Thoracic sterna: both meso- and metasternum slightly concave, the latter very shallow. Intercoxal spaces: 2—2 = $1\frac{3}{4}$ ex(!); 3—3 = $1\frac{1}{4}$ ex; 2—3 = 1 ex.

Labium reaching between the middle coxae.

Membrane (fig. 286) distinctly surpassing the tip of abdomen, its apex very broadly rounded.

Laterotergites (fig. 144) extremely narrow. The 5th tuberculate, 6th sharply dentate, produced equally to the 7th. The latter very narrowly arch-shaped, finely, regularly and acutely dentate.

The male unknown.

Differential diagnosis. The short and robust body of *M. inconspicuus* reminds one of *M. flavidipes flavidipes*, *M. insularis* and *M. sinicus*. The two former species differ profoundly by wide, strongly and irregularly dentate abdominal laterotergites. *M. inconspicuus* is in this character similar to *M. sinicus*, *M. nigrescens* and *M. idoneus*. The 2 latter species are, however, in other characters quite unlike *M. inconspicuus*, while *M. sinicus* differs from *M. inconspicuus* practically only by less distant coxae and by much shorter 2nd

antennal segment (and by the latter character influenced ratios mentioned in the key). The other differences between these species are so slight, that it is quite possible that they represent only subspecies of a single species. Both species remind one of *M. flavidipes flavidipes* by the small ratio of length of body: length of antenna.

8. *Malcus indicus*, n. sp.

(Figs. 119, 145, 169, 188, 212, 251—253, 287, 288.)

Malcus scutellatus: Horváth 1914: 636 part. (specimens from Trichinopoly); Ishihara and Hasegawa (1941): 107 part. (reference from India part.).

Derivatio nominis: indicus, lat = Indian.

Holotype: ♂ (no. 52), S. India, Madras, Tiruchirapalli (= Trichinopoly) [Lat. N. 10.50, Long. E. 78. 43]. lgt. Jos. Dubreuil (coll. MNM). The left 3rd and 4th antennal segments and the left fore tarsus are missing; the genitalia are mounted separately.

Allotype: ♀ (no. 55), the same data as the holotype (coll. MNM). The left 2nd—4th antennal segments are missing.

Paratypes: 2 ♀♀ (no. 53, 54), the same data as the holotype (coll. MNM and. PŠ); 1 ♀ (no. 157), S. India, "foot of Rodai Ghaut", T. V. Campbell coll. (coll. BM); 1 ♀ (no. 28), S. India, Nilgiri Hills, "Singara", Alt. 3400 ft., 5. 1954, lgt. P. S. Nathan, coll. S. India (coll. JAS).

In total 6 specimens were examined.

Distribution: endemic species of southernmost India.

Description. Medium-sized, moderately elongate species. Nearly dull to moderately shiny.

General ground colour variable: orange-brown*), brown or rusty brown. 1st antennal segment brown to dark rusty brown, 4th segment black-brown. Head and scutellum of the ground colour, or black-brown. Pronotum of the ground colour, or with dark brown callar region, sometimes also with slightly darkened posterolateral angles. Corium and clavus of the ground colour, or the anterior and posterior parts of corium slightly lighter externally. Corial tubercles dark brown to black. Membrane silvery with slight brownish shade, and with coalescing non-contrasting light brown, or contrasting piceous spots. Legs and light parts of antennae stramineous to dirty yellow, or brownish.

Pilosity: The 2nd and 3rd antennal segments with short, oblique hairs equal to the diameter of segment. Head, anterior part of pronotum, its lateral margins and scutellum with some erect hairs, a little longer than length of eye (longer than similar hairs in *M. flavidipes kumaunensis*). Also lateral and inner margins of corium with some long erect hairs.

1st antennal segment rather strong, stout, its inner margin uniformly convex, external margin straight.

*) Only in 2 probably not fully sclerotized specimens, with whole dorsal surface of the ground colour, and with the parts of body which are usually darkened in other specimens only slightly more dark orange or brown, and with yellow-silvery membrane without spots. These specimens are not considered in the following description of colour.

Pronotum (fig. 287) rather declivent. Callar region slightly convex laterally, not convex dorsally. Pronotal lobe rather flat, without distinct median, anteriorly with or without a short concavity along the mid-line. Posterolateral tubercles minute but distinct, posteriorly limited by deep impressions before the posterior lobuli. Lateral margins of pronotal lobe with 2—3 very small anterior and 3 much larger posterior teeth; the latter are situated on posterolateral angles of pronotum, and may be rather small (as in *M. flavidipes kumaunensis*) to very conspicuous (as in fig. 287).

Posterior pronotal outline (fig. 119): slightly undulate, medially slightly elevated (but without any posteromedial tubercle) and slightly convex; lateral tubercles distinctly indicated, lateral teeth strong.

Thoracic sterna: mesoternum deeply, metasternum shallowly concave. Intercoxal spaces: 2—2 = $1\frac{1}{2}$ cx; 3—3 = $\frac{3}{4}$ cx; 2—3 = $\frac{1}{3}$ cx.

Labium reaching slightly behind the middle coxae to between the hind coxae.

Membrane slightly surpassing the tip of abdomen.

Laterotergites (fig. 145) very conspicuous, strongly protruding laterally. The 5th large, with straight and perpendicular hind margin. The 6th unusually large and long, strongly and very sharply dentate, often more or less hook-like, then with strongly concave hind margin. The 7th conspicuously laterally protruding, widest behind $1/2$ of its length, nearly triangular, the latero-posterior margin nearly perpendicular to the body axis; the anterior margin sharply and moderately densely dentate, the latero-posterior margin provided with irregular number of large and very sharp teeth, the concavities between teeth much wider and deeper than on anterior margin.

The 7th ventrite of male without particularities.

8th urite, ♂: ventral view (fig. 169): posterior margin triangularly produced, its both parts straight, medial angle angular, lateral angles spinously produced, without lateral tubercles. Lateral view (fig. 188): medial angle spinously produced, lateral angle long and strongly spinously produced, dorsal elevation in form of 2 angular tubercles, sublateral margin deeply concave.

Pygophore (fig. 212) very broad, its outline nearly circular, without parandria. Distal margin slightly convex, undulate, hypandrium extremely short, practically not distinguished from the proximal part in lateral outline.

Gonostyli as in figs. 251—253, remarkably large. Shank very robust and thick, especially distally; blade extremely wide distally, remarkably pointed and gradually narrowed apically, its dorsal outline uniformly convex.

Differential diagnosis. *Malcus indicus* has an unique distribution among the Malcinae, i. e. South India. In appearance it is closest to *M. flavidipes kumaunensis*, but it differs (definitely from this subspecies, not so definitely from other taxa mentioned below) at first glance by more developed and protruding, and more strongly and irregularly dentate 7th abdominal laterotergites, and by more markedly dentate posterolateral angles of pronotum. *M. indicus* differs from *M. pallidus* by robuster appearance, by smaller ratio of length of membrane: minimum width of combined hemelytra ($1.87-2.03 \times 2.11-2.21$), by larger ratio of length of body: length of antenna ($1.06-1.16 \times 0.99-1.05$), by larger ratio of maximum width of pronotum: width of head ($1.67-1.85 \times$

1.56—1.65) and by smaller ratio of 3rd antennal segment: maximum width of pronotum ($1.03—1.17 \times 1.21—1.35$). *M. indicus* differs from *M. flavidipes asper* by larger ratio of length of body: length of antenna ($1.06—1.16 \times 0.96—1.04$), by smaller length of membrane ($1.74—1.89 \text{ mm} \times 1.89—2.04 \text{ mm}$), by shorter 3rd antennal segment ($1.28—1.53 \text{ mm} \times 1.56—1.79 \text{ mm}$) and by smaller minimum width of combined hemelytra ($0.90—0.96 \text{ mm} \times 0.98—1.07 \text{ mm}$). *M. indicus* differs from *M. flavidipes flavidipes* and from *M. insularis* by larger ratio of length of body: length of antenna ($1.06—1.16 \times 0.79—1.01 \times 1.03$), by smaller ratio of 3rd antennal segment: maximum width of pronotum ($1.03—1.17 \times 1.23—1.63 \times 1.21$), by longer body ($3.60—3.84 \text{ mm} \times 2.79—3.56 \text{ mm} \times 3.27 \text{ mm}$) and by longer membrane ($1.74—1.89 \text{ mm} \times 1.26—1.73 \text{ mm} \times 1.53 \text{ mm}$).

The genitalia of *M. indicus* are very characteristic due to spinously prominent lateral angle of the 8th urite combined with strikingly large gonostyli and very broad pygophore with short and feebly distinguished hypandrium. The genitalia of *M. flavidipes* and its subspecies and of *M. insularis* are very different; the differences between *M. indicus* and *M. pallidus* (sharing the spinously produced lateral angles of 8th urite) are apparent from the key and figures.

Remarks on references. The correspondence of Horváth's (1914) specimens of *Malcus scutellatus* Distant from Trichinopoly to *Malcus indicus* n. sp. was ascertained by examination of the original Horváth's specimens. Ishihara and Hasegawa's (1941) record of *Malcus scutellatus* from India was undoubtedly based on Horváth's paper, and concerned *Malcus flavidipes kumaunensis*, n. subsp. as well.

9. *Malcus insularis*, n. sp.

(Figs. 120, 146, 170, 189, 200, 213, 254—256, 289).

Malcus scutellatus: Esaki 1922: 59; Esaki 1926: 161; Esaki 1932: 1621, fig. 3202; Kato 1933: pl. 30, phot. 3, Ishihara and Hasegawa 1941: 107 part, (reference from Formosa).

Derivatio nominis: insularis = adj. from insula, lat. = island.

Holotype: ♂ (no. 145), Taiwan (=Formosa), "Hassenzan (Taichû-Shû), Kahodai-Reimei", 12. 7. 1932, lgt. Teiso Esaki (coll. KU). Genitalia mounted separately.

Distribution: endemic Taiwan species. If the above mentioned synonymy is correct, it occurs also in Taiwan: Mushi (Esaki 1922, 1926).

Description. Rather small and robust species, with relatively wide pronotum. Moderately shiny.

Ground colour olive-brown. 4th antennal segment reddish brown, head practically black. Pronotum of the ground colour, with non-contrastingly red-brown callar region. Scutellum dark black-brown. Anterior part of corium light pale olive-yellow, also the distal part slightly lighter. Corial tubercles pitchy brown. Membrane silvery to brownish, with many indistinctly coalescing, comparatively well limited dark brown spots. Legs and light parts of antennae very pale stramineous.

Pilosity: The 2nd and 3rd antennal segments with rather dense oblique hairs (fig. 200), distinctly longer than the diameter of segment. Head and anterior part of pronotum with some erect hairs longer than length of eye. Hemelytra without erect hairs. Femora and tibiae relatively long and densely pilose.

The 1st antennal segment stout, rather short, its inner margin uniformly convex.

Pronotum (fig. 289) rather robust, moderately wide and moderately swollen. Callar region slightly convex laterally and distinctly dorsally, lateral margins with 2 very small teeth. Pronotal lobe indistinctly convex, with slightly sculpturally indicated median. Lateral margins with 9 small teeth. Posterolateral tubercles small, but distinctly developed.

Posterior pronotal outline (fig. 120): slightly convex, posterolateral tubercles slightly indicated, uniformly rounded, lateral teeth moderately large.

Thoracic sterna: meso- and metasternum deeply concave, the concavities sharply limited. Intercoxal spaces: 2—2 = 1 1/2 cx; 3—3 = 1 cx; 2—3 = 2/3 cx.

Labium reaching between the hind coxae.

Membrane slightly surpassing the tip of abdomen.

Laterotergites (fig. 146): 5th and 6th rather large, laterally protruding, the 6th oblong. The 7th trapezoidal, widest in anterior 1/3; anterior and lateral margins rather regularly dentate, the teeth moderately large and moderately dense, the posterior margin feebly concave, non-dentate.

The 7th ventrite of male without particularities.

8th urite, ♂: ventral view (fig. 170): posterior margin slightly produced, medial angle subangular, lateral angles rounded, without lateral tubercles but the respective part slightly undulate. Lateral view (fig. 189): ventral angle moderately acuteangularly produced, lateral angle rounded, dorsal elevation tuberculate and subangulate, sublateral margin very short, semicircularly concave.

Pygophore (fig. 213) very small, laterally subangulate, without parandria. Distal margin feebly convex, nearly straight, hypandrium very short, not at all distinguished from the proximal part in lateral outline.

Gonostyli as in figs. 254—256. Blade not narrowed apically, not pointed, apex rounded.

Differential diagnosis. *Malcus insularis* is remarkably similar to *Malcus flavidipes flavidipes*, especially to its northern specimens with shorter antennae and slightly indicated posterolateral pronotal tubercles, but it is easily distinguishable by longer and denser pubescence, especially on the 2nd and 3rd antennal segments, and by the shape of 8th male urite, which is comparable to *M. similis* only. The latter species is, however, in any other respect dissimilar to *M. insularis*. The same is true of *M. mishmi*, which has rounded and non-narrowed apex of gonostylus — this character is shared only by *M. insularis* and *M. sinicus*. The latter species and also *M. inconspicuus* (males unknown) are similar to *M. insularis* by the general shape of body, but both species differ from *M. insularis* by inconspicuously developed abdominal laterotergites, and *M. sinicus* also by very short 2nd antennal segment. There is no possibility of confusing *M. insularis* with *M. indicus*, *M. pallidus*, *M. flavi-*

dipes kumaunensis and *M. flavidipes asper*, since these species have different distributions and markedly different genitalia.

Remarks on references. All references to *Malcus scutellatus* Distant from Taiwan were probably based on the first 2 Esaki papers (1922, 1926) (or his material), since in no other paper any definite Taiwanese locality was mentioned. The true *Malcus scutellatus* Distant is synonymous with *Malcus flavidipes flavidipes* Stål, and its occurrence on Taiwan has not been proved and is not probable. The only Taiwanese species known to me are *Malcus idoneus* Horváth and *M. insularis*, n. sp. Esaki probably did not clearly recognize both Taiwanese species (although in a 1926 paper both *M. idoneus* Horv. and *M. scutellatus* Dist. were recorded), since of 2 examined specimens from Esaki's collection, identified by him as *Malcus scutellatus* Dist., one belonged to *M. insularis*, n. sp., the other to *M. idoneus* Horv. Esaki's descriptions (1922, 1932) of *Malcus scutellatus* Dist. from Taiwan can be applied to both Taiwanese species in question. The accompanying total figure (Esaki 1932) distinctly shows that the figured species is not *M. idoneus* Horv. (different shape of abdominal laterotergites) and that it may be *M. insularis*, n. sp. Although the antennae figured were too short for *M. insularis*, n. sp., it was probably only an artist's error, since the total photograph of *M. scutellatus* Dist. from Taiwan by Kato (1933) showed the antennae approximately of body length.

It may be inferred that all mentioned references may be probably applied to *Malcus insularis*, n. sp., but some of them may be, at least partly, applicable to *Malcus idoneus* Horv. Since no nomenclatural or other important problems are involved, the application of all references to *Malcus scutellatus* Dist. from Taiwan to *Malcus insularis*, n. sp. would be the best solution in my opinion.

10. *Malcus japonicus* Ishihara et Hasegawa (Figs. 121, 147, 171, 190, 214, 257—259, 290.)

Malcus japonicus Ishihara et Hasegawa, 1941: 105, fig. p. 106.

Malcus japonicus: Esaki 1950: 223, fig. 572; Esaki 1959: 223, fig. 572; Stichel 1959: 319; Stichel 1960: 156; Hidaka 1960: 47; Miyamoto 1961: 215.

Type material: According to Ishihara and Hasegawa (1941) the holotype (♀) from Honshu, Okutama, the allotype (♂) and 2 paratypes (♂ and ♀) from the same locality are preserved in Hasegawa's collection; 1 paratype (♂) from Shikoku, Nishinokawa in Ishihara's collection.

Material examined: 1 ♂ and 1 ♀ (no. 142, 143), Japan, Shikoku, Tosa, 25. 8. 1935, lgt. Ichiji Okubo (coll. KU).

Distribution: Japan: Honshu: Prov. Musashi (Okutama nr. Tokyo — Ishihara and Hasegawa 1941), Shikoku: Prov. Tosa (material examined), Prov. Iyo (Nishinokawa — Ishihara and Hasegawa 1941), Kyushu: Prov. Kumamoto (Kunimi-yama — Hidaka 1960), Prov. Fukuoka (Fukuoka-park — Hidaka 1960). Endemic Japanese species, probably widely distributed on all principal islands.

Description. Elongate, parallel, large and robust species. Moderately shiny.

Ground colour brown. Dark parts of antennae, head, scutellum, callar region and mid-line of pronotum black-brown to black, also the lateral parts of pronotal lobe more or less blackened. Corium medio-externally darkened (till blackish), anteriorly and posteriorly yellow-brown, corial tubercles dark brown to blackish. Membrane blackish-brown with some light brown spots on the base and on apical margin, and with 1 light spot between R and Rs. Legs and light parts of antennae stramineous.

Pilosity: The 2nd and 3rd antennal segments with conspicuously dense oblique hairs, as long as the diameter of segment or slightly longer. Head, pronotum and hemelytra without erect hairs.

The 1st antennal segment short, strong, its inner margin markedly convex (esp. proximally). Also the 2nd and 3rd segments rather strong, more than in other Malcinae.

Pronotum (fig. 290) conspicuously wide and robust, considerably declivent in anterior part. Collum narrow and sharply limited, with feebly indicated median. Callar region sharply limited, laterally strongly convex and with 2—3 teeth, dorsally convex only in lateral parts, medially flattened and with a distinct, low, keel-like median. Pronotal lobe strikingly large, its lateral margins with 8—11 small, rather regular teeth. Posterolateral tubercles strongly swollen, very conspicuous, anterolaterally protruding, sharply limited, posteriorly gradually disappearing and changing into a slightly marked, medially directed transverse band. Anterodiscal part of pronotal lobe slightly swollen, posterodiscal part flattened. Median distinct on the whole lobe, rampart-like, alternately tuberculately widening and narrowing.

Posterior pronotal outline (fig. 121): posteromedial tubercle low, roof-like, distinct; intertubercular lines straight, posterolateral tubercles non-visible (due to their more anterior position and strong declivity of pronotum), lateral declivent margins very long, lateral teeth short, but very thick and robust.

Thoracic sterna: mesosternum concave, metasternum slightly convex, but with slightly concave medial part. Intercoxal spaces: 2—2 = $2\frac{1}{4}$ cx; 3—3 = $1\frac{2}{3}$ cx; 2—3 = $\frac{1}{2}$ cx.

Labium reaching the anterior bases of middle coxae.

Membrane very slightly surpassing the tip of abdomen.

Laterotergites (fig. 147) conspicuously protruding. The 5th wide, dentate; the 6th triangular, finely and sparsely, nearly indistinctly dentate, its posterior margin perpendicular to abdomen. The 7th extremely large, widest distally, of the shape of a quarter of a circle (the anterolateral margin forms the periphery, the posterior margin is in radial direction). The dentation very fine and rather regular, somewhere (esp. on posterior margin) nearly indistinct.

The 7th ventrite of male without peculiarities, but in both sexes markedly medially convex.

8th urite, ♂: ventral view (fig. 171): posterior margin slightly convex, medial angle very slightly subangular, lateral angles short spinously produced, thick, lateral tubercles very distinct, their outlines non-dentate. Lateral view (fig. 190): medial angle slightly produced, lateral angle spinous, thick, dorsal elevation indistinct, slightly tuberculate.

Pygophore (fig. 214) moderately large, without parandria, distal margin

straight, hypandrium short, distinguished from the proximal part by a very, inconspicuous incurvation of the lateral outline.

Gonostyli as in figs. 257—259. Anterior tubercle of the shank very distinct, the dorsal margin of blade sinuate.

Differential diagnosis. Extremely short antennae, especially 3rd segment, large size of body and the occurrence in Japan distinguish safely *M. japonicus* from other *Malcinae*. The large size of body, well developed pronotal median and very robust appearance are similar to *M. thoracicus*—this species has, however, distinctly longer antennae and extremely semiglobularly developed posterolateral pronotal tubercles. The shape of 8th urite of male relates *M. japonicus* to *M. idoneus*; they are, however, strikingly different biometrically, and differ profoundly in the shape of pronotum, abdominal laterotergites and gonostyli. The large space between the coxae of *M. japonicus* is unique in *Malcinae*.

Remarks on references. There are no doubts that all mentioned references to *M. japonicus* Ish. et Has. are applicable actually to this species, since it is the most easily recognizable of all *Malcinae*, and occurs endemically in Japan as the single *Malcus*-species of these islands.

11. *Malcus mishmi*, n. sp.

(Figs. 122, 148, 172, 191, 215, 260—262, 291).

Derivatio nominis: named according to Mishmis Hills, the terra typica of this species.

Holotype: ♂ (no. 148), N. W. Burma, Mishmis (= Mishmi) Hills, 1935, lgt. M. Steele (coll. BM). The left 4th antennal segment is missing, the genitalia are mounted separately.

Description. Large, conspicuously elongate, moderately shiny species.

General ground colour brown. The 1st and 4th antennal segments, callar region of pronotum, scutellum and corial tubercle black. Pronotum extensively darkened; pronotal lobe brown-black along the midline and in the posterior half, the other parts brown. Clavus piceously brown. The middle and inner posterior parts of corium piceously blackbrown. Membrane silvery brownish with large brown spots tending to coalesce; the posterior part (exc. the margins and the middle) entirely brown. Legs and light parts of antennae stramineous.

Pilosity: 2nd and 3rd antennal segments with sparse, very short oblique hairs, shorter than the diameter of segment. These hairs become distally longer and denser, on the end of 3rd segment they are longer than its diameter. Head with some erect hairs shorter than length of eye. Pronotum and hemelytra without erect hairs.

The 1st antennal segment markedly long and thin, its inner margin uniformly slightly convex.

Pronotum (fig. 291) finely built, but with very plastic relief. Callar region distinctly convex laterally and conspicuously convex dorsally, esp. in the middle. Median not developed, but the anterior part of pronotal lobe distinctly grooved in the middle. Posterolateral tubercles slightly developed, medially

non-limited, but both anteriorly and posteriorly limited by depressions. Without posteromedial tubercle. Lateral margins of pronotal lobe with 8—9 very small teeth, the posterior ones are more clustered, but of the same size as the anterior ones.

Posterior pronotal outline (fig. 122): straight, without posteromedial tubercle, posterolateral tubercles indistinguishable, lateral margins very moderately declivent.

Thoracic sterna: both meso- and metasternum slightly concave. Intercoxal spaces: 2—2 = $1\frac{1}{2}$ cx; 3—3 = $\frac{2}{3}$ cx; 2—3 = 1 cx.

Labium reaching between the middle coxae.

Membrane (fig. 291) very long, narrow, hardly surpassing the tip of abdomen. The basal field relatively long by comparison with the distal vein $M + Cu$.

Laterotergites (fig. 148): The 5th strongly reduced, its most conspicuous dens anteriorly directed, also the 6th markedly narrow, densely and finely dentate. The 7th arch-shaped, strongly posteriorly produced, widest in its most distal part; the posterior margin straight, without teeth, the teeth of anterolateral margin conspicuously dense, fine and regular.

The 7th ventrite of male without peculiarities.

8th urite, ♂: ventral view (fig. 172): posterior margin convex, subtriangularly produced, lateral angles spinously produced, without lateral tubercles. Lateral view (fig. 191): medial angle strongly acuteangularly produced, lateral angle spinous and thick, dorsal elevation spinous, short, sublateral margin convex, posterior margin strikingly short and concave.

Pygophore (fig. 215) medium-sized, of rather elongate appearance, without parandria. Distal margin moderately convex, hypandrium long, distinguished from the proximal part by a long, shallow incurvation of lateral outline.

Gonostyli as in figs. 260—262. Blade thick, not narrowed and not pointed apically, the apex rounded.

Differential diagnosis. The appearance of *Malcus mishmi* is similar to *M. nigrescens*, *M. furcatus*, *M. auriculatus* and *M. similis*. The shape of 7th laterotergite distinguishes *M. mishmi* easily from all mentioned species; its darkened pronotum and membrane distinguish it from *M. furcatus* and *M. auriculatus*. The male genitalia of *M. mishmi* are in every respect dissimilar to those of considered species (male unknown in *M. nigrescens*). The rounded and not narrowed apex of the blade of gonostylus in *M. mishmi* occurs in apparently unrelated and in other respects dissimilar species *M. insularis* and *M. sinicus* only.

12. *Malcus nigrescens*, n. sp.

(Figs. 123, 149, 192.)

Derivatio nominis: *nigrescens*, lat. = blackish.

Holotype: ♀ (no. 104), N. E. Burma, Kambaiti [Lat. N. 25.25, Long. E. 98.06], Alt. 7000 ft., 30. 4. 1934, lgt. R. Malaise (coll. BM). Both 4th antennal segments, the left and middle hind tarsi are missing, the right hind leg is mounted separately.

Description. Large, elongate, very shiny species.

General ground colour light brown; extensively and contrastingly darkened. Head, 1st antennal segment, callar region of pronotum, scutellum and corial tubercles black. Pronotal lobe (exc. posterior and lateral margins) black-brown, also the apical part of clavus, and medial and inner posterior parts of corium black-brown. Membrane silvery brown, with coalescing non-contrasting large brown spots. Legs and light parts of antennae stramineous.

Pilosity: The 2nd and 3rd antennal segments with 2 kinds of moderately dense oblique hairs: a) subequal to the diameter of segment, b) slightly longer. Head and anterior part of pronotum with some erect hairs shorter than length of eye. Scutellum and hemelytra without erect hairs.

The 1st antennal segment long, rather thin, its inner margin uniformly convex.

Pronotum (fig. 292) moderately declivent, not very robust. Callar region rather flat, laterally rather convex, dorsally convex posterolaterally only; the mid-line slightly concave. Callar region laterally rugose, posteriorly sharply limited. Pronotal lobe only slightly convex, the disc rather flat, posterolateral tubercles not developed. Posteriorly a feeble transverse keel present. Median insignificant, slightly grooved, without posteromedial tubercle. Lateral margins of pronotal lobe medially with slight transverse impressions. Slightly dentate, about 9 small regular teeth present,

Posterior pronotal outline (fig. 123): straight, without indication of any tubercles.

Thoracic sterna: both meso- and metasternum slightly concave. Intercoxal spaces: 2—2 = 1 $\frac{1}{3}$ cx; 3—3 = 1 cx; 2—3 = 1 cx.

Labium reaching before the hind coxae.

Membrane (fig. 292) considerably surpassing the tip of abdomen. Base of R close to the base of Sc.

Laterotergites (fig. 149): the 5th and 6th very narrow, but their dentate widened parts considerably elongate. The 7th laterotergite very narrowly arch-shaped, widest at half of its length, not protruding laterally, very shallowly, finely, densely and rather regularly dentate.

The male is unknown.

Differential diagnosis. *Malcus nigrescens* is in external morphology and biometrical patterns similar to *M. furcatus*, *M. auriculatus* and *M. similis*, i. e. to the species differing profoundly by the male sexual characters from the rest of the genus. Unfortunately, the females of *M. auriculatus* and *M. similis* and the male of *M. nigrescens* (maybe possessing similar peculiarities as the species mentioned) are unknown, and the detailed comparison of the species as to all characters is impossible.

Malcus nigrescens differs profoundly from the species mentioned by poorly developed, narrow and regularly dentate 7th laterotergite; in this character it is comparable only with *M. idoneus*, *M. sinicus* and *M. inconspicuus* — the two latter species are, however, in every other respect dissimilar. *Malcus idoneus* may be distinguished by the key characters. *Malcus nigrescens* is in the colouring of pronotum and membrane similar to *Malcus similis*, in the shape of pronotum it is very much like *M. auriculatus*. The general appearance and

biometrical patterns of *M. nigrescens* are also similar to *M. mishmi* (only male known); the latter species also has very narrow and finely dentate 7th laterotergites, but they are strongly posteriorly protruding (also the male genitalia of *M. mishmi* are in every respect dissimilar to *M. furcatus*, *M. similis* and *M. auriculatus*).

13. *Malcus nigrofasciatus*, n. sp.

(Figs. 124, 150, 173, 192, 216, 263—265, 293.)

Malcus scutellatus: Distant 1904a: 33 part. (specimens from Kurseong).

? *Malcus scutellatus*: Ishihara and Hasegawa 1941: 107 part. (the reference from Sikkim)

Derivatio nominis: niger, lat. = black + fascia, lat. = band (named according to the colour of pronotum).

Holotype: ♀ (no. 83), India, N. W. Bengal, Darjeeling [Lat. N. 27. 02, Long. E. 88. 20], "Gopaldhara", Alt 3440—4720 ft., 8. 7. 1917, lgt. H. Stevens (coll. BM). The fore tarsi are missing. A female had to be selected for holotype, since in no male the antennae were preserved.

Allotype: ♂ (no. 159), India, N. W. Bengal, Kurseong [= Karsiang = Siliguri; Lat. N. 26. 54, Long. 88. 21], "5071/12", Distant coll. 1911—383 (coll. BM). The antennae and left legs are missing, the genitalia are mounted separately.

Paratypes: 1 ♂ and 1 ♀ (no. 158, 160), the same data as the allotype, "3980/12" or "5049/12" (coll. BM and PS). The male without head and pronotum.

In total 4 specimens were examined.

Distribution: probably endemic East-Himalayan (N. W. Bengal, Sikkim?) species.

Description. Medium-sized, rather large and moderately enlogate species. Moderately shiny.

General ground colour light brown to brown, sometimes with inconspicuous rufous shade. First and fourth antennal segments, head, collar region of pronotum, scutellum and corial tubercles black. Posterolateral angles of pronotal lobe of the ground colour or black-brown. Corium of the ground colour, or in the middle a little darkened, anteriorly and posteriorly inconspicuously lighter. Membrane silvery brownish, with large, coalescing, non-contrasting piceous brown spots, or membrane piceous black-brown, with anterior and posterior margins contrastingly silvery, and with some small, light indistinct spots in the middle. Legs and light parts of antennae stramineous to light yellow-brown with rufous shade.

Pilosity: The 2nd and 3rd antennal segments with many semierect hairs, 1.5 times as long as the diameter of segment. Head and anterior part of pronotum with some erect hairs as long as the length of eye, or slightly longer. Hemelytra without erect hairs.

The 1st antennal segment long, thin, its inner margin only feebly convex, the distal part of the segment suddenly but slightly narrowed on the inner side.

Pronotum (fig. 293) moderately declivent, similarly, but more heavily built than in *Malcus mishmi*, and with less plastic relief. Collar region well

limited, distinctly convex laterally, slightly dorsally, depressed in the middle, its lateral margins with small inconspicuous denticles. Pronotal lobe rather flat, posterolateral tubercles inconspicuously developed, posteriorly limited by short transverse impressions, anteriorly indicated by short shallow depressions. Lateral margins of pronotal lobe with 5—6 moderately large teeth. The most elevated part of pronotum with a feeble transverse keel. Median not developed, or very slightly indicated, the anterior part of the mid-line on pronotal lobe always slightly concave.

Posterior pronotal outline (fig. 124): rugose, both intertubercular lines very moderately sloping to the subangular, indistinctly marked and somewhat elevated middle point. Posterolateral tubercles almost unindicated.

Thoracic sternae: both meso- and metasternum slightly concave. Intercoxal spaces: 2—2 = $1\frac{1}{5}$ cx; 3—3 = $\frac{1}{2}$ cx; 2—3 = $\frac{2}{3}$ cx.

Labium reaching between the middle coxae.

Membrane distinctly surpassing the tip of abdomen.

Laterotergites (fig. 150): the 5th and 6th rather large, finely irregularly dentate. The 7th more or less arch-shaped or subtrapezoidal, widest at $\frac{1}{3}$ of its length, densely, finely, shallowly irregularly dentate on lateral and posterior margins, very sparsely and indistinctly dentate on the anterior margin.

The 7th ventrite of male without peculiarities.

The 8th urite, ♂: ventral view (fig. 173): posterior margin feebly convex, subtriangularly produced, lateral angles obtusely angulate, lateral tubercles distinct, slightly dentate; a distinct emargination present between the lateral tubercles and lateral angles. Lateral view (fig. 192): medial angles non-produced, very obtusely angulate, lateral angle long, very low and rounded, dorsal elevation very indistinct — recognizable as a termination of the continuous curvature of lateral angle.

Pygophore (fig. 216) very broad, without parandria, distal margin thickened and broadly rounded, finely and densely undulate. Hypandrium very transparent, long, distinguished from the proximal part by a shallow but distinct incurvation of the lateral outline.

Gonostylus as in figs. 263—265. Shank with conspicuously biangulate anterior tubercle, blade very long and thin.

Differential diagnosis. *Malcus nigrofasciatus* lacks any peculiar conspicuous distinctive character in the external morphology and in biometrical patterns, the males are, however, easily recognizable from other species by the genital characters mentioned in the key. This species is coloured similarly to *Malcus furcatus* and *M. auriculatus* — the comparatively shorter body combined with more robustly developed pronotum distinguishes *M. nigrofasciatus* at first glance from these narrower and more elongate species. *Malcus nigrofasciatus* is, as to the shape of body, much more similar to the group of species allied to *M. flavidipes flavidipes* — these species are, however, distinctly smaller and always without contrasting black pronotal band. The most similar taxon of this group is *Malcus flavidipes asper*; it may be nearly as long as *M. nigrofasciatus* and may have similarly, but not contrastingly coloured pronotum. However, it possesses distinctly longer antennae, more rugose pronotum, and this character together with the colouring

causes a quite different appearance of both taxa. The male genitalia of *Malcus nigrofasciatus* and *M. flavidipes asper* are very different, and the occurrence of both taxa in the same locality is clear evidence against any closer relation between them.

Remarks of references. The specimens from Kurseong referred by Distant (1904a) to *Malcus scutellatus* Dist. are the allotype and paratypes of *M. nigrofasciatus*, n. sp. Ishihara and Hasegawa's (1941) record of *Malcus scutellatus* Dist. from Sikkim is uncertain, since until 1941 no species of Malcinae had been recorded from this country. It is, however, very probable that their reference was based on Distant's mentioned record, since Kurseong is situated close to the Bengal-Sikkim boundary, and might have been supposed to be in Sikkim by the Japanese authors.

14. *Malcus pallidus*, n. sp.

(Figs. 125, 151, 174, 193, 217, 266—268, 294.)

Derivatio nominis: pallidus, lat. = pale (named according to pale ground colour).

Holotype: ♂ (no. 146), N. Burma, Nam Tamai Valley [Lat. N. 27. 42, Long. E. 97.54], Alt. 3000 ft., 29.7.1938, lgt R. Kaulback (coll. BM). The left 3rd and 4th antennal segments are missing.

Allotype: ♀ (no. 153), the same data as the holotype, 25.8.1938 (coll. BM).

Paratypes: the same data as the holotype (coll. BM and PŠ): 2 ♂♂ and 1 ♀ (no. 61, 64, 155), 29. 7. 1938; 1 ♂ (no. 71), 5. 8. 1938; 1 ♀ (no. 77), 25. 8. 1938.

In total 7 specimens were examined.

Description. Medium-sized, rather elongate, slender and flat species. Nearly dull to slightly shiny.

Ground colour light yellow-brown, sometimes with rusty shade, and generally with unicolours and pallid appearance. The 4th antennal segment black-brown with some reddish shades, the 1st segment red-brown. Scutellum red-brown to black-brown. Head. pronotum, corium and clavus of the ground colour, sometimes the head, callar region of pronotum and medial part of corium of slightly more rusty or rufous appearance. Corial tubercles dark brown to black-brown. Membrane of nearly unicolours appearance: silvery yellow-brown with some non-contrasting and not sharply limited (but non-confluent) hardly recognizable brown spots. Legs and light parts of antennae stramineous.

Pilosity: The 2nd and 3rd antennal segments practically bare, or with some short oblique hairs as long as the diameter of segment. Head, pronotum and hemelytra without erect hairs, or head and anterior part of the lateral margin of pronotum with some erect hairs as long as the length of eye.

The 1st antennal segment very long and thin, its inner margin slightly and evenly convex.

Pronotum (fig. 294) very moderately declivent, rather flat. Callar region poorly convex laterally, not convex dorsally. Pronotal lobe rather flat, posterolateral tubercles not very distinct. The most elevated part of pronotum with

feebly indicated transverse keel. Median non-developed, or distinctly groove-like or pit-like in anterior part of pronotal lobe, poorly distinct in posterior part. Lateral margins of pronotal lobe with 4—5 inconspicuous teeth.

Posterior pronotal outline (fig. 125): slightly convex, without postero-medial tubercle. posterolateral tubercles slightly indicated.

Thoracic sterna: both meso- and metasternum slightly concave. Intercoxal spaces: 2—2 = $1\frac{1}{4}$ cx; 3—3 = $\frac{2}{3}$ cx; 2—3 = $\frac{3}{4}$ cx.

Labium reaching between the middle coxae.

Membrane distinctly surpassing the tip of abdomen.

Laterotergites (fig. 151): the 5th extremely small, the 6th moderately large, but strikingly protruding. The 7th triangular, conspicuously laterally protruding, widest at half of its length; the practically straight anterior margin with very small, sparse teeth, the lateroposterior margin with moderately dense, but much stronger and more irregular teeth.

The 7th ventrite of male without particularities.

The 8th urite, ♂: ventral view (fig. 174): posterior margin slightly uniformly convex, lateral angles spinously produced, slightly distinct non-dentate lateral tubercles present. Lateral view (fig. 193): medial angle slightly produced, lateral angle shortly spinous, dorsal elevation in form of 2 tubercles (the anterior angular).

Pygophore (fig. 217) conspicuously small, without parandria, distal margin rather convex, hypandrium rather long, distinguished from the proximal part by a very distinct notch in the lateral outline.

Gonostyli as in figs. 266—268. Blade remarkably narrow.

Differential diagnosis. The pale colour with rusty shades, relatively long membrane and slender and narrow appearance distinguish *M. pallidus* at first glance from *M. flavidipes* and similar species, with which alone it can be compared. *Malcus pallidus* differs from *M. indicus* by larger ratio of length of membrane: minimum width of combined hemelytra ($2.11-2.21 \times 1.87-2.03$), by smaller ratio of length of body: length of antenna ($0.99-1.05 \times 1.06-1.16$), by smaller ratio of maximum width of pronotum: width of head ($1.56-1.65 \times 1.67-1.85$) and by larger ratio of 3rd antennal segment: maximum width of pronotum ($1.21-1.35 \times 1.03-1.17$). *M. pallidus* differs from *M. flavidipes kumaunensis* by larger ratio of length of membrane: minimum width of combined hemelytra ($2.11-2.21 \times 1.75-2.11$) and by smaller ratio of maximum width of pronotum: width of head ($1.56-1.65 \times 1.70-1.86$). *M. pallidus* differs from *M. flavidipes asper* by shorter 3rd antennal segment ($1.38-1.53$ mm \times $1.56-1.79$ mm), by narrower pronotum ($1.11-1.23$ mm \times $1.31-1.46$ mm), by smaller minimum width of combined hemelytra ($0.84-0.92$ mm \times $0.98-1.07$ mm), by larger ratio of length of membrane: minimum width of combined hemelytra ($2.11-2.21 \times 1.90-2.08$), by smaller ratio of maximum width of pronotum: width of head ($1.56-1.65 \times 1.77-1.94$) and by larger ratio of length of body: maximum width of pronotum ($3.11-3.27 \times 2.72-2.96$). *M. pallidus* differs from *M. flavidipes flavidipes* and from *M. insularis* by longer membrane ($1.77-1.98$ mm \times $1.26-1.73$ mm \times 1.53 mm), by larger ratio of length of membrane: minimum width of combined hemelytra ($2.11-2.21 \times 1.56-1.98 \times 1.79$), by generally larger ratio of

length of body: minimum width of combined hemelytra ($4.07-4.28 \times 3.45-4.08 \times 3.82$) and by larger ratio of length of body: maximum width of pronotum ($3.11-3.27 \times 2.63-3.04 \times 2.94$).

The genitalia of *Malcus pallidus* differ profoundly from those of *M. insularis* and *M. flavidipes* and its subspecies by spinously produced lateral angles of 8th urite. *M. pallidus* is similar to *M. indicus* in the mentioned character, but differs by much smaller gonostyli, smaller and narrower pygophore with longer and better distinguished hypandrium, and by less concave sublateral margin of 8th urite (in lateral view).

15. *Malcus setosus*, n. sp.

(Figs. 126, 152, 295)

Malcus flavidipes: Distant 1904a: 33 part. (specimen from Karennee).

Derivatio nominis: from seta, lat. = bristle (named according to the long pilosity of body).

Holotype: ♀ (no. 21), S. Burma, Carin Cheba [= Karen Cheba = Karennee — according to information by Dr China], Alt. 900—1100 m, 5. 12. 1888, lgt. L. Fea, Distant Coll. 1911—383 (coll. BM). The left 4th antennal segment is missing.

Description. Small, very elongate, subparallel species with strikingly flat pronotum. Moderately shiny.

General ground colour sandy yellow. The 1st antennal segment, head and callar region of pronotum light, somewhat rufous. The 4th antennal segment blackish. Scutellum blackish marginally, dark red-brown in the middle. Corial tubercles piceous. Membrane dirty milky yellow-white, without spots. Legs and light parts of antennae stramineous.

Pilosity: The 2nd and 3rd antennal segments with moderately dense oblique to semierect hairs, on the base of 2nd segment twice as long as the diameter of segment, on the distal end of 3rd segment at least 1.5 times as long. Head with several erect hairs longer than length of eye. Pronotum with many erect setae on the anterior margin of collum, on the lateral margins (on tubercles and dentes only) and on the disc. The setae on the anterior half of pronotum longer than length of eye, on the posterior half subequal. Scutellum with erect setae longer than length of eye. Hemelytra with 2 rows of dense erect of semierect setae situated on both inner and outer margins of corium; the setae are subequal or slightly longer than length of eye. Also the legs remarkably pilose.

The 1st antennal segment extremely long and thin, practically (exc. the narrow base) parallel-sided.

Pronotum (fig. 295) very flat, the whole dorsal surface at the same level, lateral margins very conspicuous. Collum distinctly raised. Callar region posteriorly indistinctly limited, laterally only insignificantly convex, dorsally only posteriorly feebly convex (behind the cicatrical impressions), medially slightly concave. Lateral margins of callar region with 3 small seta-bearing tubercles. Pronotal lobe flat, the posterolateral tubercles not indicated, median nearly indistinct, closely behind the callar region slightly grooved. Posterior

lobuli very minute. Lateral margins of pronotal lobe with 1 small tubercle anteriorly and 3 small teeth posteriorly — both tubercles and teeth bear setae.

Posterior pronotal outline (fig. 126): slightly convex, feebly tuberculate, without posteromedial or posterolateral tubercles.

Thoracic sterna: both meso- and metasternum slightly concave, metasternum conspicuously wide and more shallow. Intercostal spaces: 2—2 = $1\frac{3}{4}$ cx; 3—3 = $1\frac{1}{4}$ cx; 2—3 = 1 cx.

Labium reaching onto the anterior margin of 3rd andominal ventrite (!).

Membrane (fig. 295) relatively narrow, considerably surpassing the tip of abdomen. Sc and R markedly divergent right from their bases.

Laterotergites (fig. 152): The widened part of the 5th represented by 1 strongly protruding tooth. The 6th laterotergite strongly developed, rather hook-like, irregularly dentate. The 7th very wide, widest in anterior third, both laterally and posteriorly strongly produced; the anterior margin finely, shallowly, sharply and sparsely dentate, the lateral margin with 3 extremely large and strongly produced teeth with deeply concave emarginations between them, the posterior margin concave, with a very minute tooth.

The male unknown.

Differential diagnosis. *Malcus setosus* differs at first glance from other Malcinae by the elongate, narrow and flat appearance, and by densely and long pilose body; also the very long labium is unique within the Malcinae. The only similar species *M. elongatus* may be easily distinguished by the key characters and by different shape of abdominal laterotergites.

Remark on reference. Distant's (1904a) specimen of *Malcus flavidipes* from Karennee is the holotype of *Malcus setosus*, n. sp.

16. *Malcus similis*, n. sp.

(Figs. 127, 153, 175, 194, 199, 218, 269—271, 296.)

Derivatio nominis: similis, lat. = similar (named according to resemblance to *M. furcatus*, n. sp.).

Holotype: ♂ (no. 47), N. Burma, Nam Tamai Valley, [Lat. N. 27.42, Long. E. 97.54], Alt. 3000 ft., 5. 8. 1938, lgt. R. Kaulback (coll. BM). The left 4th antennal segment and the left hind tibia and tarsus are missing, the genitalia are mounted separately.

Description. Large, robust species with conspicuously concave lateral margins of hemelytra. Moderately shiny.

General ground colour dark brown. The 1st and 4th antennal segments, pronotum (exc. collum and posterior margin), scutellum and corial tubercles black. Costal margin of corium anteriorly and before corial tubercle light brown. Membrane black-brown, only the posterior and externo-lateral margins brown; without any spots. Legs and light parts of antennae stramineous.

Pilosity: The 2nd and 3rd antennal segments with sparse oblique hairs shorter or equal to the diameter of segment. Head, pronotum, scutellum and hemelytra without erect hairs.

The 1st antennal segment moderately long and moderately thick, parallel-sided (exc. the convex inner proximal margin).

Pronotum (fig. 296) relatively short, considerably declivent, rather wide and robust, with very plastic relief. Callar region narrow, distinctly limited, dorsally slightly convex, lateral margins convex and rugose, median indistinctly rampart-like. Pronotal lobe with very distinct posterolateral tubercles, which are somewhat elevated and laterally strikingly sloping to the dentate lateral margin. Disc of pronotal lobe slightly convex anteriorly, slightly flattened posteriorly. Mid-line shallowly grooved, mediane indistinct, exc. a very short posterior rampart-like part ending in a feebly distinct postero-medial tubercle. Lateral margins of pronotal lobe strongly dentate (6—7 teeth, the posterior ones are the largest).

Posterior pronotal outline (fig. 127): posteromedial tubercle distinctly angular, intertubercular lines concave, posterolateral tubercles very distinct and laterally vertically declivent.

Thoracic sterna: both meso- and metasternum slightly concave. Intercoxal spaces: 2—2 = $1\frac{1}{3}$ cx; 3—3 = 1 cx; 2—3 = 1 cx.

Labium reaching between the middle coxae.

Membrane (fig. 296) long and broad, distinctly surpassing the 7th tergum, the hind margin of pygophore and parandria are not covered by membrane (in repose).

Laterotergites (fig. 153): The 5th rather large, moderately protruding. The 6th conspicuously protruding, hook-like, densely, finely and irregularly dentate. The 7th wide, triangular, widest in $4/5$ of its length, conspicuously posterolaterally protruding; the anterolateral margin finely and densely dentate, posterior margin with much sparser and more acute small teeth, the interdental parts markedly concave.

The 7th ventrite, ♂ (fig. 199): anterolaterally with slightly swollen paired tubercles (homologous to processes in *M. auriculatus* n. sp. and *M. furcatus* n. sp.) sparsely covered by ventrally directed hairs. These hairs longer and less curved in comparison with normal hairs of this urite.

The 8th urite, ♂: ventral view (fig. 175): posterior margin medially convex and subtriangularly produced, medial angle rounded, lateral angles subangulate, without lateral tubercles. Lateral view (fig. 194): very similar to *M. insularis* n. sp. Medial angle feebly produced, lateral angle rounded, dorsal elevation conspicuously tuberculate, sublateral margin very short, semicircularly concave, posterior margin slightly convex.

Pygophore (fig. 219) rather robust, nearly quadrangular, with 2 divergent fork-like parandria (slender and shorter than in *M. furcatus* n. sp.). Distal margin feebly convex, slightly bisinuate, three times as long as parandrium. Hypandrium short, oblong, its proximal margin slightly concave.

Gonostyli as in figs. 269—271. Blade rather thick, apex slightly curved ventrally.

Differential diagnosis. *Malcus similis* is according to male sexual characters very similar to *M. furcatus*, differing from this species by the key-characters. (The shape of the 8th urite of male is, however, quite different from *M. furcatus*, and it is comparable to *M. insularis*, which is in all other characters

quite dissimilar.) *Malcus similis* is in external morphology and biometrical patterns similar to *M. furcatus*, *M. auriculatus*, *M. nigrescens* and *M. mishmi*. It differs from *M. nigrescens* and *M. mishmi* by quite different shape of 7th abdominal laterotergite, and from *M. furcatus* and *M. auriculatus* by extensively darkened pronotum, and to a lesser degree also by the different shape of the 7th laterotergite.

17. *Malcus sinicus*, n. sp.

(Figs. 128, 154, 176, 195, 219, 272—274, 297.)

Derivatio nominis: *sinicus*, lat. = Chinese. The series of 5 studied specimens from the collections of Zoologicheskij Institut in Leningrad has been provided with a label "*sinicus* n. sp." written by Oshanin, who recognized, but did not describe this species. I have accepted this Oshanin's nomen museale.

Holotype: ♂ (no. 136), China, Szechwan, Pingwu (= Lunan'fu) [Lat. N. 32. 38, Long. E. 104. 34]. Alt. 6000 ft., 7. 9. 1893, lgt. Berezovskij (coll. ZI). The 3rd and 4th antennal segments are missing, the genitalia are mounted separately.

The original locality "Lunan'fu, Khotzigou" is written in the Cyrillic alphabet. According to information by Dr Kerzhner, the correct transcription of „Lunan'fu" in the Cyrillic alphabet is Lun-an'-fu (Komarov, 1928: Acta Hort. Petropol. 24[2]), and this place is identical with Lung-ngan = Pingwu. "Khotzigou" is undoubtedly mutilated Jedshu-gon Mts)

Allotype: ♀ (no. 140), the same data as the holotype, 7. 8. 1893 (coll. ZI).

Paratypes: 2♀♀ (no. 108, 111), China, Kiangsu, Soochow [= Su-tschou-fu, Lat. N. 31.21, Long. E. 120.40], (coll. BM and PS); 2♀♀ (no. 137, 139), China, Kiangsu, "Nanking-Koo-ling-Sze", 20. 6. 1934, lgt. Zhenzhurist (coll. ZI and PS) - the locality has not been identified, but it must be in the vicinity of Nanking [Lat. N. 32. 05, Long. E. 118.40], where Zhenzhurist actually collected — information by Dr. Kerzhner; 1 ♀ (no. 138), China, Szechwan, between Kangting [= Ta-tsien-lu, Lat. N. 30. 05, Long. E. 102. 40] and Lihsien [= Li-fan = Tsaku, Lat. N. 31. 32, Long. E. 103. 26], 24. 7. 1893, lgt. Potanin (coll. ZI) : the original label written in Cyrillic alph.: "r. Sjaochzhinkho, Pan'-sham-Singen" means — in the Cyrillic transcription by Komarov 1928 (l. c.) — river Sjaochzin'khe, between the villages Pan'sha-myr and Sin'-chan-czy. These villages are situated between the places mentioned above (information by Dr Kerzhner).

In total 7 specimens were examined.

Distribution: China: Kiangsu and Szechwan, but undoubtedly also in some other provinces.

Description. Small, rather wide and robust species. Dull to moderately shiny.

Colouring very variable. General ground colour rusty brown, yellow-brown to brown, sometimes with some olive shades. 1st antennal segment of the ground colour or slightly darkened (to black-brown), the 4th segment dark brown to black. Head of the ground colour or darkened (to black), scutellum black-

-brown to black. The whole pronotum of the ground colour, or non-contrastingly darkened in callar region (blackish), sometimes also in the lateral parts of pronotal lobe (dark brown). Corium unicolours, or anteriorly and posteriorly slightly and non-contrastingly lighter than the medial part. Corial tubercles black-brown to black. Membrane milky brownish, with groups of small brown spots, coalescing longitudinally between the veins. Legs and light parts of antennae yellow-brown or yellow-olivaceous.

Pilosity: The 2nd and 3rd antennal segments with dense oblique hairs a little longer than the diameter of segment. Head and pronotum (exc. the posterior $\frac{1}{5}$) with many erect hairs a little longer than length of eye or subequal. Scutellum and hemelytra without erect hairs.

The 1st antennal segment moderately long, rather wide, its inner margin slightly and uniformly convex.

Pronotum (fig. 297) moderately declivent, rather robust. Callar region indistinctly limited from pronotal lobe, laterally rugose and considerably convex, dorsally slightly convex, medially not grooved. Pronotal lobe with slightly indicated inconspicuous posterolateral tubercles. Lateral margins with about 8 fine teeth, distinct especially on well indicated posterolateral angles. Disc inconspicuously convex, anterolaterally (behind the callar region) with short, narrow impressions. The mid-line anteriorly grooved, median non-developed or slightly indicated in the middle.

Posterior pronotal outline (fig. 128): straight, without any recognizable tubercles.

Thoracic sterna: both meso- and metasternum slightly concave, the latter very little. Intercoxal spaces: 2—2 = 1 cx; 3—3 = $\frac{3}{4}$ cx; 2—3 = $\frac{1}{2}$ cx.

Labium reaching to slightly behind the middle coxae.

Membrane (fig. 297) slightly surpassing the tip of abdomen. The bases of Sc and R very close.

Laterotergites (fig. 154): the 5th and 6th very small. The 7th narrowly and regularly arch-shaped, widest before half of its length, very moderately produced. The whole margin moderately densely, absolutely regularly, finely and shallowly dentate.

The 7th ventrite of male without particularities.

8th urite, ♂: ventral view (fig. 176): posterior margin slightly convex in the middle, medial angle rounded, lateral angle obtusely angular, lateral tubercles distinct, finely dentate. Lateral view (fig. 195): medial angle feebly produced, lateral angle obtusely, but distinctly angulate, dorsal elevation in form of a very short tubercle.

Pygophore (fig. 219) moderately large, without parandria, distal margin slightly convex, hypandrium moderately long, distinguished from the proximal part by poorly distinct shallow incurvation of the lateral outline (situated, however, proximally to hypandrium).

Gonostyli as in figs. 272—274. Blade nearly straight, practically not narrowed apically, the apex rounded. Anterior tubercle of shank poorly developed.

Differential diagnosis. *Malcus sinicus* is by its very short 2nd antennal segment safely recognizable from other species of the genus. Its small size, but robust and wide appearance are similar to *M. inconspicuus*, *M. flavidipes*

flavidipes and *M. insularis*. *M. insularis* and *M. flavidipes flavidipes* differ from *M. sinicus* by well developed and strongly, irregularly dentate abdominal laterotergites, *M. flavidipes flavidipes* also by longer antennae, *M. insularis* also by the quite different shape of 8th male urite. The difference between *M. sinicus* and *M. flavidipes flavidipes* as to the shape of 8th male urite is smaller, but distinct (compare the shape of lateral angle in figs. 195 and 182—184); the latter species differs profoundly from *M. sinicus* also by the shape of the apex of gonostylus. The rounded and un-narrowed apex of gonostylus is shared only by *M. sinicus*, *M. insularis* and *M. mishmi*; the latter species is otherwise quite dissimilar to *M. sinicus*.

Malcus inconspicuus is the species most similar to *M. sinicus*: both have similarly built very narrow abdominal laterotergites, and, except for the different ratios of antennal segments and different intercoxal spaces, they differ only in minute morphological and biometrical characters. More material, including also the males of *M. inconspicuus*, is necessary for study of their relationship — maybe they represent only subspecies of one species. The narrow laterotergites of *M. sinicus* remind one further of *M. idoneus* and *M. nigrescens* — these large, elongate species with long 2nd antennal segment are otherwise quite dissimilar to *M. sinicus*.

18. *Malcus thoracicus*, n. sp.

(Figs. 129, 155, 298.)

Derivatio nominis: named according to greatly developed thorax.

Holotype: ♀ (no. 169), N. Vietnam, Kouei Tiao [Lat. N. 21.40, Long. E. 103.49 — according to information from Dr China] (= Kouy-Tchéou), "Rég. de Pin-Fa", 1908, lgt. Pére Cavalerie (coll. MNHN). A pinned specimen, the left hind tarsus is missing.

(The identification of "Kouy-Tchéou" with Kouei Tiao is somewhat uncertain; it may be identical with nearby Khuoi Chieu [China, Kwangsi, Lat. N. 22.38, Long. E. 106.18] as well.)

Description. Large and robust species, with nearly parallel-sided posterior half of body, but with greatly developed pronotum with strongly produced posterolateral tubercles, conspicuously arising from the body outline. Moderately shiny.

General ground colour rusty brown. The 1st antennal segment, head, callar region of the pronotum, swollen posterolateral pronotal tubercles and scutellum brown. The 4th antennal segment and corial tubercles blackish. Membrane light brown with irregularly distributed non-contrasting brown spots. Legs and light parts of antennae more darkly stramineous than in most of the other species.

Pilosity: The 2nd and 3rd antennal segments nearly bare, with some oblique hairs shorter than the diameter of segment. Head and anterior part of pronotum with some erect hairs shorter than length of eye. Hemelytra without erect hairs.

The 1st antennal segment short, widely cylindrical, the proximal part of the external margin convex. The 2nd and 3rd antennal segments rather thick.

Pronotum (fig. 298) very robust, strongly declivent in anterior $2/3$. Callar region sharply limited from collum, indistinctly from pronotal lobe, dorsally flat, slightly convex posterolaterally, lateral margins slightly convex, without teeth or with 1 tooth; the mid-line concave. Pronotal lobe with extremely strongly developed posterolateral tubercles: they are regularly semiglobular, far protruding laterally, swollen high, and laterally with an irregular number (3—5) of teeth; 2 of them are very large, but wider and less pointed than in *M. dentatus*, n. sp. Lateral margins of pronotal lobe with 3 small teeth before the posterolateral tubercles, the lateral margins non-developed proximally to these tubercles. Disc of pronotal lobe slightly convex anteriorly, flattened between the tubercles. Median anteriorly non-developed, but in the mid-line a fine groove is present; median very distinct, rampart-like between the tubercles. Without posteromedial tubercle. Posterior lobuli normally developed.

Posterior pronotal outline (fig. 129): medially without tubercle, more or less straight, tuberculate the posterolateral tubercles strongly elevated above the level of intertubercular line, lateral teeth strong, long, spinous, the lateral margins sloping under a very sharp angle.

Thoracic sterna: both meso- and metasternum deeply and narrowly concave, the concavities sharply limited. Intercoxal spaces: 2—2 = slightly more than 1 cx; 3—3 = slightly more than 1 cx; 2—3 = $1/2$ cx.

Labium reaching between the middle coxae.

Membrane (fig. 298) slightly surpassing the tip of abdomen. R undulate and distally close to Rs.

Laterotergites (fig. 155) extremely large, but only slightly dentate. The 5th long, triangular. The 6th hook-shaped, apically truncate, its anterior margin long, finely irregularly dentate. The 7th remarkably extensive, laterally strikingly protruding, widest at $2/3$ of its length; anterolateral margin nearly semicircular, only slightly undulate, posterior margin with a large emargination (its anterior margin straight) followed by 2 wide, moderately protruding teeth.

The male unknown.

Differential diagnosis. The large body size, very robust appearance, well developed median on pronotum and relatively very short antennae of *M. thoracicus* are comparable with *M. japonicus* only. The latter species has, however, much shorter antennae, especially their 3rd segment, and much more poorly developed posterolateral pronotal tubercles. These semiglobular tubercles in *M. thoracicus* are comparable with *M. dentatus* only. These species are, however, not closely allied, and differ by many important characters mentioned in the key.

19. *Malcus tuberculatus*, n. sp.

(Figs. 130, 156, 177, 196, 220, 275—277, 299.)

Malcus scutellatus; Distant 1904a: 33 part. (specimen from Shillong); Ishihara and Hasegawa 1941: 107 part. (the reference from Assam).

Derivatio nominis: tuberculum, lat. = small tubercle (named according to the distinct posteromedial pronotal tubercle).

Holotype: ♂ (no. 135), India, Assam, Lat. N. 27. 53. Long. E. 96.05 [= valley of Luhit river], 7. 2. 1912, lgt. von Vik (? Wick) (coll. ZI).

Allotype: ♀ (no. 81), N. Burma, Nam Tamai Valley [Lat. N. 27. 42, Long. E. 97. 54], Alt. 4000 ft.; 14. 8. 1938, lgt. R. Kaulback (coll. BM).

Paratypes: 3 ♂♂ (no. 131—133), the same data as the holotype (coll. ZI and PŠ); 2 ♀♀ (no. 74,80), the same data as the same data as the allotype, 29. 7.1938 or 14. 8. 1938 (coll. BM); 2 ♀♀ (no. 14,16), Sikkim, "Singhik", Alt. 5000 ft., 24. 8. 1924, lgt. Maj. R. W. G. Hingston, Everest Exp. Brit. Mus. 1924—386 (coll. BM and coll. PŠ); 1 ♀ (no. 78), India, N. W. Bengal, Darjeeling [Lat. N. 27. 02, Long. E. 88.20], "Gopaldhara", Alt. 3440—4720 ft., 7. 4. 1914, lgt. H. Stevens (coll. BM); 2 ♀♀ (no. 129,130), India, Assam, Shillong [Lat. N. 25. 34, Long. E. 91. 53], "7734/12", Distant Coll. 1911 — 383 (coll. BM).

In total 12 specimens were examined.

Distribution: widely distributed in Eastern Himalayas, mountains of N. W. Burma and of W. Assam (southwards from Brahmaputra). The extreme east and west localities are remote about 1000 km.

Description. Medium sized, elongate, not very robust species. Moderately shiny.

General ground colour light to dark brown. The 1st antennal segment red-brown to black, the 4th segment mostly black-brown. Head, scutellum and corial tubercles black-brown to black. Pronotum with black callar region, pronotal lobe of the ground colour, or more or less extensively black-brown to black (the sequence of darkening: posteromedial tubercle, posterolateral angles, mid-line; in extreme cases also the other parts of pronotal lobe black-brown). The medial part of corium always darkened (brown to piceously black-brown), the other parts of corium lighter. Colouring of membrane variable: membrane silvery-brownish with brown (contrasting or non-contrasting) spots tending to coalesce, or brown with some silvery spots, or dark brown with silvery shade and some more or less recognizable silvery spots.

Pilosity: The 2nd and 3rd antennal segments practically bare, or with some oblique hairs subequal to the diameter of segment. Head, pronotum and hemelytra without erect hairs.

The 1st antennal segment moderately long, rather stout, its inner margin convex, esp. proximally.

Pronotum (fig. 299) not heavily built, but with a very plastic relief. Callar region well limited, slightly convex and dentate laterally, slightly convex dorsally, but shallowly concave medioposteriorly. Pronotal lobe with distinctly swollen posterolateral tubercles, anteriorly and posteriorly limited by depressions — the anterior depressions set off the tubercles from inconspicuously swollen anterolateral regions of pronotal lobe. Median usually distinct, anteriorly concave, posteriorly nearly disappearing or slightly keel-like, but always ending in a large, swollen, often keel-like posteromedial tubercle. Lateral margins of pronotal lobe with 5—7 small teeth.

Posterior pronotal outline (fig. 130): posteromedial tubercle large, swollen, obtuse; intertubercular lines straight, posterolateral tubercles not indicated, lateral teeth short.

Thoracic sterna: both meso- and metasternum slightly concave. Intercoxal spaces: 2—2 = $1\frac{3}{5}$ cx; 3—3 = 1 cx; 2—3 = $\frac{2}{3}$ cx.

Labium reaching between the middle coxae.

Membrane distinctly surpassing the tip of abdomen.

Laterotergites (fig. 156): the 5th small, the 6th conspicuously posterolaterally protruding, hook-like, its anterior margin long and sharply dentate. The 7th very wide, subtrapezoidal, widest before half of its length; anterior margin sparsely and finely dentate, lateral margin densely and strongly dentate, posterior margin finely, densely and irregularly dentate.

The 7th ventrite of male without particularities.

8th urite, ♂: ventral view (fig. 177): posterior margin slightly convex, medial angle rounded, lateral angles slightly acuteangular (but not spinously produced!), lateral tubercles very feebly indicated, minutely dentate. Lateral view (fig. 196): medial angle moderately produced, lateral angle rounded, dorsal elevation (very similar to *M. pallidus*, n. sp.) in form of 2 tubercles (the anterior angulate).

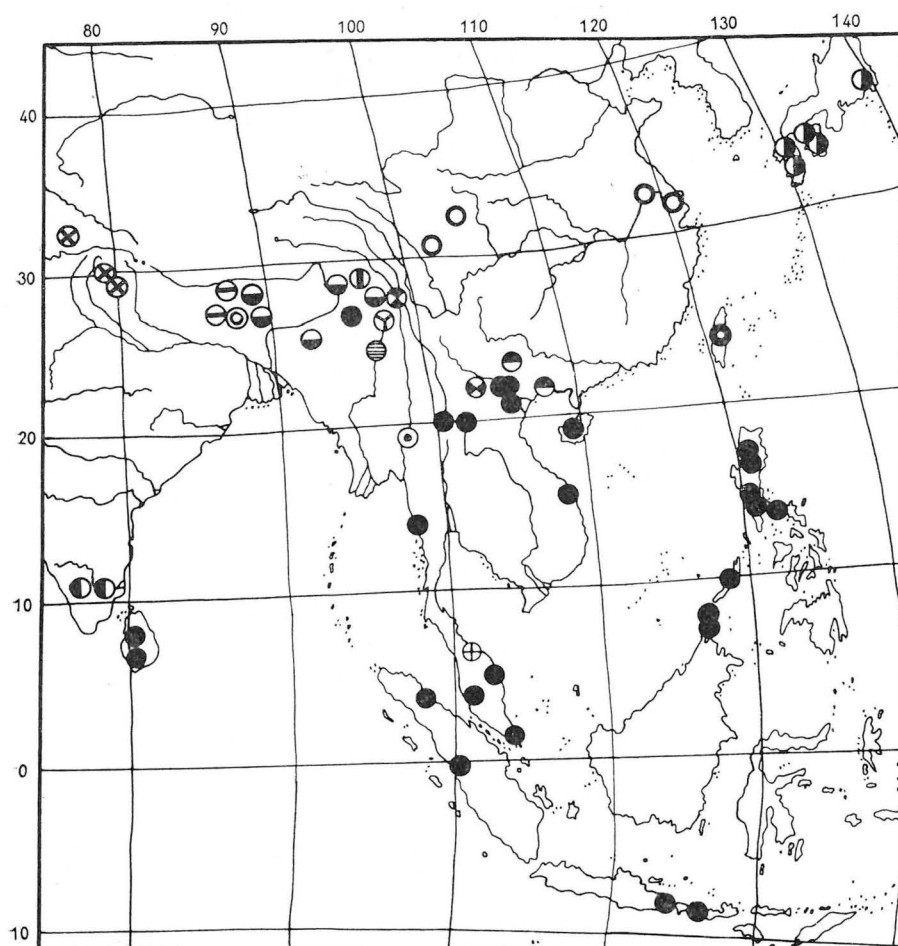
Pygophore (fig. 220) rather small, without parandria, distal margin moderately convex, medially subangulate, hypandrium moderately long, distinguished from the proximal part by an indistinct incurvation (or rather change of curvature) of the lateral outline.

Gonostyli as in figs. 275—277. Blade conspicuously pointed, its direction forms more obtuse angle to the direction of the proximal part of shank than in most other species.

Geographical variability. There are some differences between the males and females of this species: the males are slightly smaller, narrower and at first glance of more slender appearance; also the biometrical patterns are slightly different. Unfortunately, no female has been available from the locality of males and vice versa. Since in no species of Malcinae such sexual dimorphism has been ascertained, it is highly improbable that it would exist in *Malcus tuberculatus*, n. sp. It cannot be at present decided whether different subspecies, clines or local populations are involved. Certainly, however, both males and females are conspecific.

Differential diagnosis. The well developed posteromedial pronotal tubercle combined with moderate size and with lack of any other striking feature in external morphology distinguish *M. tuberculatus* safely from other Malcinae. The species having at least indicated posteromedial pronotal tubercle are either very distinctive by many striking characters in external morphology (*M. japonicus*, *M. dentatus*) or they belong to large species characterized by peculiar male genital characters (*M. auriculatus*, *M. furcatus*, *M. similis*). The genital characters of *M. tuberculatus* are most similar to *M. flavidipes flavidipes* and its subspecies, the outline of 8th urite (in lateral view) is, however, very distinctive.

Remarks on references. Distant's (1904a) record of *Malcus scutellatus* Dist. from Shillong (Assam) must be referred to *Malcus tuberculatus*, n. sp. according to examination of Distant's original specimen. Ishihara and Hasegawa's (1941) record of *M. scutellatus* from Assam was undoubtedly based on the above mentioned Distant's reference, since until 1941 no other Assamese locality of Malcinae had been mentioned.



| | | | | | | | | | | | |
|-----------------|---|---|--------------|---|---|----------------|---|---|--------------|---|---|
| auriculatus | = | ⊗ | furcatus | = | ⊗ | japonicus | = | ◐ | setosus | = | ⊙ |
| dentatus | = | ⊕ | idoneus | = | ● | mishmi | = | ◑ | similis | = | ⊗ |
| elongatus | = | ◐ | inconspicuus | = | ◑ | nigrescens | = | ⊗ | sinicus | = | ◐ |
| fl. asper | = | ◑ | indicus | = | ◑ | nigrofasciatus | = | ⊙ | thoracicus | = | ⊗ |
| fl. flavidipes | = | ● | insularis | = | ● | pallidus | = | ⊗ | tuberculatus | = | ◐ |
| fl. kumaunensis | = | ⊗ | | | | | | | | | |

Map 1. Geographical distribution of *Malcus*-species.

The symbols are identical for *Malcus auriculatus*, n. sp., *M. furcatus*, n. sp. and *M. nigrescens*, n. sp.; for *M. idoneus* Horv. and *M. insularis*, n. sp.; for *M. pallidus*, n. sp. and *M. similis*, n. sp.

X. Zoogeography and speciation of Malcinae

The present distribution of Malcinae characterizes this group as typically Oriental (Map 1). Only 2 species are East-Palaeartic (*Malcus sinicus*, n. sp., *M. japonicus* Ish. et Has.), and some species or subspecies occur in the mountainous transition area between the Palaeartic and Oriental regions. Some peculiar patterns of the distribution of Malcinae are, as follows:

1. Most of the species (and subspecies) occur endemically within very small areas. Only the following species are more widely distributed: *Malcus tuberculatus*, n. sp. in mountainous regions of S. W. Asia, both Palaeartic species (*M. japonicus* Ish. et Has. in all principal Japanese islands, *M. sinicus*, n. sp. in a great area in E. China) and *M. flavidipes flavidipes* Stål ranging from Ceylon to Luzon, and from Java to Assam and Hainan.

2. All endemic species of small ranges occur only in continental Asia, especially in mountains. The southern islands are inhabited by a single form, the nominate subspecies of *Malcus flavidipes* Stål, on Japanese islands *M. japonicus* Ish. et Has. is widely distributed. Only Taiwan has 2 endemic species.

3. There is no indication of the formation of island subspecies by *Malcus flavidipes flavidipes* Stål. Its island populations are morphologically rather homogeneous, and at the same time fairly different from the other species of the genus, but the continental specimens of this subspecies seem to exhibit some clines tending to link them morphologically and biometrically to other species of the genus and to both Himalayan subspecies of *Malcus flavidipes* Stål, which are remarkably similar to other Malcinae.

4. The occurrence of *Malcus flavidipes flavidipes* Stål in Ceylon is of a relict character, and probably represents the only discontinuity in the distribution of this subspecies. The nearest areas inhabited by this form are Sumatra and the Malayan Peninsula; in southernmost India another species occurs.

The following conclusions may be drawn from the distribution and taxonomy of Malcinae:

The mutual relationship of the individual species of Malcinae cannot be expressed by the usual cladistic dendrogram. We find some groups of very distinctly similar species (e. g. *Malcus sinicus*, n. sp. and *M. inconspicuus*, n. sp.; species with parandria and sexual modifications on the 7th male urite: *M. furcatus*, n. sp., *M. auriculatus*, n. sp. and *M. similis*, n. sp., etc.) taking in account only some conspicuous characters, but when the whole complex of morphological and biometrical patterns is considered, no species seems to be distinctly related to one of the others, but all together seem to be connected by many intricate networks of common characters seemingly occurring at random. It seems that the evolution of the species of Malcinae was a rather fast process, accomplished in a situation when the entire range of probably a single ancestral species was fragmented by many physical barriers; within their limits the species evolved approximately at the same time. Under different selective pressures they could evolve their modern phenotypic patterns independently of each other, but within the limits of the evolutionary predispositions peculiar to the genotype of their common ancestor. Thus the confusing mosaic-like occurrence of various characters within the complex of modern species can be explained.

Therefore, the mutual phylogenetic relationships among the individual species of Malcinae are, perhaps, not dependent on the relative recency of their common ancestry, but since all species are direct descendants of a single ancestral species, their relationship can be expressed only by mutual geographical relationships among the ranges in which they have arisen. The modern distribution (with some overlapping ranges of individual species) need not be, of course, consistent with the original ranges and the whole evolution was undoubtedly more complicated. Some species-groups may be mutually more related not only in geographical terms, but also in time of divergence from the ancestral species—the supposed main patterns of speciation in Malicinae may, however represent the generalized and most important type in this subfamily.

Since many regions where Malcinae undoubtedly occur are as yet unexplored and a lot of species are probably still undescribed, it would be premature to discuss this matter in detail, especially when some facts imply that already the supposed common ancestral species of Malcinae could have been polytypic, i. e. differentiated into geographical races, or, more probably, exhibiting several non-correlated clines. The whole problem will be discussed elsewhere, in connection with the known palaeogeographical data on S. E. Asia. It is, however, very probable that the main process of speciation of the continental species of Malcinae occurred already in the Tertiary in connection with the main orogenetical changes in S. E. Asia, and that the pleistocene climatic changes contributed only to the formation of modern distributional patterns and to subspeciation in some species (namely in *Malcus flavidipes* Stål). *Malcus flavidipes flavidipes* Stål is, perhaps, morphologically closest to the supposed ancestral species of Malcinae; it is also the taxon with the greatest intrinsic variability of all the taxa of Malcinae. The lack of any indication of at least subspeciation in *M. flavidipes* in Ceylon, Hainan, Indonesian Islands and Philippines, considered together with the appearance of mentioned clines in this subspecies in Continent and occurrence of another subspecies in the Himalayas, and compared with the abundance of well individualized species in mountainous S. W. Asia, may suggest that:

a) no insuperable geographical barriers occurred in the island area inhabited by *Malcus flavidipes flavidipes* Stål at the time of the main speciation of Malcinae;

b) the mountain subspecies of *Malcus flavidipes* Stål, occurring in the areas where the other well defined species of Malcinae live, represent more recent immigrants into those areas;

c) the isolation of the islands inhabited by *Malcus flavidipes flavidipes* Stål is of a very recent date;

d) the endemic species of Malcinae living in Taiwan and in the Japanese islands had evolved before the islands inhabited by *Malcus flavidipes flavidipes* Stål were isolated.

XI. Remarks on ecology of Malcinae.

Life history, the yearly number of generations, etc. are unknown in Malcinae. The dates of finds of *Malcus japonicus* Ish. et Has. (Ishihara and Hasegawa

1941, Hidaka 1960, specimens examined: 2. 6., 3. 6., 5. 6., 17. 6. — 11. 8., 13. 8., 25. 8., 23. 9.) suggest that the adults of this species hibernate and that only 1 generation occurs.

The regions inhabited by Malcinae belong to those parts of Oriental and East-Palaearctic tropics and subtropics (only *M. japonicus* Ish. et Has. reaches the moderately temperate zone) characterized by the yearly rainfall of more than 1000 mm. Malcinae occur both in coastal and inland areas, in the latter they probably prefer mountains (also *Malcus japonicus* Ish. et Has. occurs mostly in mountainous regions — a letter communication by Dr Miyamoto). The highest altitude given in the localities of Malcinae is of 2134 m from Kambaiti in Burma; some other localities without specified altitude from N. E. Burma, Sikkim or Kumaun may be even higher.

The only data on habitats, host-plants and abundance known to me are following: *Malcus japonicus* Ish. et Has. is "not gregarious" (Ishihara and Hasegawa 1941), very rare in Japan, and its host-plant "is considered to be *Morus bombycis* Koidz. (one of the paratypes was captured on a leaf of *Morus* by Nakane)" (communication by Dr Miyamoto). "*Malcus scutellatus* Dist." (probably *M. insularis* n. sp.) is not rare at Musha in Taiwan (Esaki 1926), and lives in mountainous regions there (Esaki 1932, Kato 1933). Specimens of *Malcus flavidipes asper* n. subsp., *M. tuberculatus* n. sp. and *M. nigrofasciatus* n. sp. were taken in Gopaldhara by "sweeping herbage" (data on labels). *Malcus flavidipes flavidipes* Stål was collected in Hainan by sweeping the herbage at a rubber-tree plantation situated in a place cleared of jungle (personal communication by Dr Hrdý). This subspecies (material not examined!) is abundant on the leaves of banana-trees in Cambodja (opinion of Mr Delattre communicated to me by Dr Carayon).

The body shape of adult Malcinae (short, but not too stout body, long antennae and legs), reminding of *Dicyphus* Fieb. (Miridae) and *Gampsocoris* Fuss. (Berytidae), suggests that, analogously to the before mentioned genera, Malcinae move slowly, but are capable of a short rapid run ending with a sudden quick flight. The numerous spinous processes in nymphs of Malcinae suggest that at least these stages live on plants covered by dense trichomes (analogously to nymphs of many Tingidae).

Summary

1. The morphology (including also internal ectodermal genitalia) of Malcinae and Chauliopininae is described and figured. Especially the morphology of abdomen and genitalia is studied in detail, and is partly newly interpreted.

2. The 5th stage nymph and eggs of *Malcus flavidipes flavidipes* Stål are described and figured.

3. The cases of teratology in Malcinae are described.

4. The morphology of Malcinae and Chauliopininae is compared, and primitiveness or derivativeness of individual structures is established.

5. The morphology of these subfamilies is compared with that of Lygaeidae (esp. Cyminae), Berytidae and Colobathristidae. Many new data on 2 latter families are presented, and the laterotergal region of Berytidae is newly interpreted.

6. Morphology of nymphs and eggs, anatomical and cytological data about the mentioned groups are compared.

7. The phylogeny of Malcinae and Chauliopininae is discussed. Both groups evolved probably (together with Cyminae, Berytidae and Colobathristidae) from precymine lygaeids. All non-lygaeid families of Coreoidea (sensu Štys) evolved probably from extinct Lygaeidae.

8. Some theoretical aspects of study of phylogeny are discussed; a theory on mosaic-like realization of evolutionary trends is presented.

9. Malcinae are raised to a family rank, the Chauliopininae are included in the Malcidae as a subfamily.

10. Some theoretical opinions on the relation of hierarchical classification to phylogeny are given.

11. New definitions of Malcidae, Malcinae and Chauliopininae are given.

12. The catalogue of references to Malcinae is given, the history of research in this group is reviewed.

13. The importance of some characters for taxonomy of Malcinae is discussed; application of some standard methods for study of this group is recommended.

14. The results of measurements and calculated ratios are summarized in biometrical tables.

15. Two keys to Malcinae are given: one based on externally visible characters, the other solely on male genitalia.

16. *Malcus flavidipes flavidipes* Stål (= *M. scutellatus* Distant **New synonym**), *M. idoneus* Horváth and *M. japonicus* Ishihara et Hasegawa are redescribed. The references to these species are discussed.

17. A clinal variability in *Malcus flavidipes flavidipes* Stål is noted.

18. The following new taxa are described: *Malcus auriculatus*, n. sp. (Burma), *M. dentatus*, n. sp. (Thai), *M. elongatus*, n. sp. (Burma), *M. flavidipes asper*, n. subsp. (E. Himalaya), *M. flavidipes kumaunensis*, n. subsp. (W. Himalaya), *M. furcatus*, n. sp. (Burma), *M. inconspicuus*, n. sp. (N. Vietnam, China), *M. indicus*, n. sp. (S. India), *M. insularis*, n. sp. (Taiwan), *M. mishmi*, n. sp. (Burma), *M. nigrescens*, n. sp. (Burma), *M. nigrofasciatus*, n. sp. (E. Himalaya), *M. pallidus*, n. sp. (Burma), *M. setosus*, n. sp. (Burma), *M. similis*, n. sp. (Burma), *M. sinicus*, n. sp. (China), *M. thoracicus*, n. sp. (N. Vietnam) and *M. tuberculatus*, n. sp. (Assam, Benghal, Burma).

19. All redescribed and described taxa are many times figured.

20. The zoogeography of Malcinae is reviewed, and their speciation is discussed. The modern species evolved probably by a "fragmentation" of a single ancestral species during Tertiary orogenetic changes. *Malcus flavidipes flavidipes* Stål may be most close to that species.

XII. REFERENCES

- Almasov A. and Boltovskoy E., 1955: On the treatment of words written with Cyrillic characters, for the purposes of zoological nomenclature, bibliography, reference indices, etc. *Bull. zool. Nomencl.* **11** (1) : 7—18.
- Ashlock P. D., 1957: An investigation of the taxonomic value of the phallus in the Lygaeidae (Hemiptera-Heteroptera). *Ann. ent. Soc. Amer.* **50** : 407—426, 23 figs.

- Banks C. S., 1909: Rhynchota Palawanica, Part I: Heteroptera. *Phillip. Journ. Sci.*, A, General Sci. **4**(6) : 573—597, 2 pls.
- Bartholomew J., 1958: The Times atlas of the World, mid-century edition. 1. London. —, 1959: ibidem. 2. London.
- Beier M., 1937: 28. Ordnung der Pterygogenea: Heteroptera = Wanzen. In Kükenthal: Handbuch der Zoologie, 4. Band: 2. Hälfte, 2. Teil: 2041—2204, figs. 2219—2435.
- Bergroth E., 1910: Remarks on Colobathristidae with descriptions of two new genera. *Ann. Soc. ent. Belg.* **54**: 297—305, 2 maps.
- , 1916: Neue Myodochidae (Hem. Het.). *Wien entomol. Ztg.* **35**: 215—221.
- , 1918: Studies in Philippine Heteroptera I. *Phillip. Journ. Sci.*, D, Gen. Biol., Ethnol. Anthropol. **13**(2) : 43—126.
- Bonhag P. F. and Wick J. R., 1953: The functional anatomy of the male and female reproductive systems of the milkweed bug, *Oncopeltus fasciatus* (Dallas) (Heteroptera: Lygaeidae). *J. Morph.* **93** : 177—284, 68 figs.
- Breddin G., 1899: Hemiptera Insulae Lombok in Museo Hamburgensi asservata adiectis speciebus nonnullis quas continet collectio auctoris. *Mitth. Naturhist. Mus. Hamburg* **16**(= 2. Beih. z. Jhrb. d. Hambg. Wiss. Anst.) : 155—194, 1 pl.
- , 1907: Berytiden und Myodochiden von Ceylon aus der Sammelausbeute von Dr. W. Horn (Rhynch. het.). *Deutsch. entomol. Zeitschr.* 1907 (1) : 34—47, 2 figs.
- Brues C. T. and Melander A. L., 1932: Classification of Insects. *Bull. Mus. comp. Zool. Harv. Coll.* **73** : 1—672.
- Brues C. T., Melander A. L. and Carpenter F. M., 1954: Classification of Insects. *Bull. Mus. comp. Zool. Harv. Coll.* **108** : V + 1—917, 1219 figs.
- Carayon J., 1950: Nombre et disposition des ovarioles dans les ovaires des Hémiptères-Hétéroptères. *Bull. Mus. nat. Hist. nat.* (2), **22** : 470—475.
- China W. E. and Miller N. C. E., 1955: Check-list of family and subfamily names of the Hemiptera-Heteroptera. *Ann. Mag. nat. Hist.* (12) **8** : 257—267.
- , 1959: Check-list and keys to the families and subfamilies of the Hemiptera-Heteroptera. *Bull. Brit. Mus. (Nat. Hist.) Entomology* **8**(1) : 1—45.
- Claassen P. W., 1921: Typha insects: their ecological relationships. *Corn. Univ. agr. exp. Sta.* **47** : 469—531, 86 figs.
- Davis N. T., 1961: Morphology and phylogeny of the Reduvioidea (Hemiptera: Heteroptera). Part 2. Wing venation. *Ann. ent. Soc. Amer.* **54** : 340—354.
- Distant W. L., 1901: Rhynchotal notes. XI. Heteroptera: Fam. Lygaeidae. *Ann. Mag. nat. Hist.* (7) **8**: 464—485.
- , 1904a: The fauna of British India, including Ceylon and Burma. Rhynchota. Vol. 2. London, 242, pp., 167 figs.
- , 1904b: Undescribed Rhynchota. *Entomologist*, **37** : 277—278.
- , 1910: The fauna of British India, including Ceylon and Burma. Rhynchota. Vol. 5. Heteroptera, appendix. London, 362 pp., 214 figs.
- Drake C. J. and Davis N. T., 1959: A new subfamily, genus, and species of Lygaeidae (Hemiptera-Heteroptera) from Australia. *J. Wash. Ac. Sci.* **49**(1) : 19—26, 19 figs.
- Dupuis C., 1963: Progrès récents de l'étude des genitalia des Hétéroptères (Étude bibliographique critique). Thèses présentées à la Fac. Sci. Univ. Paris pour obtenir le grade de D. Sc. nat., Mus. nat. Hist. nat., Paris, 100 pp.
- Esaki T., 1922: Unrecorded Heteroptera from Formosa. *Trans. nat. hist. Soc. Formosa* **12** (60) : 49—60 (in Japanese).
- , 1926: Verzeichnis der Hemiptera-Heteroptera der Insel Formosa. *Ann. Mus. nat. Hung.* **24** : 136—189.
- , 1932: p. 1621 in Iconographia Insectorum Japonicorum (= Nippon-Konchû-Zukan. Tokyo, Hokuryan, 4478 figs., 24 pls., (in Japanese).
- , 1950: p. 223 in Iconographia Insectorum Japonicorum, Editio Secunda, Reformata. Tokyo, Hokuryukan, Ltd., 1757 pp., 4969 figs., 15 col. pls. (in Japanese).
- , 1959: p. 223, ibidem.
- Handlirsch A., 1925: Hemiptera. In Schröder: Handbuch der Entomologie **3** : 1037—1140.
- Hertel R., 1953: Zur Artberechtigung von *Neides favous* Fieb. (Heteroptera: Neididae). *Beitr. z. Ent.* **3** : 372—377, 1 fig.
- , 1955: Zur Kenntnis der Systematik, Biologie und Morphologie von *Neides tipularius*

- L. (Heteroptera: Neididae). *Abh. Ber. Staatl. Mus. Tierkunde Dresden* **22** (2) 111–183, 24 figs.
- Hidaka T., 1960: The occurrence of *Malcus japonicus* on Kyushu. *Kontyû* **28** : 47 (in Japanese).
- Horváth G., 1904: Monographia Colobathristinarum. *Ann. Mus. Hung.* **2** : 117–172.
- , 1914: Miscellaneous Hemipterologica XIII–XVII. *Ann. Mus. nat. Hung.* **12** : 623–660, 9 figs. (XIV: Lygaeidae nonnullae indo-australiae p. 626–638).
- International Code of Zoological Nomenclature adopted by the XV International Congress of Zoology. Int. Commiss. Zool. Nomencl., London 1961, 176 pp.
- Ishihara T. and Hasegawa H., 1941: A new *Malcus* — species from Japan, with a list of Malcinae of the world (Hemiptera: Lygaeidae). *Mushi* **13** : 105–107, 1 fig.
- Jeannel R., 1909: Sur les mœurs et les métamorphoses de *Phyllomorpha laciniata* Vill. (Hem. Coreidae). *Bull. Soc. entom. France* 1909: 282–286.
- Jordan K. H. C., 1933: Beiträge zur Biologie heimischer Wanzen (Heteropt.) (*Spathocera dalmani* Schill., *Nysius punctipennis* H. S., *Ischnorhynchus resedae* Panz. und *Galeatus maculatus* H. S.). *Stettin. ent. Ztg.* **94** : 212–236.
- , 1935: Beitrag zur Lebensweise der Wanzen auf feuchten Boden (Heteropt.). *Stettin. ent. Ztg.* **96** : 1–26.
- Kato S., 1933: pl. 30 in Bunrui — Genshoku — Nippon — Konchû — Zukan, 5 (in Japanese).
- Kormilev N. A., 1949a: *Riggiella vianai* n. g., n. sp. de la Argentina (Hemiptera, Lygaeidae, Blissinae). *Com. Inst. nac. Investig. Cienc. Nat., Cienc. zool.* **1** (11) : 1–13, 4 figs.
- , 1949b: Notas sobre los Colobathristidae de Bolivia con la Descripción de un Género y una Especie Nuevos (Hemiptera). *Notas Mus. de La Plata* **14** : 167–176, 3 figs.
- Leston D., 1958: Chromosome Number and the Systematics of Pentatomomorpha (Hemiptera). *Proc. 10th int. Congr. Entomol. Montreal 1956*, **2** : 911–918, 5 figs.
- , 1962: Tracheal capture in ontogenetic and phylogenetic phases of insect wing development. *Proc. R. ent. Soc. London* (A) **37** : 135–144, 20 figs.
- Lethierry L. and Severin G., 1894: Catalogue général des Hémiptères. Tome II. Hétéroptères — Coreidae, Berytidae, Lygaeidae, Pyrrhocoridae. Bruxelles, 277 pp.
- Manna G. K., 1958: Cytology and Inter-Relationships Between various Groups of Heteroptera. *Proc. 10th int. Congr. Entomol. Montreal 1956*, **2** : 919–934.
- Michener C. D., 1957: Some bases for higher categories in classification. *Syst. Zool.* **6** : 160–173.
- Miller N. C. E., 1956: The biology of the Heteroptera. London, 162 pp., 64 figs., 5 pls.
- Miyamoto S., 1957: List of ovariole numbers in Japanese Heteroptera. *Sieboldia* **2** : 69–82, 1 pl.
- , 1959: Additions and correction to my “List of ovariole number in Japanese Heteroptera”. (1). *Sieboldia* **2** : 121–123.
- , 1961: Comparative morphology of alimentary organs of Heteroptera, with the phylogenetic consideration. *Sieboldia* **2** (4) : 197–259, pls. 20–49.
- Naef A., 1919: Idealistische Morphologie und Phylogenetik. (Zur Methodik der Systematischen Morphologie.) G. Fischer, Jena, 77 pp., 4 figs.
- Obenberger J., 1958: Entomologie 4. Praha, 614 pp, 603 figs. (in Czech).
- Oshanin B., 1906: Verzeichnis der Palaearktischen Hemipteren mit besonderer Berücksichtigung ihrer Verteilung im Russischen Reiche. I. Band Heteroptera. I. Lieferung Pentatomidae-Lygaeidae. St. Petersburg, LXXIV + 586 pp.
- , 1912: Katalog der palaearktischen Hemipteren (Heteroptera, Homoptera-Auchenorrhyncha und Psylloidea). Berlin, XVI + 187 pp.
- Pendergrast J. G., 1957: Studies on the reproductive organs of the Heteroptera: with a consideration of their bearing on classification. *Trans. R. ent. Soc. London* **109** (1) : 1–63.
- Pfaller-Collander E. v., 1941: Vergleichend-karyologische Untersuchungen an Lygaeiden. *Acta zool. Fenn.* **30** : 1–120, 49 figs., 2 pls.
- Poisson R., 1951: Ordre des Hétéroptères. In Grassé: *Traité de Zoologie*, T. 10, Fasc. 2 : 1657–1803, figs. 1463–1591.
- Pruthi H. S., 1925: The morphology of the male genitalia in Rhynchota. *Trans. ent. Soc. London* 1925: 127–267, 279 figs.

- Puchkov V. G., 1958: Lichinki nastojaschikh poluzhestkokrylykh (Hemiptera-Heteroptera). I. Lygaeidae. *Ent. Obozr.* **37** : 392—413, 36 figs. (in Russian)
- Puchkova L. V., 1956: Jajtha nastojaschikh poluzhestkokrylykh (Hemiptera-Heteroptera). II. Lygaeidae. *Ent. Obozr.* **35** : 262—284, 3 pls. (in Russian).
- , 1959: Stroenie i razvitie jajth nazemnykh poluzhestkokrylykh (Hemiptera-Heteroptera) i ikh klassifikacii. Avtoreferat dissertacii na soiskanie uchenoj stepeni kandidata biologicheskikh nauk, AN Ukrainskoj SSR, Inst. Zool., Kiev, 15 pp.
- Schaefer C. W., 1963: Remarks on Scudder's classification of the lygaeoid-coreoid complex of the Heteroptera. *Canad. J. Zool.* **41** : 1174—1175.
- Scobel A., 1899: Andrees allgemeiner Handatlas. Bielefeld u. Leipzig.
- Scudder G. G. E., 1957: A revision of Ninini (Hemiptera-Heteroptera, Lygaeidae) including the description of a new species from Angola. *Public. cult. Comp. diam. Angola* **34** : 91—108, 16 figs.
- , 1959: The female genitalia of the Heteroptera: morphology and bearing on classification. *Trans. R. entom. Soc. London* **111** : 405—467, 103 figs.
- , 1962a: The Ischnorhynchinae of the world (Hemiptera : Lygaeidae). *Trans. R. entom. Soc. London* **114** : 163—194, 32 figs.
- , 1962b: Results of the Royal Society expedition to Southern Chile, 1958—59: Lygaeidae (Hemiptera), with the description of a new subfamily. *Canad. Entomol.* **94** : 1064—1075, 11 figs.
- , 1963: Adult abdominal characters in the lygaeoid-coreoid complex of the Heteroptera, and the classification of the group. *Canad. J. Zool.* **41** : 1—14, 9 figs.
- Simpson G. G., 1961: Principles of animal taxonomy. New York, Columb. Univ. Press, 247 pp., 30 figs.
- Slater J. A., 1963: Immature stages of the subfamilies Cyminae and Ischnorhynchinae (Hemiptera: Lygaeidae). *J. Kans. entom. Soc.* **36** : 84—93, 5 figs.
- Slater J. A. and Hidaka T., 1958: Studies on the Lygaeidae, II. A new species of the genus *Entisberus* from Japan (Hemiptera, Lygaeidae). *Mushi* **32** (9) : 93—95 1 fig.
- Slater J. A. and Hurlbutt H. W., 1957: A comparative study of the metathoracic wing in the family Lygaeidae (Hemiptera : Heteroptera). *Proc. ent. Soc. Wash.* **59** : 67—79, 28 figs.
- Slater J. A. and Miyamoto S., 1963: A revision of the sugar cane bugs of the genus *Cavalerius* (Lygaeidae: Blissinae). *Mushi* **37** (14) : 139—154, 46 figs.
- Slater J. A. and Sweet M. H., 1963: *Australodemus*, a new genus of Blissinae from Australia, with a description of a new species of *Heinsius* (Hemiptera : Lygaeidae). *J. entom. Soc. Queensland* **2** : 51—55, 11 figs.
- Slater J. A., Woodward T. E. and Sweet M. H., 1962: A contribution to the classification of the Lygaeidae, with the description of a new genus from New Zealand (Hemiptera : Heteroptera). *Ann. ent. Soc. Amer.* **55** : 597—605, 17 figs.
- Southwood T. R. E., 1956: The structure of the eggs of the Terrestrial Heteroptera and its relationship to the classification of the group. *Trans. R. ent. Soc. London* **108** (6) : 163—221, 13 figs.
- Southwood T. R. E. and Leston D., 1959: Land and Water Bugs of the British Isles. F. Warne Ltd., New York and London, 436 pp., 153 figs. and 63 pls.
- Stål C., 1859: Hemiptera. Kongliga Svenska Fregatten *Eugenies* Resa Omkring Jorden under Befäl af C. A. Virgin åren 1851—1853, Zoologi 4 : 219—298, pls. 3 and 4, Stockholm.
- , 1866: Hemiptera africana. *Tomus secundus*. Holmlae, 181 pp.
- Stichel W., 1957: Die Erscheinungszeiten einiger klassischer Werke über Heteroptera. *Mitt. Schweiz. ent. Ges.* **30** : 343—346.
- , 1959: Illustrierte Bestimmungstabellen der Wanzen. II. Europa. 4(10): 289—320. Berlin.
- , 1960: Verzeichnis der Paläarktischen Hemiptera-Heteroptera. III. p. 94—186 Berlin.
- Štys P., 1959: Reinterpretation of the theory on the origin of the pterygote ovipositor and notes on the terminology of the female ectodermal genitalia of insects. *Acta Univ. Carol. Biologica* 1959: 75—85, 9 figs.

- , 1961: Morphology of the abdomen and female ectodermal genitalia of the trichophorous Heteroptera and bearing on their classification. Verh. XI. int. ent. Kongr. Wien 1960, 1 : 37—43, 2 figs.
 - , 1963: Notes on the taxonomy, distribution, and evolution of the Chauliopininae (Lygaeidae, Heteroptera). *Acta Univ. Carol. Biologica* 1963 : 209—215, 7 figs.
 - , 1964a: The morphology and relationship of the family Hyocephalidae (Heteroptera). *Acta Zool. Ac. Sci. Hung.*, 10 : 229—262 29 figs.
 - , 1964b: Thaumastellidae — a new family of Pentatomoid Heteroptera. *Acta Soc. ent. Českoslov.* 61 : 238—253, 14 figs.
- Sweet M. H. and Slater J. A., 1961: A generic key to the nymphs of North American Lygaeidae (Hemiptera-Heteroptera). *Ann ent. Soc. Amer.* 54 : 333—340, 7 figs.

Appendix

The manuscript of this paper was submitted at the beginning of 1964. For technical reasons it was impossible to include in this monograph the discussion of papers published during the elapsed period and relevant to Malcidae or related taxa. They will be dealt with in a separate paper containing also recently accumulated new data on Malcinae. Nevertheless, a few comments are necessary here.

1) The valid name of the subfamily Megalonotinae (Lygaeidae) is now Rhyparochrominae (Opinion 676). Hence also all references to this subfamily in this paper should be changed and the term „premegalonotine lygaedis“ should be read as „pre-rhyparochromine lygaedis“.

2) The subfamily Pamphantinae (Lygaeidae) was reduced to a tribe of Bledionotinae by Scudder (1963b); I think this is a reasonable action. All references to this group should be therefore read as Bledionotinae: Pamphantini;

3) The morphology of Colobathristidae is now better known (Štys 1966a, b) and the relationship of this family to precymine ancestors, rather tentatively claimed in the present paper, seems to be firmly established. The morphology of spermatheca in particular suggests that Malcidae, Berytidae and Colobathristidae belong to the same evolutionary line, which was called a „malcid evolutionary line“ in my review of the phylogeny of Coreoidea (Štys 1965).

4) Slater and Sweet (1965) recently raised the tribe Psammiini Bergoth, 1921 (Lygaeidae: Geocorinae) to a subfamily rank and discussed its morphology and relationships. Many features of Malcinae and Chauliopininae (dorsal abdominal glands, spiracles, trichobothria, 7th ventrite of female, male and female genitalia) were mentioned and mostly well characterized. However, a few errors of Slater and Sweet should be corrected: a) Malcinae do possess dorsal processes on phallosome; b) there is a trace of a cleft on the 7th ventrite in females of Malcinae; c) some structures of female genitalia of Malcinae were misinterpreted: „the eight valvifers“ are in fact posterior lobes of the 7th ventrite and „ninth paratergites“ are the true 1st valvifers; d) Cyminae do have trichobothria on the 4th ventrite. Slater and Sweet did not reach any definite conclusion on the relationship of Psammiinae, but they pointed out many similarities between this subfamily and the Malcinae — Chauliopininae. The similarities between the Piesmatidae and Psammiinae were considered as parallel evolutionary developments.

The family Piesmatidae has not been considered in the present paper. It is phenetically insomuch different from other Coreoidea that it was necessary to include it in a separate superfamily (Štys 1961), but it probably shares the precymine ancestry with the malcid line. Whether the cladistic relationship to precymines is true also for Psammiinae is a new problem ensuing from the paper by Slater and Sweet. It will be investigated in another paper together with the problem of the ancestry of Piesmatidae.

REFERENCES

- Opinion 676, 1963: Pamera Say, 1831 (Insecta, Hemiptera): Suppressed under the plenary powers. *Bull. Zool. Nomencl.* 20 : 333—335.
- Scudder G. G. E., 1963b: Pamphantinae, Bledionotinae and the genus Cattarus Stål (Heteroptera, Lygaeidae). *Opusc. ent.* 28 : 81—89.

- Slater J. A. and Sweet M. H., 1965: The systematic position of the Psammiinae (Heteroptera: Lygaeidae). *Proc. ent. Soc. Wash.* **67** : 255—262.
- Štys P., 1965: General outline of the phylogeny of Coreoidea (Heteroptera). *Proc. 12th Int. Congr. Ent.*, London 1964, p. 74.
- , 1966a: Revision of the genus *Dayakiella* Horv. and notes on its systematic position (Heteroptera, Colobathristidae). *Acta ent. bohemoslov.* **63** : 27—39.
- , 1966b: Morphology of the wings, abdomen and genitalia of *Phaenacantha australiae* Kirk. (Heteroptera: Colobathristidae) and notes on the phylogeny of the family. *Acta ent. bohemoslov.* **63** : 266—280.