TAXONOMIC CHARACTERS

A brief survey of the taxonomic characters used in the present work will enable us to have a general picture of the stability and variability of the morphological features in thrips which together with their colouration are helpful in the separation of taxa at the genus and species levels.

The Head

The head in the dorsal view is generally squarish to somewhat broader than long, but may be elongate and longer than broad as in Amalothrips, Neocorvnothrips, Sorchothrips jonannphilus, or Cricothrips alis. The cheeks (genae) may be straight and parallel-sided in Antiothrips, Ascirothrips, Megalurothrips (females), some Anaphothrips, or gradually converge posteriad in Alathrips, Ceratothripoides, and many Thrips. In Dendrothripoides the cheeks are swollen considerably immediately behind the eyes, followed by a constricted collar. In many cases the cheeks are slightly emarginate behind the eyes, but are swollen posteriorly as in Neocorvnothrips, Thrps orchidii, Cricothrips albus, C. alis. The antennal bases are separated by the frontal costa which is usually narrow, but may be broad and enlarged when it is a flat process as in Smeringothrips and Aroidothrips. Looked from above the frontal costa may be truncated as in most genera but in Chirothrips the margin is produced forward as a conical process. A distinct anterior production of the head between and in front of eyes is seen in Neocorvnothrips, Amalothrips and many Chirothrips.
The ocellar area is often raised or elevated above the surrounding area to form a hump (clearly visible in lateral mounts) in Cricothrips, Craspedothrips and others, or this area may be flat as in Priesneciola and Chirothrips. In the genus Diarthrothrips, however, one species (coffea) lacks a distinct hump, whereas another (nimbus) has a well developed hump.

The ocelli are usually present in macropterous individuals, but are absent in brachypterous and apterous forms. One notable exception has been seen in Cricothrips caesnitus (PR.) where the apterous male has fully developed ocelli.

The position of ocelli is variable. In many genera these are placed in the anterior part of the dorsal interocular area, in others they are placed far behind in the area (as in Chirothrips, Exothrips cephalicus).

The head is produced downwards and backwards into a conical mouth cone. It is short in Amphithrips, Seringothrips etc., but broad and long in Agriothrips. In Lunithrips, Tusothrips, Perissothrips, and some Myterothrips it is long and slender. It is interesting to note that Myterothrips chaetogastra females have a mouth cone with a progressively decreasing length in populations from northern to southern India; the males of this species have only the short conical type. Thus M. chaetogastra shows sexual dimorphism in the northern population.

The shape of the maxillary palps is often indicative of the relationships of species, but their segmentation is not. The earlier trend to lay too much emphasis on the segmentation of the
maxillary palp is gradually losing its appeal with modern workers. The maxillary palp is generally 3-segmented and moderately slender. It may be long and slender as in *Perissothrips*, or short and stout as in *Neocorynothrips*. A two-segmented condition exists in many genera like *Ayvaria*, *Smeringothrips*, *Gnomothrips*, etc.

The dorsal and postocular chaetotaxy affords fairly constant characters. The position and size of interocellar setae (1 pair) are constant within limits for each species, and they may be located within or outside the triangle. The anteroocular setae ("ocellar setae" of O'NEILL & BIGLOW, 1964) may be one pair (*Thrips*, *Baliothrips*, *Cricothrips*), two pairs (*Scolothrips*, *Nycterothrips*, *Sorchothrips*), or as many as 4 pairs (*Florithrips*, *Exothrips anolis*). *Chirothrips africanus* may have 2 to 3 pairs, whereas some exotic species of *Chirothrips* (like *spinipecs*) have as many as 26 pairs. The postocular setae usually form a continuous row (linear arrangement). A nonlinear arrangement is present in *Bolanothrips*, many *Baliothrips* and some *Thrips* species.

The ventral interocular setae are generally constant in number, there being 5 pairs of these up to the anterior tentorial setae pits, but *Neocorynothrips* has 7-8 on either side.

The sculpture on the dorsal surface in the anteroocular and occipital areas is usually transverse. *Indusiothrips* has the entire dorsal surface reticulate, whereas *Dendrothripoides* has only the interocular part reticulate. Some genera like *Priesneriola* and *Chirothrips* have a smooth interocular area.
The Antenna

The primitive antenna is 9-segmented, which condition is found in Ascirtothrips, and some Anaphothrips and Oxythrips. The 8-segmented antenna is the most commonly met with, as in Chirothrips, Scolothrips, Frankliniella, many Thrips and so on. The 7-segmented condition is found in Baliothrips, Ramaswamiahniella, many Thrips, etc. In Priesneriola, Antinothrips rufus (GMELIN) and Caprithrips melanorhthalmus (SAGNALL), the antennae are 6-segmented. The number of antennal segments is usually constant for a given species. However some exceptions are there. Some species of Thripis (havaiiensis, flavus) may have 7 or 8 segments; Ruphysothrips minozzii, though normally having 8 segments, shows only 7 segments in some antennae; Oxythrips indicus may have 8 or 9 segments. Sexual dimorphism in the number of antennal segments is seen in Sorghothrips longistylus and Johnsonaphilus where the female has 7 and 8 segments respectively but the male has only 6.

The sense cone on segments III and IV may be single (simple) or bifurcated (forked). There are 3 well developed sense cones on segment V in Ceresaothrips and Acridothrips, but in other genera only 2 sense cones are present. Generally the sense cones arise from a nearly circular base, but in Emeeringothrips the outer (major) sense cone on segment V, and two sense cones on VI arise from a greatly elongate base.

The shape of antennal segments, and their size and chaetotaxy are useful in recognition of species and sometimes of genera too. In many species of Chirothrips segment I is enlarged, particularly
in the males, the same happens in the males of some *Exothrips*. Many *Chirothrips* species have segment II produced exteriorly at apex, whereas in some species of *Exothrips* segment IV or V may be produced. A very unusual structure of antenna is seen in males of some genera; in *Craspadothrips* segments III to VI are very much enlarged and heavily setose (just like the males of the exotic genus *Plesiothrips*), whereas in some *Mycterothrips* and *Sorghothrips* segment VI is greatly enlarged and heavily setose accompanied by a reduction of segments preceding and following it.

In most genera segments II to VI bear each a varying number of annular or semiannular rows of microtrichia. On II there are 3 rows of microtrichia restricted to the dorsal side, these may be present or absent in species of a single genus. Microtrichia are absent on segments VII and VIII, but in *Projectothrips* segment VIII is heavily clothed with microtrichia. In several cases the microtrichia are lost on all segments, as in *Chirothrips* (most species), *Aneurothrips*, *Sciorthrips*, and males of *Craspadothrips* and *Plesiothrips*.

**The Prothorax**

The pronotum is usually broader than long, often it is as long as broad, but rarely (*Perissothrips*) it is much longer than broad. Its surface is covered with setae which may be of a uniformly small size (*Anaphothrips*, *Caprithrips*, *Amaurothrips*) or one or more setae at each posterior angle may be long and prominent. Thus in *Oxythrips*, *Dichromothrips*, *Laplothrips*, etc., there is one long seta at each posterior angle. In *Bregmatothrips*, *Thrins*, *Balotheins*, etc., there are two such setae.
Usually the posteroangular setae are pointed at apex, in *Lunithrips* these are apically dilated and fringed. It is not possible here to accept the interpretation of STANNARD (1956, 1968), who calls the posteroangular setae as epimeral setae. The area from which these setae arise is pronotal and not pleural. The epimeral area which is usually not visible dorsally lacks setae.

One or two pairs of anterior marginal or submarginal setae may be enlarged. Near the lateral margin on either side often one of the setae (sublateral or midlateral) is enlarged.

Along the posterior margin, between the major posteroangular setae, are a variable number of setae. There may be just one pair (*Arpidothrips, Avvaria*), or two pairs (*Cricothrips, Mnycterothrips, Smerinotrichria*, etc.), or more commonly 3 pairs (*Sorchothrips, many Baitiothrips, many Thrins*, etc.), or 4 pairs (*Megalurothrips, some Thrins*), or as many as 5-7 pairs (*Microcephalothrips, Ernothrips, Euphysothrips*). The innermost of these setae is usually the longest, with the size gradually decreasing towards the sides. However, in *Ceratothricoides brunneus* and *olartis* the posteromarginal setae are alternately longer and shorter starting from the innermost pair. In *Frankliniella* a very unusual feature is seen, in that the innermost pair is very small, the pair next to it being the longest.

Anterior to the innermost pair of posteromarginal setae is often a pair of discal setae known as the prebasal setae (named by PRISSNER, 1936, in *Malanthrips*, and 1950, in *Eclolothrips*). Although this pair of setae is not differentiated in size from
the other disc setae, its presence or absence in some cases helps in the separation of species. Thus Scolothrips australis may be separated from indicus by the absence of the prebasal pair of setae; similarly Cricothrips indicus lacks these setae whereas three other related species have these. Yet in Cricothrips albus this character is variable.

Based upon the number of long setae on pronotum, we may recognise several groups of genera: (a) with one pair of long setae (many genera like Oxythrips, Laplothrips, Limothrips, etc.), (b) with 2 pairs of long setae (many genera), (c) with 3 pairs of long setae (Avvaria, Aroidothrips, Seringothrips), (d) with 4 pairs of long setae (Eurothrips), and (e) with 5 pairs of long setae (Eurothrips). Proietothrips is interesting in having species with one to three pairs of long setae in different species, always situated at the posterior angles.

The pronotal surface is mostly sculptured with transverse lines or ridges which often anastomose. In some cases the surface is smooth (Agriothrips, Microcephalothrips, Cricothrips, some Megalurothrips, some Baliothrips, etc.), but in others it is reticulate (Aneurothrips, Indusiothrips, Antinothrips).

The prosternum is largely membranous and is divisible into two main parts, an extensive membranous or semimembranous area of basisternum, and a sclerotised sternosternellar area. The anterior basisternal part is usually completely membranous and lacks setae. It is weakly sclerotised in a median longitudinal strip in Megalurothrips, some Thrips, and Craspedothrips minor. Craspedothrips harringae has the median strip well sclerotised and fused posteriorly with the sternosternellum. The median basisternal area is
partially and weakly sclerotised in patches in *Microcephalothrips* and bears 4 to 5 pairs of setae. Some species of *Chaetanaphothrips* have 2 to 3 pairs of setae on the semimembranous basisternal area. The basisternum in *Aneurothrips* bears a seta on either side.

The sclerotised sternosternellar area in most cases forms a transverse strip between the two apophysial pits. The condition of this transverse sclerotisation is very useful for separating species and even genera as has been shown by the writer (BHATTI, 1969a) for members of the tribe Dendrothripini. In Thripini a wide variety of form occurs. *Priesneriola* and *Ayvaria* show the transverse sclerotisation divided into two halves which almost meet but do not fuse in the middle. The same condition occurs in *Baliothrips kroeli*, while in the related species *dispar* the sclerotisation is undivided. In *Aneurothrips*, *Caprithrips*, and *Psilothrips*, the two halves are widely separated.

Although usually the apodemuses (apophyses) issuing from the apophysial pits are long and distinct, in *Caprithrips* they are reduced. The sternocostal suture is usually absent, but sometimes it is clear. The transverse sclerotisation generally comprises only a small basisternal area. However in *Amalothrips* and *Caprithrips analis* the greater part of the sternosternllum appears to be basisternal. In the former this sclerotised area carries setae on either side, whereas in the latter the membranous basisternum carries setae. The sternosternellar plates in *Caprithrips melanophthalmus* merge indistinctly with the anterior part of basisternum which is weakly sclerotised, and the entire sternosternellar area has transverse striae.
The intersternite (spinasternum) is a transverse sclerite bearing a median spina posteriorly. Between the sternosternellar sclerite and the spinasternum is a membranous area which in some cases (*Megaluorthrns, Craspedothrns minor*) bears a median patch of weak sclerotisation immediately next to the sternosternellar sclerotisation.

**The Pterothorax**

The mesoscutum in macropterous forms has 3 pairs of major setae, of which there are 2 pairs of median setae and 1 lateral seta on either side. The inner pair of median setae may be placed along posterior margin or across the middle of the scutum. The setae of the outer pair are situated along the posterior margin. The sculpture of mesoscutum is mostly of transverse lines, but it may tend towards reticulations (*Aneurothrin*) or most of the surface may be nearly smooth (some *Oriothrin*).

The metascutum and scutellum are separate sclerites in macropterous forms, but in apterous and brachypterous forms they are not separated. In macropterous form the metascutum has 2 pairs of setae both of which may be along the anterior margin, or the inner may be placed back of the margin, depending upon the species.

The sculpture on metascutum may consists of (a) longitudinal lines, (b) longitudinal lines often anastomosing, (c) longitudinal lines anastomosing to form distinct longitudinal reticules, (d) reticules not oriented in any particular direction, and (e) reticules elongated transversely. In some cases between the lines of sculpture there may be secondary lines, weaker than the main
lines; secondary lines forming wrinkles are often present. The sculpture may be wanting medially on metascutum as in Avaria and some Cricothrips. A pair of discaal pores are often present on the metascutum, but sometimes this character is variable in a single species. Thus Cricothrips albus may or may not have the discaal pores.

The mesosternum is divided into two parts, the large sterno-sternellum, and a narrow strip, the spinasternum behind, separated by an apodemal line. On either end of this apodemal line is the sternal coxal process, but the base of furca is extended forward of this line to a smaller or greater extent. When the base is very much extended forward and traverses much of the length of the sternum, it is marked by an internal longitudinal ridge named as the spinula (Priesner, 1957). A similar forward extension of the furcal base occurs in many other insects (Snodgrass, 1935), thus obliterating the demarcation between the basisternum and sternellum. In most cases the mesospinula, when present, is a constant structure. But in some species of Haliotrips it is variably developed. H. biformis and aralian usually lack it, but an incidental number may possess it; calus and graminum have a distinct spinula; and tenabrius lacks it in a small percentage of specimens. The furcal pits are usually closely approximated and fuse in the middle, but in Chorithrips these are placed wide apart.

Perissothrips aureus shows a unique example of sexual dimorphism in the mesosternum with a thick dark spine like seta at each lateral angle in the male.

The spina is reduced and appears to be invaginated in the middle of the transverse apodemal line referred to above. The spinasternum is free posteriorly and not fused with the metasternum in the Thripini.
The mesosternum is usually marked from the pleura by sterno-pleural sutures but sometimes the sutures may be indistinct (Agriothrins) or absent (Avvaria, Scolothrins, Dusothrins, Neocorynothrins, Cricothrins, Ednathrins pardus).

The metasternum is a single composite plate not separated from the pleura. The sternacostal suture is usually present separating a depressed sternellum from the basisternum. This has been called as the metaspinasternum by STANWIND (1956, 1966) although the metasternum never possesses a spinasternite (SHODGASS, 1935). The shape of metasternellum affords characters useful at the specific level. As in the case of the mesosternal furca, the base of metasternal furca might often be extended forward to form a spinula. This happens in Aiothrins, Diarthrothrins, Dichromothrins, Foliothrins, Mycoterothrins, Psilo- thrins, Scolothrins, and Emeirenothrins.

The mesoanepimeron (metepimeron of SAKIMURA, 1967a, etc.) may be reticulate as in Thrins, Batiothrinis, etc., or it may bear a pubescence of microtrichia, as in Aroidothrins, etc. Often it is partially reticulate, as in some Amblythrins.

The Wings

The wings may be fully developed (macropterous forms), or shortened (hemimacropterous forms), or reduced to short stubs (brachypterous or micropterous forms), or in some cases all trace of wings is lost (apterous forms). Some species show more than one conditions of wing development. The females of Microcephalo-thrins abdominalis are macropterous, whereas the males are
macropterous or brachypterous. In *Anaphothrips sudanensis* the females may be macropterous or brachypterous, whereas the males are always brachypterous. Although the females are macropterous, the males of *Priesneriola oncella* and *Brachmatothrips brachycephalus* are apterous. In *Antinothrips* both sexes are apterous. *Baliothrips pteratus* has both sexes hemimacropterous. A vast majority of species have fully developed wings in both sexes. However, even where both sexes are macropterous, it would not be unlikely that a form with differently developed wings or without wings may be discovered. For instance, *Selacothrips orizae* is known to be macropterous in both sexes, but now a brachypterous female has been discovered.

The structure of fore wing is taxonomically useful. The entire surface is covered with microtrichia forming a dense pubescence. Certain deviations from this general pattern exist. *Scolothrips* has the wing surface covered by granules. The proximal part of fore wing in *Paiothrips indicus* lacks microtrichia and the surface is wrinkled. In *Pandrothripoides* the basal part of the wing has large warts. The size of microtrichia is generally uniform on the entire wing. But in *Indusiothrips* several rows of microtrichia along the basal part of upper vein are enlarged, and a single row of such enlarged microtrichia continues along the length of the vein. Such differentiated microtrichia along the veins have been named elsewhere (MATTI, 1968) as venal microtrichia in contrast to the undifferentiated intervenal microtrichia.

A fully developed wing is divisible into an elongate body or wing blade from which a short basal lobe is separated along the anal fold. This basal lobe is called the scale or anal lobe or alula (PAEISNER, 1926a, 1964b; PESSON, 1951).
The venation is reduced and each vein is marked by a series of chitinised rings. These rings enclose lacunae which are regarded as air cavities (JONES, 1954). The oval lacunae are distinct proximally and then become more and more diffuse, and finally fade out. However, in many cases the veins are not distinct throughout their course, and only the presence of setae (macrotrichia) marks their position. Along the margin of the wing blade runs the ambient vein. The anterior costal part of this vein usually bears a variable number of setae, although in one species (Chirothrips tuttlei) the setae are absent. The anal part of the ambient vein never has any setae. Two other principal veins are distinguishable although they are often represented by the presence of setae alone. The anterior of these is referred to as the upper or anterior or principal vein (Hauptader). The posterior vein is referred to as the lower or posterior or second longitudinal vein (Nebenader). This vein arises in the basal third of the wing, as a bifurcation (or fork) from the upper vein. PRIEBNER (1926a, 1964b) compared the venation with that in Zoraptera, and identified the upper vein as the radius (plus branches), and this has been accepted by all subsequent workers. But the homologies of the lower vein are not quite agreed upon. PRIEBNER considers this homologous with the cubitus, which view has been followed by PEISSON (1951) and JONES (1954). DOEKSENN (1941) regards this as media + cubitus, while ZUR STRASSEN (1957, etc.) continues to regard this as the media. Cross veins may or may not be present, but their presence or absence has little bearing on speciation, as has been amply demonstrated in Cranothrips by FAURE (1962). The number and size of setae along the veins are important for the separation of species.
The anterior and posterior margins of the wing are provided with long fringes of hair. Those along the anterior margin are always straight, but are absent in *Psilotrheis*. The posterior fringe hair may be straight or undulated (wavy).

**The Legs**

The legs are exclusively gressorial, and are not enlarged usually.

The coxae are mostly simple. But in *Avvaria* the fore coxae have each an anteriorly directed conical process near its distal end, whereas each fore coxa of *Perissothrips aureus* males is produced posteromesially into a short conical process bearing a short stout seta. The fore femora are often broad, and in *Ctenidothrips* bear an inwardly directed tooth near apex, whereas in *Perissothrips pardinus* a pair of teeth are present basally.

The fore tibiae are unarmed in most species, but some have one or more teeth on the inner margin near the distal end. A single small tooth is found in many *Exothrips*, whereas a pair of teeth is present in *Perissothrips aureus*. A large tooth apically and smaller tubercles subapically are present in *Ctenidothrips* and in males of *Perissothrips pardinus*. The fore tibia of *Sorghothrips* bears 2 to 3 short pointed microtrichia along its apical margin.

The tarsi are generally 2-segmented. However, in *Anurothrips*, *Antinothrips* and *Litothrips* they are 1-segmented.

**The Abdomen**

The basic structure of abdominal terga I to VIII and sterna I to VI is similar in both sexes. The sculpture and chaetotaxy
of the segments are peculiar to each species or species group.

A typical segment (III to VI or VII) is divisible into* (a) the tergum proper, (b) the laterotergites, (c) the pleurites, and (d) the sternum. Often the laterotergites or pleurites or both are not marked out as separate sclerites. In certain cases, when these areas are distinguishable, the pleurites may incorporate part of the laterotergites. The following conditions of the tergopleural area can exist:

(1) Laterotergites and pleurites marked out by sutures, though the suture between the tergum and laterotergites may be incomplete.
(2) Laterotergite and pleurite fused on either side, but separate from tergum.
(3) Laterotergites not separated from tergum, pleurites separated.
(4) Laterotergites and pleurites not separated by sutures.

The tergum proper generally has 5 pairs of setae, which may be numbered from the median pair (S.1) laterad as S.2 to S.5. The last pair (S.5) is inserted at the margin, the others are roughly across the middle of the tergum. Another seta (S.6) is situated along the posterior margin of laterotergites. The median pair (S.1) may be closely placed or widely apart from each other; also these setae may be long or short.

*These divisions are adopted following the interpretation of SNODGRASS (1935), and used recently by SAKIMURA (1969a). There has been no uniformity in the nomenclature of laterotergites and pleurites. The names epipleurites and pleurites have been used for either or both of these by various authors. FAURÉ (1953) used the term laterosternite for pleurites.
Between S.1 and S.2, on either side, is a discal (sensory) pore, called the median discal pores. They are shifted backwards in some genera, very near the posterior margin, as in Brematothrips, Ceratothrinoides, and Limotheirus.

The tergal setae are placed in a transverse row in the posterior half of each tergum in Antinothrips and Caprithrips. Antinothrips also has a row of accessory setae across anterior half of each tergum. The laterotergites normally possess a single seta (S.6) along the posterior margin, but when a pleurite incorporates part of the laterotergite, this seta is borne on the pleurite (as in Anaphothrips sudanensis, Antinothrips and Arathrips). Accessory laterotergital setae on either side, numbering 2 to 5, may be present in Ernothrips and some Thrips; in Ramaswamiialiella there are as many as 8 to 12 of these setae.

The sterna normally carry 3 pairs of postero marginal (primary) setae. The median pair of postero marginal setae on female sternum VII is often submarginally inserted. But in some cases, like Agriothrips and Baliothrips dispar and kroeli, these setae are submarginal on sterna II to VII, and are reduced on the female sternum VII in some Perisothrips. Anurothrips has 4 pairs of minute setae on female sternum VII interspersed among the postero marginal setae. As many as 4 to 5 pairs of primary setae may be present on sterna III to VI in Projectothrips, whereas Ramaswamiialiella has 6 to 7 pairs. In Megalurothrips morosus the postero marginal setae are sabre-shaped.
in the male.

Anterior to the posteromarginals, there are often present accessory setae (intermarginal setae of SPEYER, 1934). In most cases the accessory setae form a transverse row across the middle of sterna III to VII. Sometimes the row is irregular, because the setae may not be at the same level. Thrips orientalis females have 1 or 2 accessory setae on either side on sterna III to VI, there being no accessory setae in the middle; the males of this species lack accessory setae. Myzerthrothrips chaetorasta and consociatus exhibit a different type of sexual dimorphism, with the accessory present in the male but absent in the female. Two species of Megalurothrips (morosus, pecularis) have a large number of irregularly arranged sabre-shaped accessory setae limited to the male sex, there being no accessory setae in the female.

Some of the male abdominal sterna have each one or more gland areas (osmeterial glands; see PILIKAN, 1951; FRIESSNER, 1926a, 1964b) in several genera. They may be present on two (III and IV) to seven sterna (II to VIII). Sorghothrips longistylus and ionnaphilus, and some species of Thrips have a gland area on sterna III and IV. Many species of Thrips have a gland area on sterna III to VII. These areas may be rounded, oval, crescentic, or transversely elongate. In Friesneriola and Diarthrothrips nimsus each gland area on sterna III to VI covers almost the entire sternum. In Carathripoides claratris there are numerous irregularly shaped gland areas arranged in two rows on each sternum; whereas many Cricothrips (gaesnitis and fasciatu sections) have on each sternum a median gland area and two
gland areas along the lateral margin on either side. *Cricothrips priessneri* has the median area, on some of the sterna, subdivided into two. Some species, like *Cricothrips arorai*, *Diarthrothrips fasciatus*, *Alathrips roomwali*, and *Neocorynothrips asiaticus*, have numerous circular gland areas on each sternum.

The gland areas on the female abdominal sterna are rarely present, as in *Gnomonothrips* and *Chaetanaphothrips signipennis*. Their function in this sex is unknown.

The posterior margin of terga and sterna sometimes bears various kinds of projections. The projections may be of the form of minute hair-like microtrichia, as on the sterna of *Projectothrips*, or the sides of terga IV to VI of *Thrips ciliatus*. In *Baticothrips divisus* the terga V to VIII bear short triangular teeth along the entire margin; whereas *B. serratus* and *Ctenidothrips bambusae* have large teeth on both terga and sterna. Some genera like *Amphithrips*, *Arathrips*, *Fusothrips* and *Ernothrips* have a fairly broad continuous postmarginal flange. In some cases a continuous flange is present in the females, but is absent in the males, as in *Crasspedothrips*, *Sorghothrips jonannphilus* and *longistylus*. The border of the flange is often produced into pointed irregular projections as in *Sorghothrips fusus* and *Aneurothrips*. The sterna of *Ernothrips* males have long fine hair at the border of a wide flange.

The female abdominal segment VIII has the first gonocoxa (*Scudder*, 1961; *valvifer of Dorksen*) on either side bearing 3 setae whose relative size and position are useful to separate some species. This area has been interpreted as the sternum VIII by *Priessner* (1926a, 1964b) and *Jones* (1964).
The Male Genitalia

The periphallic organs in the sense of Snodgrass (1935) include any processes movable or immovable arising from the ninth tergum or sternum. The claspers or harpagones are developed in some species of Aeolothrips (family Aeolothripidae), but not in the Thripini. Immovable structures on the tergum IX may be in the form of a paired or unpaired mound (elevated area) from which thick and short setae arise (Aneurothrips, Indusiothrips) or in others there may be antler-like curved processes of which there may be two (many Cricothrips, Asciothrips antilope) or four (Asciothrips varius). Among the movable structures on the tergum IX, the form, arrangement, and size of setae are important taxonomically.

The phallic organs consists of a chitinised phallobase and a membranous phallus. The phallobase or hypophallus is made of three principal chitinous plates or hypophallic processes, a median hypomere and two parameres. Dorsally at the base of the hypophallus is a rounded or elliptical plate, the perianarium. This is homologous with the slender rod-like curved and better sclerotised perianarium of Aeolothripidae and Phlaeothripidae. Contrary to earlier opinion (Hartwig, 1952), the hypophallic arms are not firmly attached to the perianarium, for, if that were so the hypophallic arms would be immovable with respect to one another. At least in the Thripini muscles are attached directly to the hypophallic arms and they are movable. It has been seen in Avvaria, during the process of distension of genitalia, that any one or two of the hypophallic arms may be thrust out angularly.
beyond the other or others to more than half the length of the hypophallus. This would seem to suggest that the hypophallic arms act like forceps to broaden the female genital opening before the membranous phallus is everted and thrust in. It appears that the major part of the membranous phallus is inserted into the female genital opening at the time of copulation, and functions as the intromittent organ.

At the base of the hypome, on either side, is a roughly ring-shaped sclerite with an apodeme for muscle attachment. These ring-shaped sclerites may be completely fused with the hypomere or a line of separation may be visible.

The hypophallus exhibits a variety of form, differing principally in the shape and chaetotaxy of the different parts.

Each paramere consists of a fairly broad proximal part carrying a variable number of setae arranged in peculiar patterns. Beyond the proximal part each paramere is usually a slender and slightly bent process which is rounded at the apex, as in many species of *Thrins*. Often beyond the setose part, the parameres are explanate dorsally; this explanate part is cut across and divided clearly in some species of *Cricothrins*, like *fasciatus* and *nilgiricus*. In *Dichromothrins sakimurai* the distal part is toothed laterally on outer side. The distal part beyond the proximal setose part is slender and bent C-shaped in *Diarthrothrins fasciatus*. The most complicated structure is found in species of *Sorchothrins*, where distally a long segment is sharply deflected back forming an acute angle with the main body, and from the place of origin of this downwardly and backwardly directed process
there arises also a short stumpy posteriorly directed process; a laterally directed short crest is also discernible.

The hypomere is apically tapering and pointed or it may be uniformly broad distally and rounded at the apex. In *Mycterotrichins* it is apically broadened like a spatula. In *Sorosothrins* it is a very much bent double process, the dorsal part of which is longer, while the ventral is shorter; both have a ventral flattened triangular process.

The phallus, when everted, is a membranous sac bearing the male genital opening, which is usually situated at the apex. It is supported at the base by 2 pairs of semimembranous cords. One of these pairs is elongate and strongly developed forming a double sinuate cord in *Diarthothrins nimbus*. The phallus shows a variety of shape, with variously developed lobes and processes. Often the paired processes are so strongly developed that the genital opening becomes subterminal. The phallus is usually symmetrical, but in *Thrins apicatus* it is highly asymmetrical. Chitinous armature is usually absent, but it may consists of paired spikes (*Exothrins*), or the spikes may arise from sacs (*Chirothrinus africanus*). In *Thrins apicatus* there are a pair of asymmetrically placed spikes each arising from a broad base, and in addition there are small spine-like tubercles.

The terminal gonopore bearing part of phallus is mostly membranous in Thripini, as also in several Phlaeothripidae, and is homologous with the haplothripine pseudovirga. The endophallus or the distal part of the ejaculatory duct is broader than the rest and is muscular and non-versible.

The male genitalia in Thysanoptera were investigated by De Gayse & Plesherne (1924), Hartwig (1962), Jones (1954), and
PHI3SN3R (1956, 1964b). The interpretation by DE CRYSE & TRESHERNS, JONES, and PRIESSNER is in line largely with that of SNOODGRASS (1936) in the Hemiptera. They have identified the hypomere (median hypophallic arm) as the aedeagus, but this name cannot be applied to this structure or any other in the Thysanoptera, as has been shown by HARTWIG. The partially or completely sclerotised tubular or grooved intromittent organ, the aedeagus, as defined by SNOODGRASS, does not occur in Thysanoptera.

HARTWIG correctly interpreted the various parts of the phallus. However it has been found more useful here to use the term hypomere for the median hypophallic arm of HARTWIG, and parameres (JONES, 1954; PRIESSNER, 1956, 1964b) for the lateral hypophallic arms of HARTWIG (hypophallic arms of DE CRYSE & TRESHERNS).

The species whose genitalia have been studied here, can be tentatively grouped as follows, based upon the structure of the phallic organs. It would have been better perhaps to group the genera based upon the organs of the entire phallic complex, but in many cases the membranous phallus could not be studied. Therefore the genera would be grouped separately on the structure of the phallus and the hypophallus.

I Grouping based upon the phallus:

(a) Genital opening situated at the tip of a membranous median lobe, which may or may not have radial grooves. Phallic spikes or other armature absent. Basal half of phallus with two short lateral lobes. Alathrins, Ascirothrina, Ayvaria, Balothrins,
*Crasspedothrips, Florithrips, Poliothrips, Mesalurothrips, Micro-
ccephalothrips, Nycterothrips, Rameswamiahiella,* most *Thrips*
species.

(b) Genital opening situated at the tip of a chitinous tube strictly comparable to the pseudovirga of Phlaeothripidae. Lateral and dorsal phallic lobes present; spikes absent. *Euphorothrips.*

(c) Genital opening with an overhanging median lobe, and having a median chitinous process arising just below it. *Anaphothrips.*

(d) Phallus produced into a pair of long processes extending beyond the median part bearing the gonopore; each lobe carrying a chitinous spike. *Exothrips, Chirothrips.*

(e) Phallus produced into a pair of stout processes extending beyond gonopore; unarmed. *Scalothrips.*

(f) A pair of phallic cords strongly developed, sinuate. Spikes (1 pair) present. *Marthrothrips nimbus.*

(g) Genital opening situated at the end of a median weakly chitinised tube arising from the middle of the phallus. Phallus produced into a single median lobe reaching far beyond the gonopore, and with a pair of basal fleshy lobes. A spike present on either side. *Ceratothripoides.*

(h) Phallus asymmetrical, with a large dorsolateral (left or right) expansion bearing two thick spikes and several spinules. *Thrips acicatus.*

II. Grouting based upon the hypophallus

(a) Distal half of hypomere and parameres gradually narrowed towards apex. Parameres without especially long setae. *Alathrips, Anaphothrips, Ascirothrips, Ayvaria, Baliothrips, Chirothrips,*
Parameres short and stout, each with a very thick seta which is more than one-third of its length. *Ceratothripoides.*

(c) Parameres slender, each with a prominent (but not stout) seta almost one-third of its length. *Folothripus.*

(d) Hypomere dilated spatula-like at apex. *Myzothripus.*

(e) Parameres enlarged at apex, each with a crochet-like downwardly and backwardly turned process. *Amblythripus alis*, *Florothripus*, some *Thrips.*

(f) Parameres in proximal half with an explanate dorsal process which is cut across and divided. *Ercothripus.*

(g) Parameres stout, each with a long curved backwardly directed arm and two short dorsal processes. Hypomere consisting of two processes, a dorsal and a ventral, each with a rudder-like ventral median extension. *Sorchothripus.*

**Colouration of the Body**

The colour of various parts of the body is useful in the recognition of species. Often we can separate dark species, with brown to dark brown body, from yellow species, with yellowish body. In other species the body may be bicoloured yellow and brown, as in *Ecoothripus asura*, *Eriothripus alis* *C. aroral*, *C. prieneri*, *Laniothripus bicolor*, *Amphithripus argutus*, etc. Some species, like *Bathrips melanicornis*, *Thrips garudus*, and *Ardodothrips longistylus*, have a yellow body with brown shadings.
The colour of fore wing, legs and antennae, also affords useful diagnostic characters for species. The fore wing may be uniformly colourless, uniformly shaded, partly shaded, or with alternating dark and light areas (cross bands), depending upon the species. The pattern of colour in the legs is also peculiar within a limited range of variability for each species. The antennae in some species are totally dark grayish or brownish, in others some or all segments may be yellow.

Although the colouration is important for taxonomic purposes, its has to be used with utmost discretion. *Anaphothrines sudanensis*, for instance, normally has some of the antennal and abdominal segments yellow, but some specimens show a completely grayish brown body and antennae. Even the wings are dark in such specimens.