

Notes on the Thysanoptera collected during western and southern India Survey, 1962, with a Review of the Thysanoptera complex of the Hosts

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PART I

I. INTRODUCTION

The author, while surveying some hilly and forest tracts in Kerala, Madras, Maharashtra, and Mysore States as Liaison Officer to Dr. E. S. Ross of National Geographic Society & California Academy of Sciences' Entomological Expedition to Tropical Asia during February-April 1962, collected many species of insects in their natural state. The collections include a good number of Thysanoptera from several host plants, some of them new records to India and others collected on plants hitherto not recorded as hosts.

The majority of Thysanoptera are phytophagous and a few predatory. Most of them may be found on the surface feeding on the soft tissues of flowers, shoots, and leaves; others live in galls on the plant body produced by the reaction of the plant to the presence of the insect. According to Mani (1964) 'the thysanopterous galls are predominantly leaf galls but some remarkable bud galls and unique stem and flower galls are also known'. Though the insects are found inside the galls, in fact these insects remain external to the surface of the leaf and are gradually enclosed in a cavity by a folding movement of the leaf margin, which produces the fold galls or roll galls. Sometimes button-shaped pouch galls are also produced. The gallicolous forms may be either primary gall-formers or 'inquilines' residing in the galls of other species of thrips or other insects. Another interesting feature of some of them is that, though they can stimulate the production of galls, they still behave as inquilines and stay in the galls of other species. Many species are stenophagous and are confined to a few related species of hosts with host pre-

ferences ; a few others have a wide latitude of hosts, i.e. they are polyphagous. The feeding may be confined to specific parts like leaves, petals, etc., or it may be non-specific and extend to different parts of the same plant or different parts on different hosts. Markkula's (1953) classification of hosts in the case of aphids is applicable to Thysanoptera. According to him the hosts may be true hosts (brutwirte), pseudohosts (scheinwirte), or non-hosts (nichtwirte). True hosts are those plants or parts of plants on which the species develop and reproduce attaining normal age. They may be primary, or secondary ; and permanent, or temporary (on which, during a period of host-suitability, e.g., during an outbreak or a seasonal peak on the permanent host, a sequence of two to three generations develop), or accidental hosts (on which rarely and sparsely one generation may develop). Pseudohosts are plants on which a few nymphs may be borne which, however, do not attain maturity. Non-hosts are plants on which no reproduction or development takes place, but on which the longevity of the insect may be extended by a few more days.

The habits and behaviour of phytophagous species is as important as their identification. The observations presented below may be useful for both pure taxonomists and applied workers. The literature on Thysanoptera is scattered and probably inaccessible for an applied entomologist and the changes that have been made in the nomenclature often confuse him. Hence, in addition to remarks and important synonymies under each species, a review has been given on the Thysanoptera complex of each host species recorded during the survey.

This paper has been arranged in two parts. Part I comprises the Introduction ; Review of Literature ; Localities of collections ; List of species collected ; List of their hosts and Notes on the species collected. Part II comprises the Thysanoptera complex of the host plants recorded during the present survey.

II. REVIEW OF LITERATURE

The earliest work on Indian Thysanoptera dates back to Newman (1856) who described the two species *Idolothrips halidayi* and *Phlaeothrips anacardi*, followed by one species by Kieffer (1908). We owe our knowledge on Indian Thysanoptera chiefly to Bagnall, Hood, Karny, Moulton, and Priesner, who described many new species from material sent to them for identification by Indian institutes or workers. Ramakrishna Ayyar (hereafter referred as Ramakrishna), the pioneer Indian worker, brought many species of Indian thrips to light, particularly of southern and western India. Later contributions were made by Margabandhu, Shumsher Singh, and Seshadri, either independently or along with other workers. Ananthakrishnan added much to our

knowledge since Ramakrishna, and published many papers including several on new genera and species. Stray papers have been published by Patel & Patel, Bhatti, Lakshminarayana *et al.*, Stannard & Ushakumari, etc. References on the earlier work on Indian Thysanoptera have been well summarised by Ramakrishna & Margabandhu (1940) and Margabandhu & Ananthakrishnan (1953). An exhaustive review on the subject is not within the scope of the present paper, hence, only those papers that have been cited here are given under references. References of taxonomic importance are listed under each species; others are given at the end.

III. LOCALITIES OF COLLECTIONS

The Thysanoptera collections have been made in the following localities. The altitude is given in metres above mean sea-level.

Kerala : Munnar [1565 m.]

Madras : Coimbatore; Kodaikanal [2125 m.]; Madras; Mt. Stuart (Top-slip) [760 m.]; Ootacamund (Ooty) [2678 m.]

Maharashtra : Hadpsara; Mahabaleshwar [1461 m.]; Poona.

Mysore : Jog (Gersoppa) Falls [258 m.]

IV. LIST OF SPECIES RECORDED

Species recorded during the survey are arranged alphabetically. Those recorded for the first time in India are marked with a dagger [†]. Those new to the National Zoological Collections of the Zoological Survey of India are marked with an asterisk [*].

1. *Aeolothrips collaris* Priesner
2. *Anaphothrips flavicinctus* (Karny)
3. *Dendrothripoides ipomeae* Bagnall
- *4. *Haplothrips ganglbaueri* Schmutz
- *5. *H. schultzei* Priesner
6. *Haplothrips* sp.
7. *Mallothrips indicus* Ramakrishna
- *†8. *Pnigmothrips medanensis* Priesner
9. *Retithrips syriacus* (Mayet)
10. *Rhipiphorothrips cruentatus* Hood
- *11. *Taeniothrips nigricornis* Schmutz
- *12. *Thrips kodaikanalensis* Ananthakrishnan & Jagdish
13. *Thrips (Isothrips) orientalis* Bagnall

V. HOST SPECIES

The collections were made on the following host plants :

1. Anacardiaceae .. *Mangifera indica* L.
2. Araceae .. *Pothos scandens* L.
3. Combretaceae .. *Terminalia* sp. near *marbellarica* Roxb.
4. Compositae .. *Artemisia scoparia* Waldst. & Kit.
(Marathi : gazara)
5. Convolvulaceae .. *Ipomoea campanulata* L.
6. Gramineae .. *Triticum vulgare* Vill.
7. -do- .. *Zea mays* L.
8. Hypericaceae .. *Hypericum mysorense* Wight & Arn.
9. Leguminosae .. *Sesbania grandiflora* Pers.
10. Melastomaceae .. *Tibouchina semidecandra* Cogn.
11. Meliaceae .. *Azadirachta indica* A. Juss.
12. Moraceae .. *Ficus religiosa* L.
13. -do- .. *Ficus* sp. ? (Marathi : chatranz)
14. Oleaceae .. *Jasminum mesnyi* Hance [*J. primulinum*
Hemsl.]
15. Rosaceae .. *Rosa* spp.
16. Solanaceae .. *Datura suaveolens* Humb. & Bonpl.
17. -do- .. *Solanum wightii* Nees
18. Thymelaeaceae .. *Lasiosiphon eriocephalus* Decne.
19. Verbenaceae .. *Petraea volubilis* L.

VI. NOTES ON SPECIES

Notes on the thrips recorded are given under each species. The families are arranged following Priesner's (1949) classification in alphabetical sequence. The subfamilies, genera, and species are also arranged under each family in alphabetical sequence. Under each species the first reference and only the more important synonymies are listed. The subfamilies included here are from different sources. All the specimens except where otherwise stated have been preserved in alcohol. The Zoological Survey of India has been abbreviated as Z.S.I. The collector's name has been abbreviated as K. V. L. Narayana for brevity.

Family AEOLOTHRIPIDAE Uzel

Genus *Aeolothrips* Haliday 1836

Aeolothrips collaris Priesner

- 1919 *Aeolothrips fasciatus* var. *collaris* Priesner, *S.B. Akad. Wiss. Wien.*, 128, p. 119 (March).
 1919 *A. fulvicollis* Bagnall, *Ann. Mag. nat. Hist.*, (9) 4, pp. 253-254 (October).
 1942 *A. fasciatus* L., Shumsher Singh, *Indian J. Ent.*, 4, pp. 112-114.
 1948 *A. collaris* Priesner, *Bull. Soc. Fouad Ent.*, 32, pp. 323, 324, 335 & 338.
 1964 *A. collaris* Priesner, Bhatti, *Bull. Ent.*, 5, pp. 17-18.

Material : On Wheat (*Triticum vulgare* Vill.) (Reg. No. 3452/H8-2 exs) ; on *Artemisia scoparia* Waldst & Kit. (?) (Marathi : gazara), (Reg. Nos. 3453/H8-2 exs. & 4251/H8-1 ex.). Hadpsara, 9.II.1962, K.V.L. Narayana coll.

Notes : The Z.S.I. has material from Manali to Kote, 'on broad leaves (?) in streams', Dr. A. P. Kapur coll.

Bagnall (loc. cit.) described this species as *A. fulvicollis* from material collected on *Verbascum* flowers at Kanpur (India, A.D. Imms coll.). Priesner (loc. cit.) described *collaris* as a variety of *A. fasciatus* Linn., and recognised *fulvicollis* as a form of *collaris* (loc. cit.) ; thus the latter has precedence over the former. Ramakrishna (1928) recorded it on Mango flowers at Pusa (Bihar, D.P.S. coll.) ; Ramakrishna & Margabandhu (1931) on *Saccharum officinarum* ; Shumsher (loc. cit.) recorded it from Delhi under *A. fasciatus* Linn., on *Brassica campestris* var. *dichotami* and var. *sarson* (Cruciferae), *Lathyrus odoratus*, *L. sativus* flowers ; and *Medicago sativa* leaves ; Patel *et al.* (1953) recorded it on leaves and leaf sheaths of *S. officinarum* and flowers of *Allium cepa* (onion) in January from Poona, very near to Hadpsara from where the present collections were made. Recently Bhatti (loc. cit.) discussed the taxonomic status of *A. collaris* and *A. fulvicollis* with two new records on *Centaurea cyanea* and *Citrus* spp. from Hoshiarpur (Punjab).

Both wheat and gazara, a compositae fodder crop, are two new hosts recorded during this survey. On the former the thrips were confined to the central shoots ; on the latter it was found on young leaves and on flowers. Incidentally, I may mention that on both hosts it was found in association with another species, *Anaphothrips flavicinctus* (Karny).

Family THIRIPIDAE Uzel

Subfamily Heliothripinae¹ Karny

Genus *Retithrips* Marchal 1910

Retithrips syriacus (Mayet)

1890 *Heliothrips syriacus* Mayet, *Insects de la Vigne*, p. 451.

1910 *R. syriacus* (Mayet) Marchal, *Bull. Soc. Ent. d'Egypte*, p. 7.

Material : On leaves of *Ficus religiosa* L. (Reg. Nos. 3456/H8-3 exs., 4266/H8-3 exs. ; and 4310/H8-several exs. ; 4199-4200/H8-1 ex. each (on slides), Coimbatore, 14.III.1962, K.V.L. Narayana coll.

Notes : In the National Zoological Collections one slide (Reg. No. 1458/H8) containing material from Bapatla (A.P.) on cotton, June 1952, A. R. Seshadri coll., is available.

¹ Shumsher Singh (1942) raised this subfamily to family rank.

Seshadri & Ananthakrishnan (1954) first reported this species from India on cotton leaves from Cuddalore (E. R. G. Menon coll.), Bapatla (K. R. Mohan Rao coll.) and grape vine from Chingelpet (E. R. G. Menon coll.); on leaves of *Cassia auriculiformis* and *Acalypha indica* from Madras (T.N.A. coll.). Ananthakrishnan (1954 b) states that it is a polyphagous, cosmopolitan species, with special preference to castor and cotton leaves, and recorded two additional hosts, Pomegranate and Bauhinia. This author (1956) also worked out the host preferences as well as its incidence on castor.

During the present survey another host, *Ficus religiosa* has been recorded. The heavy incidence and the presence of all stages indicate that this is a true and definitive host.

Genus *Rhipiphorothrips* Morgan 1913

Rhipiphorothrips cruentatus Hood

1919 *R. cruentatus* Hood, *Insec. Inscit. menst.*, 7, p. 94.

Material : On *Rosa* spp., Hadpsara, 9.II.1962 (Reg. Nos. 3454/H8-10 exs.; 4250/H8-24 exs.); on *Terminalia* sp. near *marbellarica* Roxb., Jog Falls (258 m.s.l.), 18.II.1962 (Reg. Nos. 4192-4193/H8-1 ex. each (on slides) and 4265/H8-2 exs.), K.V.L. Narayana coll.

Notes : Hood (loc. cit.) described this species from material collected on grape vine from Coimbatore and careya leaves from Ceylon. Karny (1926) recognised this species from Ramakrishna's collections from calotropis flowers, grape vine, and rose leaves from Coimbatore, *Lannea coromandelica* (*Odina wodier*) from Palur (Madras), and *Syzygium cuminii* (*Eugenia jambolana*) from Maddur (Mysore State). Ramakrishna (1928) on tender leaves of grape vine from Coimbatore, Vijayawada [Bezwada : Andhra Pradesh], and *S. cuminii* from Bangalore and Lyallpur (Pakistan); Rahman *et al.* (1937) gave a list of host plants and worked out its biology; Ramakrishna & Margabandhu (1939b) in addition to the above, reported it on *Punica granatum*, *Terminalia arjuna*, *Mangifera indica*, *Prosopis spicigera* from Lyallpur; grape vine from Madura and Travancore also (1931). Patel *et al.* (1953) in addition to *T. arjuna* recorded it on *T. catappa* at Anand; *Psidium guyava* and *Punica granatum* from Poona; rose and grape at Nasik and Poona respectively. Lakshminarayana *et al.* (1961) while recording it on grape vine (*Vitis vinifera*) and country almond (*T. catappa*) from Bapatla; *Rosa* spp. at Araku valley (Andhra Pradesh), also recorded two new hosts, Cashew and *Eucalyptus* spp., at Bapatla.

During the present survey another species of *Terminalia* was recorded as a host. This, like other *Terminalia* spp., is a true host. Heavy incidence of this species on rose at Hadpsara was noted at the time of my

visit. Hitherto, this species was reported to attack only the leaves ; during the present survey severe attacks on flowers were also observed.

Subfamily Panchaetothripinae Bagnall

Genus *Dendrothripoides* Bagnall, 1923

***Dendrothripoides ipomeae* Bagnall**

1923 *D. ipomeae* Bagnall, *Ann. Mag. nat. Hist.*, (9) 12, p. 625.

Material : On *Ipomoea campanulata* L., Madras, 8.IV.1962 (Reg. Nos. 3457/H8-3 exs. and 4311/H8-7 exs.), K. V. L. Narayana coll.

Notes : In the National Zoological Collections one slide is available with details as *Ipomoea* leaf, Trivandrum, Aug. 1955, T.N.A. coll. (Reg. No. 1784/H8). Bagnall (loc. cit.) described this species on *Ipomoea staphylina* from Maddur (Ramakrishna coll.). Ramakrishna (1928) also mentioned its occurrence at Maddur (Mysore).

No other host plant has been recorded so far and *I. campanulata* is a new record. As this is a common hedge plant in south India, it is possible that this species can be met with in other regions as well.

Subfamily Thripinae Karny

Genus *Anaphothrips* Uzel, 1895

***Anaphothrips (Neophysopus) flavicinctus* (Karny)**

1912 *Euthrips flavicinctus* Karny, *Marcellia*, 1, p. 115.

1919 *E. citricinctus* Bagnall, *Ann. Mag. nat. Hist.* (9) 4, p. 270.

1931 *A. flavicinctus* (Karny), Ramakrishna & Margabandhu, *J. Bombay. nat. Hist. Soc.* 34 (4), p. 1036.

Material : On *Zea mays* (Reg. Nos. 3448/H8-7 exs. & 4246/H8-13 exs.) ; wheat (Reg. Nos. 3449/H8-3 exs. ; 3450/H8-2 exs. and 4309/H8-3 exs.) ; and *Artemisia scoparia* Waldst & Kit. [Marathi : gazara] (Reg. Nos. 3451/H8-8 exs.; 4252/H7-3 exs.), Hadpsara, 9.II.1962, K. V. L. Narayana coll.

Notes : This species is represented in the National Collections from Shahjhanpur, on sugarcane, 20.III.1956, O. P. Singh coll., (Reg. Nos. 1583-1587/H8), and from Madras on guinea grass, Nov. 1955, T. N. Ananthakrishnan coll., (Reg. No. 1781/H8) (on slides).

Originally described by Karny (loc. cit.) from Java. Bagnall (loc. cit.) described the same as *Euthrips citricintus* from one female collected on Arrowroot leaves from Taliparamba (Ramakrishna coll.). Ramakrishna (1928) also recorded it on *Sorghum vulgare* shoots from Coimbatore ; Ramakrishna & Margabandhu (1931) on *Pennisetum typhoideum* from Koilpatti (Madras) ; Shumsher Singh (1942) on paddy

leaf sheaths, *Pennisetum spicatum*, *Saccharum officinarum*, *Triticum aestivum* leaves, *Zea mays* (Gramineae), *Lawsonia inermis*, and tobacco flowers from north India. Patel *et al.* (1953) reported from many places in erstwhile Bombay Presidency, namely on *P. spicatum* from Viramgam and Detroz in September 1950, on leaves and leaf sheaths of *Sorghum vulgare* from Poona, Nasik, Anand, Baroda, Detroz, and Borivili in post-monsoon and early winter months; on *T. aestivum* at Poona, Bombay, and N. Gujarat; on *Zea mays* and other grasses from Poona and N. Gujarat. In addition, they recorded it on *Avena sativa* and *Echinochloa stagnina* at Poona; on leaves of *Cynodon dactylon*, *Eleusine coracona* from Poona and Anand; on tobacco, tomato, leaf sheaths of *Canna indica* (Cannaceae), and flowers of *Lagasca mollis* (Lobeliae), all from Poona. Ananthakrishnan (1960) recorded it on grasses at Coonoor (5500 ft.) and Shembaganur, Kodaikanal (5000 ft.). According to the latter author this is one of the commonest species of grass-inhabiting thrips exhibiting alary polymorphism with macropterous, brachypterous, and apterous forms. Ananthakrishnan (1961) while recording the degree of incidence of this species on *Andropogon pertusus* and *Panicum maximum* states that it has special preference for guinea grass (*P. maximum*) over other grasses.

One more host, gazara has been recorded now in addition to the already known hosts, i.e. wheat and maize. While on maize and wheat it was found mostly on the tender leaves particularly the central shoots, on gazara it was collected both on tender leaves and on flowers. Further, it was found associated in both cases with *Aeolothrips collaris* Pr.

Genus *Taeniothrips* Amyot & Serville, 1843

Taeniothrips nigricornis (Schmutz)

1913 *Frankliniella nigricornis* Schmutz, *S.B. Acad. Wiss. Wien.*, 122, p. 1020.

1922 *Taeniothrips longistylus* Karny, *J. Siam Soc.*, 16, p. 99.

1925 *T. longistylus* Karny, *Bull. Ent. Res.*, 16, p. 125.

1926 *T. longistylus* Karny, *Mem. Dep. Agric. India, Ent.*, 9 (6) pp. 196.

Material: On *Azadirachta indica* A. Juss. (Neem), Poona, 7.II.1962 (Reg. Nos. 3443/H8-3 exs. & 4253/H8-4 exs.); on *Sesbania grandiflora* Pers., (Reg. Nos. 3444/H8-8 exs. & 4249/H8-8 exs.); on *Hypericum mysorense* Wight & Arn., Kodaikanal (2125 m.s.l.), 28-29.III.1962 (Reg. Nos. 4261/H8-1 ex.; 4262/H8-7 exs. and Reg. No. 4201/H8-1 ex. ♀). (on slide), K.V.L. Narayana coll.

Notes: The present collection is a new addition to the National Zoological Collections.

Ramakrishna & Margabandhu (1939a) recorded this species on *Mimosa pudica* flowers from Wynaad Hills (2000 ft.). They consider

the possibility of the specimens of *T. longistylus* described by Karny also belonging to this species only. *T. longistylus* was noted on flowers of red gram (*Cajanus indicus*), Sann hemp (*Crotalaria juncea*), shoots of neem (*Melia azadirachta*=*Azadirachta indica*), lucerne flowers from Coimbatore, and cowpea (*Vigna catiang*) from Taliparamba (Malabar). Ramakrishna (1928) also recorded it on groundnut flowers from Bangalore; Moulton (1928) on an unidentified plant from Buldana (Berar, H. S. Rao coll.), and Ramakrishna (1934b) on sandal shoots are other records. Bhasin *et al.* (1958) also listed *Azadirachta indica* as a host of *T. longistylus*.

Two new hosts have been noted during the present survey, *Sesbania grandiflora* Pers. (Leguminosae) and *Hypericum mysorens* Wight & Arn. (Hypericaceae), in addition to neem. On neem it was collected from the underside of the leaves; on *Sesbania* and *Hypericum* from flowers. The beautiful *Hypericum* flowers were badly infested at the time of my visit. All the flowers had wilted due to desapping. Both plants can also be classed as true hosts.

Genus *Thrips* Linnaeus, 1761

***Thrips kodaikanalensis* Ananthakrishnan & Jagadish**

1966 *T. kodaikanalensis* Ananth. & Jagadish, *Ent. Tidskrift* 87. 1-27 : 85-99.

Material : On *Datura suaveolens* Humb. & Bonpl. (Solanaceae), Munnar, (1565 m.s.l.), 20.III.1962, (Reg. Nos. 4194-4196/H8-3 exs.) (on slides) & (Reg. No. 4263/H8-12 exs.); on *Tibouchina semidecandra* Cogn., Kodaikanal, 28.III.1962 (Reg. No. 4264/H8-5 exs), K. V. L. Narayana coll.

Notes : Originally recorded on an unidentified host plant.

According to Dr. Ananthakrishnan (personal communication) this is one of the most common species of thrips in south India. *Tibouchina semidecandra* Cogn. and *datura* may be classified as true hosts in view of the abundance of the specimens as well as symptoms of attack on these hosts.

***Thrips (Isothrips) orientalis* (Bagnall)**

1915 *Isoneurothrips orientalis* Bagnall, *Ann. Mag. Nat. Hist.*, (8) 15, p. 593, pl. 32, fig. 1.

1926 *Isoneurothrips orientalis* Bagnall, Karny, *Mem. Dep. Agric. India, Ent.*, 9 (6), p. 197, pls. 17-18, figs. 1 & 8.

1940 *Isothrips* Priesner, *Bull. Soc. Fouad Id' Egypte*, p. 54.

Material : On *Jasminum mesnyi* Hance [= *J. primulinum* Hense] Ootacamund [Ooty], (2678 m.s.l.), 11.III.1962, (Reg. No. 3458/H8-12 exs.; 4247/H8-3 exs.), K. V. L. Narayana coll.

Notes : The National Zoological Collections had a slide (Reg. No. 124/H8) of this species under *Isoneurothrips orientalis* Bagnall on Jasmine flowers, Coimbatore, 1923, T.V.R. coll.

Bagnall (loc. cit.) described this species from material collected on a white flower from Mt. Matanga, Sarawak (G. E. Bryant coll.). Unfortunately, the specimen studied by Bagnall was imperfect. Hence, Karny (loc. cit.) redescribed it after studying several specimens from flowers of *Morinda tinctoria* and Jasmine in Ramakrishna's collections from Coimbatore. Ramakrishna (1928) also mentioned it on Jasmine. Ramakrishna & Margabandhu (1939a) recorded it from Bombay and Poona. Priesner (loc. cit.) created a new subgenus *Isothrips* under genus *Thrips* L., with *I. orientalis* Bagnall as the type of the subgenus. Patel *et al.* (1953) also recorded it on Jasmine from Poona and it was also listed by Mathur *et al.* (1960a) on *Jasminum* spp.

It is believed that *J. mesnyi* is a new host species, as it is a rare plant and perhaps the earlier records are all on the usual ornamental varieties only.

Family PHLAEOTHIRIPIDAE Uzel

Subfamily Cryptothripinae Karny

Genus *Mallothrips* Ramakrishna, 1928

Mallothrips indicus Ramakrishna

1928 *M. indica* Ramakrishna, *Mem. Dep. Agric. India Ent.*, 10 (7), pp. 308-310, fig. 31.

Material : On *Ficus* sp., Mahableshwar (1461 m.) 14.II.1962 (Reg. Nos. 3455/H8-1 ex. ; 4248/H8-4 exs.), K.V.L. Narayana coll.

Notes : The Z.S.I. collections include two slides, one co-type slide (Reg. No. 424/H8) with 2 exs. *Eugenia* sp. from S. India, T.V.R. coll., and another on *Eugenia* sp., Kanpur, Ramakrishna coll.

Ramakrishna (1928) described the new genus and species from material collected by him in leaf galls of *Syzygium cuminii* (*Eugenia jambolana*) from Coimbatore and identified them from specimens collected by D. S. Chaudhury also from Kanpur on the fruits of the same plant (?) (Ramakrishna 1934a). Ananthakrishnan *et al.* (1965) while recording this species on *E. jambolana* from Tirupati (A.P.) & Pondicherry, state that it has been hitherto believed to make galls on *Eugenia* leaves but the actual gall producer is a psyllid. The adults gain entry when the galls are dried and cracked.

The present record is from pouch galls also made by a psyllid on the dorsal lamina of *Ficus* leaves.

Subfamily Haplothripinae Karny

Genus *Haplothrips* Amyot & Serville, 1843

***Haplothrips ganglbaueri* Schmutz**

1913 *H. ganglbaueri* Schmutz, *S.B. Akad. Wiss. Wien.*, p. 1034.

1916 *H. ganglbaueri* Schmutz, Karny, *Mem. Dep. Agric. India, Ent.*, 9 (6), pp. 217, fig. 18, pl. 21, (fig. 1).

1933 *Haplothrips* sp. Priesner, *Rec. Indian Mus.*, 25 (4), p. 355.

Material : On *Petraea volubilis* L., Poona, 6.II.1962, (Reg. Nos. 3445/H8-3 exs. ; 4308/H8-1 ex.) ; on *Solanum wightii* Nees, Poona, 8.II.1962 (Reg. Nos. 3446/H8-5 exs. ; 4312/H8-4 exs.), K. V. L. Narayana coll.

Notes : This species is new to the National Collections. Karny (1926) studied this species collected by Ramakrishna on a wild plant at Coimbatore. Ramakrishna (1928) recorded it on Jasmine flowers from Kollegal. He observed the occurrence of apterous and brachypterous forms also. Priesner (loc. cit.) dealt in detail with the species of *Haplothrips* from Indo-Malayan region and mentioned that this species occurs chiefly in Japan, Sumatra, and Krakatov Island.

The two hosts, *Petraea volubilis* L. (Verbenaceae) and *Solanum wightii* Nees (Solanaceae), are two new hosts recorded now. On both only the flowers were attacked. The infestation on *Petraea* was very heavy. The thrips as well as aphids present at the time of the author's visit almost desapped the blue flowers and they turned brown and scorched.

***Haplothrips schultzei* Priesner**

1910 *H. aculeatus* Schultze, *Zool. anthropol. Erg. Porschungor Westl. O. centr. Sud-afrika.*, 4, pp. 147-174.

1921-22 *Haplothrips* sp. Priesner, *Treubia*, 2, p. 17, fig. 7.

Material : On Mango, Poona, 8.II.1962 (Reg. No. 3442/H8-1 ex.), K. V. L. Narayana coll.

Notes : This species is represented in the National Collections as *H. aculeatus* F. collected on *Cyperus* sp. from Hokuto, Formosa, 5.XII.26, Takahashi coll. (Reg. No. 132/H8-on slide).

Only a single example was collected on sweeping mango inflorescence. Obviously, this host should be considered as nichtwirte (non-host).

Haplothrips sp.

- 1843 *Haplothrips* Amyot & Serville, *Hist. Ins. Hemipt.*, p. 640.
 1918 *Haplothrips* (Synonymy notes) Hood, *Mem. Qd. Mus.*, 6, p. 126.
 1921-22 *Haplothrips* (studies) Priesner, *Treubia*, 2, pp. 1-20, 7 figs.
 1921-22 Priesner's *Haplothrips* studies, Karny, *Treubia*, 2, pp. 21-36.
 1933 *Haplothrips* (Indo-Malayan studies) Priesner, *Rec. Indian Mus.*, 35 (3), pp. 347-369.

Material : On *Lasiosiphon eriocephalus* Decne., Mahabaleshwar (1461 m.), 14.II.1962 (8 exs. and 2 exs. on slide not registered), K. V. L. Narayana coll.

Notes : The National Zoological Collections have slides of *H. aculeatus* F. (now *H. schultzei* Pr.) on *Cyperus* from Formosa, R. Takahashi coll. (Reg. No. 132/H8) ; *H. ceylonicus* Schmutz, from Buldana (Berar) H. S. Rao coll. (Reg. No. 85/H8) ; *H. euphorbiae* Pr., on *Euphorbia hirta* from Kallar, T.N.A. coll. (Reg. No. 2581/H8) ; *H. gowdeyi* (Franklin) on lantana blossoms from Honolulu, Hawaii, O. H. Swezey coll., and *Haplothrips* sp. on Peach, J. P. Chatrath coll.

Priesner (loc. cit.) gave a brief account on this genus and in 1933 dealt with, in detail, the Indo-Malayan species. Karny (1926) discussed many species of *Haplothrips* from India. Ramakrishna (1928) stated that this genus is represented in India by numerous species and includes the commonest among tubulifera found in flowers. He added that some of them are so very closely related to each other that it is often difficult to separate them.

It was not possible to identify the specimens under report as they are badly damaged. However, it may be mentioned that they inhabited flowers.

Genus *Pnigmothrips* Priesner, 1953

***Pnigmothrips medanensis* Priesner**

1953 *P. medanensis* Priesner, *Treubia* 22, pp. 357-380.

Material : On *Pothos scandens* L., Mt Stuart [Top-slip] (760 m.s.l.), 17.III.1962 (Reg. Nos. 4197-4198/H8-2 ♀♀ exs. (on slides) (Reg. No. 4267/H8-12 exs.), K. V. L. Narayana coll.

Notes : This species is a new addition to the National Zoological Collections and also a new record from India.

Priesner (loc. cit.) described it as a new genus and species, from Sumatra (SE. coast) Batang Serangan Virgin forest, December 1923, in leaf galls (herbarium No. 23), L. Fulmek coll. According to this author, this genus comes close to *Eugynothrips* differing by the slightly enlarged fore femora of both sexes, the unarmed fore tarsi of the male, and the shape of the head and the contracted neck (hence *Pnigmothrips*).

The present material was collected in leaf galls on *Pothos scandens* L. (Araceae). The leaves are folded over the mid rib on the epiphyllous side, crumpled, twisted, and mottled badly. The infestation was so heavy, that bunches of leaves were drooping and hanging loosely due to desapping and gall formation. Old infested leaves finally become yellow and brittle.

PART II

VII. THYSANOPTERA COMPLEX OF THE RECORDED HOST PLANTS

The Thysanoptera complex of the host plants recorded during the present survey is discussed hostwise arranged alphabetically according to families.

ANACARDIACEAE

Mangifera indica L.

Bagnall (1919) mentioned *Aeolothrips fulvicollis* Bagnall (now *A. collaris* Pr.) on mango flowers. Karny (1926) identified *Haplothrips ceylonicus* Schmutz from Ramakrishna's collection at Coimbatore. Ramakrishna (1928) recorded *Ramaswamiahiella subnudula* Karny as well as *H. ceylonicus* Sch. at Coimbatore and Anakapalli (A.P.). He also described *Liothrips kiriti* from mango leaves. Ramakrishna *et al.* (1939a) described *Oxyrrhinothrips beharensis* Ramk. & Marg., now *Thrips (Oxyrrhinothrips) beharensis* (Ramk. & Marg), and recorded (1939b) *Rhipiphorothrips cruentatus* Hood on mango leaves and *Podothrips javanus* Priesner on mango inflorescence from Coimbatore. Patel *et al.* (1953) recorded *Scirtothrips dorsalis* Hood at Anand. Mathur & Singh (1960b) in addition to the above also listed *Heliothrips haemorrhoidalis* (Bouche) and *Selenothrips rubrocincta* (Giard) on leaves.

Haplothrips schultzei Priesner now recorded at Poona was found on mango inflorescence. In the light of Markkula's classification of host plants this plant may be classified as Nichtwirte or non-host.

ARACEAE

Pothos scandens L.

Only two species are hitherto known to be associated with this plant, namely, *Tetradothrips folliperda* (Karny), (*Eothrips folliperda* Karny), and *Mesothrips melinocnemus* Karny from Taliparamba, causing leaf galls. Ramakrishna (1928) states that in the case of the former species

the foliage often suffers very seriously. The leaf rolls up longitudinally and its colour gradually changes to a sickly yellow ; in the later stages the galled leaf becomes brittle. Ananthakrishnan *et al.* (1965) recorded *Gynaikothrips pallicrus* Karny from *Pothos scandens* leaf galls along with the gall maker *Tetradothrips folliperda* (Karny) and *Mesothrips melino-cnemus* Karny from Moodbidri near Mangalore (Mysore State).

Pnigmothrips medianensis Priesner, now recorded for the first time from India, also produces galls on the leaves. The leaf folds on the epiphyllous or axial side over the mid-rib, and becomes twisted, yellowed, and brittle. It may be mentioned that the yellowing is gradual. This plant in view of the heavy infestation appears to be a true host.

COMBRETACEAE

***Terminalia* sp. near *marbellarica* Roxb.**

No record of any species on this host is available. However, there are records on closely allied species. Karny (1926) described *Rhynchothrips pallipes* from Travancore collected by Ramakrishna in *Megatrioza hirsuta* C. (Psyllidae) gall on *Terminalia* sp., and *Gynaikothrips interlocatus* Karny from the same locality and from psyllid galls. Ramakrishna (1928) in addition to the above, mentioned *Androthrips flavipes* Schmutz inside psyllid galls on *Terminalia* spp. He also described *Rhipiphorothrips karna* on a related species *T. catappa*, from Malabar. Ramakrishna & Margabandhu (1939b) reported the occurrence of *R. cruentatus* Hood on *T. arjuna*. Patel *et al.* (1953) and Lakshminarayana *et al.* (1961) recorded the latter species on *T. catappa* at Anand and Bapatla respectively. The latter species of thrips is now recorded on *Terminalia* sp. near *marbellarica* Roxb., during the present survey.

COMPOSITAE

***Artemisia scoparia* Waldst. & Kit. [Marathi : gazara]**

No record of any species on this fodder crop is available. Two species, *Aeolothrips collaris* Priesner and *Anaphothrips* (*Neophysopus*) *flavicinctus* Karny, were found infesting both the tender leaves as well as flowers at Hadpsara (Maharashtra).

CONVOLVULACEAE

***Ipomoea campanulata* L.**

No species has been recorded on this host plant.

Bagnall (1923) described *Dendrothripoides ipomeae* from a related host *I. staphylina* from Maddur. Ramakrishna (1928) recorded the above species as well as *Taeniothrips* (*Physothrips*) *minor* (Bagnall) on *I. staphylina*. Ramakrishna *et al.* (1939b) recorded *Frankliniella*

sulphurea Schmutz on *Convolvulus* flowers at Lyallpur, which is extremely polyphagous (Ananthakrishnan 1960). Patel *et al.* (1953) also recorded the latter species on *Ipomoea* sp. and *Achaetothrips mundus* (Karny) on sweet potato (*I. batatas*) at Poona. Mathur *et al.* (1960a) listed *Frankliniella persetosa* Karny and *Thrips japonicus* Bagnall on *Ipomoea* sp.

GRAMINEAE

***Triticum vulgare* Vill. and *Zea mays* L.**

Ramakrishnothrips jonnaphilla (Ramakrishna) has been recorded on *Zea mays* at Guntur (A.P.) by Ramakrishna (1928). *Anaphothrips flavicinctus* (Karny) has been recorded on *Zea mays* cobs as well as *Triticum aestivum* by Shumsher (1942). Patel *et al.* (1953) recorded it on *Zea mays* from Poona and N. Gujarat as well as on *T. aestivum* both from the latter locality as well as Bombay. They also recorded *A. (Dantabahuthrips) sacchari* Shumsher on *Zea mays*.

During the present survey *Aeolothrips collaris* Pr. has been recorded on wheat (*T. vulgare* Vill.) for the first time along with *A. flavicinctus* (Karny) at Hadpsara near Poona. The infestation was mostly confined to the central shoots on both plants. They can be safely included under true hosts.

HYPERICACEAE

***Hypericum mysorensense* Wight & Arn.**

No record of any thrips species is known from this host plant. The plant is an ornamental one growing 4-6 ft. with fine yellow flowers, extending from Konkan to Palni Hills at 3000-5000 ft.

Taeniothrips nigricornis (Schmutz) recorded during the present survey from Kodaikanal is the only known species on this host plant, which can be rightly included under true host category.

LEGUMINOSAE

***Sesbania grandiflora* Pers.**

Karny (1926) recorded *Eurhynchothrips ordinarius* (Hood) from flowers of this plant. Ramakrishna (1928) recorded *Heliothrips indicus* Bagnall in addition to *E. ordinarius* on a related species, *S. aculeata*, and described *Brachythrips dirghavadana* on another closely allied species, *S. aegyptiaca*. Ananthakrishnan (1954b) described *Perissothrips aureus* from Ramakrishna's collections on *S. aegyptiaca*. Mathur *et al.* (1961) also listed *B. dirghavadana* Ramk. and *E. ordinarius* (Hood) on *S. aegyptiaca* and

S. grandiflora respectively, the former on the foliage and the latter on flowers.

Thus the present record of *T. nigricornis* (Sch.) adds one more species associated with *S. grandiflora*. Infestation was confined to the flowers only. This is a true host for this species.

MELASTOMACEAE

Tibouchina semidecandra Cogn.

No thrips has so far been recorded on this plant and *Thrips kodai-kanalensis* Ananth. & Jagadish recorded now is the first known species from this host. Most of the flowers were dried up due to desapping, which is clearly seen on the petals.

MELIACEAE

Azadirachta indica A. Juss.

Karny (1926) and Ramakrishna (1928) recorded *Heliothrips haemorrhoidalis* (Bouche) on the shoots of neem (*Melia azadirachta*) at Coimbatore. The latter also noted *Dicaiothrips* (now *Elaphrothrips* Buffa.) on *Melia indica* (now *A. indica*) from Dehra Dun (Champion coll.). Bhasin *et al.* (1958) listed the above species only. *Taeniothrips nigricornis* Sch., recorded during the present survey, has been collected on the underside of the leaves, though on other plants it was collected from flowers. A new host record for this common pest.

MORACEAE

Ficus religiosa L. and *Ficus* sp.

So far only two species of thrips, *Dichaetothrips beesoni* Moulton (Moulton 1928, and Mathur *et al.* 1959) and *Dendrothripiella* (*Projectothripoides*) *pandai* Shumsher (Shumsher 1942) were recorded on this host. But many records from related hosts are known. Karny (1926) described *Mesothrips apatelus* from *Ficus retusa* and mentioned two more species, *Gynaikothrips uzeli* Zimm. and *G. elegans* Zimm. He also described varieties of *Androthrips flavipes* Schmutz on the same host. Ramakrishna (1928) mentioned *G. elegans* Zimm. on different species of *Ficus*; *G. uzeli* Zimm. on *F. retusa*; *Androthrips flavipes* Sch. in leaf galls of *F. retusa* along with *G. elegans*, and described *Brachythrips dirghavadana* from *retusa* leaf galls; *G. malabaricus* from rolled banyan leaves (*F. indica*); and *Mesothrips bhimabahu* on *retusa* leaf galls. Ananthakrishnan (1951, 1960) recorded *Gigantothrips ochroscelis*

Priesner on *F. heterophylla* and *Cercothrips tibialis* (Bagnall) on *F. bengalensis*. Mathur *et al.* (1959) listed the above species on different *Ficus* plants as well as two more species, *Leptothrips constrictus* Karny and *Mesothrips jordani* on *F. benjamina*. Ananthakrishnan *et al.* (1965) recorded *Androthrips flavipes* Sch., in galls on *Ficus* sp. produced by *Gynaikothrips flaviantennatus* Moulton and in the leaf galls of *F. benjamina* produced by *G. uzeli* Zimm. from Calicut, Agumbe Ghat Road, and Courtallum with peak incidence during January-March; *Arrhenothrips dhumrapaksha* Ramk. from Agumbe Forest Ghat Road (Mysore) in the leaf fold galls on *F. retusa* in galls resembling that of *G. uzeli* Zimm.; the latter species from Burliar (Nilgiris), Courtallum, and Agumbe Forest Ghat Road; *G. malabaricus* from rolled tubular galls on *Ficus* sp., from Yercaud (Salem) and Guindy (Madras); *G. moultoni* Ramk. from Salem on *Ficus* sp.; *Liothrips hradeensis* Uzel on *F. benjamina* galls along with *G. uzeli* and *A. flavipes* from Courtallum and *Mesothrips jordani* Zimm. in leaf galls on *Ficus* sp. at Courtallum.

The present record of *Retithrips syriacus* (Mayet) (of all stages) is a new record on *F. religiosa* and this plant could well be considered as a true host.

During this survey *Mallothrips indica* Ramakrishna, hitherto known from *Syzygium* spp. (*Eugenia*) was recorded in psyllid galls on *Ficus* spp.

OLEACEAE

***Jasminum mesnyi* Hance. [= *J. primulinum* Hemsl.]**

This plant is an evergreen twiggy shrub, a native of Yunnan, extensively cultivated throughout the Tropical and Sub-tropical parts of the world. The flowers are solitary and primrose yellow in colour. It is not known in the wild state in India but only grown as an ornamental plant for its large scentless flowers, which appear from March to May. The collections were made in the Botanical Gardens, Ooty. Being a rare plant no record of any species on this particular host is available. However, records from other common cultivated varieties are available as follows :

Karny (1926) noted *Haplothrips ceylonicus* and *Thrips (Isothrips) orientalis* Bagnall on jasmine flowers. Ramakrishna (1928) recorded *Frankliniella sulphurea* Schmutz, *H. ganglbaueri* Schmutz, and *T. (I) orientalis* Bagnall on jasmine. Ramakrishna *et al.* (1939a) recorded the last species on jasmine, and also another species *Dendrothripiella jasminum*, from jasmine. Ananthakrishnan (1953, 1954a) recorded *H. veroniae* Pr. and *Eothrips aswamukha* Ramk. on jasmine leaf galls (M. S. Mani coll.). Mathur *et al.* (1960a) also listed *T. (I) orientalis*

Bagnall and *T. florum* Sch. on jasmine flowers. The former is now recorded for the first time on *J. mesnyi* flowers.

ROSACEAE

Rosa spp.

Bagnall (1918, 1926) described *Haplothrips tenuipennis* and *Thrips melaneurus* on rose from Darjeeling. Karny (1926) mentioned *Rhipiphorothrips cruentatus* Hood. Ramakrishna (1928) recorded *Taeniothrips* (*Physothrips*) *andrewsi* Bagnall and *T. brunneicornis* (Bagnall), *T. (Physothrips) lefroyi* Bagnall, and *Thrips florum* Sch. Ramakrishna *et al.* (1939a) recorded *Frankliniella sulphurea* Schmutz. Shumsher Singh (1945) described *Taeniothrips rhopalantennalis* on rose (M. S. Mani coll.). Ananthakrishnan (1953) identified *Thrips florum* Sch. from specimens collected by K. K. Nayar, from Trivandrum 'causing galls on leaves of rose' and states that this is the first record of the species on this plant causing galls. He (1960) recorded this species on *Rosa* spp. at Ooty; *T. tabaci* Lind. and *T. melaneurus* Bagnall on *Rosa bankia* at Kodaikanal. Mathur *et al.* (1960c) also listed the above species. Lakshminarayana *et al.* (1961) recorded *R. cruentatus* Hood on *Rosa* spp. at Araku Valley (A.P.).

During the present survey *R. cruentatus* Hood was found infesting and feeding on rose flowers, in addition to the leaves.

SOLANACEAE

Datura suaveolens Humb. & Bonpl.

Popularly known as Angel's Trumpet, this handsome shrub growing to a height of 10-15 ft. and native of Mexico is grown in Indian gardens for its 8-12 inch long sweet-scented, drooping flowers. It blooms during the hot season. So far, no thrip species is recorded on this host.

Only two species are hitherto recorded on closely related species, Karny (1926) and Moulton (1929) recorded *Frankliniella sulphurea* Sch. on datura flowers. Ramakrishna (1928) recorded *Trypactothrips rutherfordi* (Bagnall) on datura flowers and Ramakrishna *et al.* (1939a) recorded *F. sulphurea* Sch. on *D. fastuosa*. Mathur *et al.* (1959) listed *T. rutherfordi* (Bagnall) on datura flowers.

Thrips kodaikanalensis Ananth. & Jagadish is now recorded for the first time on *D. suaveolens*.

***Solanum wightii* Nees**

No thrips is known to attack this plant and the present record of *Haplothrips ganglbaueri* Sch., on both flowers and leaves, is the first record.

THYMELAEACEAE

***Lasiosiphon eriocephalus* Decne.**

This small tree or much-branched shrub (1·8-3·0 m.) is found in open forests on the hills of the Deccan and Western Ghats from Konkan southwards to Kerala, Nilgiris, Palnis, and Tinnevely Hills at altitudes of 1200-2100 m. ; with small yellow flowers densely arranged on a terminal inflorescence. It yields a fibre useful in paper technology and serves as a fish poison. It causes dermatitis to human beings and hence is of considerable medical importance also.

No Thysanoptera has so far been recorded on this plant and the only known record is the present case of *Haplothrips* sp. As the specimens are all damaged, they could not be identified further.

VERBENACEAE

***Petraea volubilis* L.**

No Thysanoptera has been recorded on this plant. Heavy infestation of *Haplothrips ganglbaueri* Sch. and aphids completely desapped the flowers, which appeared scorched. This is the only known case of thrips infestation on this plant.

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