Species-richness in the Oriental fungus-feeding thrips of the genus \textit{Azaleothrips} (Thysanoptera, Phlaeothripidae)

SHÛJI OKAJIMA\(^1\) & MASAMI MASUMOTO\(^2\)

\(^1\)Laboratory of Entomology, Tokyo University of Agriculture, 1737 Funako, Atsugi, Kanagawa, 243-0034 Japan. E-mail: okajima@nodai.ac.jp

\(^2\)Yokohama Plant Protection Station, Tokyo Sub-station, Tokyo Port Government Offices building, 2-7-11 Aomi, Koto-ku, Tokyo, 135-0064 Japan. E-mail: masumotom@pps.maff.go.jp

Table of contents

Abstract .................................................................................................................................................. 302
Introduction ........................................................................................................................................ 302
Material and methods ....................................................................................................................... 303
Quality of specimens .......................................................................................................................... 303
Generic relationships of \textit{Azaleothrips} .......................................................................................... 303
Species-groups and morpho-clines within \textit{Azaleothrips} ............................................................... 304
Genus \textit{Azaleothrips} Ananthakrishnan ............................................................................................ 305
Key to \textit{Azaleothrips} species ........................................................................................................... 305
\textit{Azaleothrips amabilis} Ananthakrishnan ..................................................................................... 307
\textit{Azaleothrips apoensis} sp.n. ........................................................................................................ 307
\textit{Azaleothrips aspersus} Bhatti ........................................................................................................ 309
\textit{Azaleothrips atayal} sp.n. ............................................................................................................. 309
\textit{Azaleothrips bali} sp.n. ................................................................................................................ 310
\textit{Azaleothrips bhutii} Vijai Veer et Chauhan .................................................................................. 312
\textit{Azaleothrips bifidus} sp.n. ........................................................................................................... 312
\textit{Azaleothrips bulelengi} sp.n. .......................................................................................................... 313
\textit{Azaleothrips dentatus} sp.n. ........................................................................................................ 314
\textit{Azaleothrips dorsalis} sp.n. ......................................................................................................... 316
\textit{Azaleothrips flavicollis} sp.n. ....................................................................................................... 318
\textit{Azaleothrips floresi} sp.n. ............................................................................................................ 320
\textit{Azaleothrips formosae} sp.n. ....................................................................................................... 320
\textit{Azaleothrips indonesiensis} Okajima ........................................................................................ 322
\textit{Azaleothrips inflavus} sp.n. ........................................................................................................ 323
\textit{Azaleothrips laevigatus} Okajima ............................................................................................. 323
\textit{Azaleothrips laocai} sp.n. ............................................................................................................. 325
\textit{Azaleothrips lepidus} Okajima ................................................................................................... 327
\textit{Azaleothrips lineus} Bhatti .......................................................................................................... 327
\textit{Azaleothrips luzonicus} sp.n. ........................................................................................................ 327
\textit{Azaleothrips malaya} sp.n. .......................................................................................................... 328
\textit{Azaleothrips mindanaoensis} sp.n. .............................................................................................. 330
\textit{Azaleothrips mouadii} Okajima ................................................................................................ 332
\textit{Azaleothrips philippinensis} sp.n. .............................................................................................. 332
\textit{Azaleothrips phuketanus} sp.n. .................................................................................................. 333
\textit{Azaleothrips pulcher} sp.n. ......................................................................................................... 334
\textit{Azaleothrips reticulatus} sp.n. .................................................................................................... 335
\textit{Azaleothrips richardi} sp.n. ........................................................................................................ 337
\textit{Azaleothrips siameensis} Okajima ............................................................................................. 338
\textit{Azaleothrips simulans} sp.n. ....................................................................................................... 338
\textit{Azaleothrips sulawensis} Okajima ............................................................................................ 341
\textit{Azaleothrips taiwanus} sp.n. ...................................................................................................... 342
\textit{Azaleothrips templeri} sp.n. ....................................................................................................... 342
\textit{Azaleothrips toshifumii} sp.n. ..................................................................................................... 344
Azaleothrips, a phlaeothripine genus of fungus-feeding species, is presumably endemic to the Oriental Region between India and Japan. Although only 10 species have been known in this genus until now, a total of 35 species is recorded here, of which 26 are newly described: from Indonesia—A. bali sp.n., A. bulelengi sp.n., A. dentatus sp.n., A. dorsalis sp.n., A. floresi sp.n., A. inflavus sp.n., A. simulans sp.n., A. sulawesicus sp.n., from the Philippines—A. apoensis sp.n., A. bifidus sp.n., A. luzonensis sp.n., A. mindanaoensis sp.n., A. philippinensis sp.n., from Taiwan—A. atayal sp.n., A. formosae sp.n., A. taiwanus sp.n., from Thailand—A. flavicollis sp.n., A. phuketanus sp.n., A. pulcher sp.n., A. toshifumii sp.n., from Vietnam—A. laocai sp.n., A. vietnamensis sp.n., from W. Malaysia—A. malaya sp.n., A. reticulatus sp.n., A. richardi sp.n., A. templieri sp.n. In addition A. magnus Chen, described from Taiwan, is newly synonymized with A. moundi. Azaleothrips laevigatus, described from southern Japan, is newly recorded more widely in Southeast Asia. A key to 33 species is provided, but A. bhattii and A. lineus cannot be recognized because of the poor information in the original descriptions.

Key words: Fungus-feeding, Thysanoptera, Phlaeothripidae, Phlaeothrips-lineage, Amphibolothrips genus-group, Azaleothrips, new species

Introduction

The fungus-feeding phlaeothripine thrips fauna of tropical and subtropical Asia is probably very rich. Unfortunately, the Thysanoptera fauna of most of this region is still insufficiently investigated, though there have been extensive studies on it from some parts of India (Ananthakrishnan & Sen 1980), the Philippines (Reyes 1994) and Japan including the subtropical Ryukyu and Ogasawara Islands (Okajima 2006). In the early 20th century, before World War II, some European authors, such as Bagnall, Karny and Priesner, described many thrips taxa from some parts of this region, but most of those studies are now unreliable. As pointed out by Mound and his colleagues in their Australian phlaeothripid papers (Mound 2008; Mound et al. 2013), many taxa had also been described based on low quality, as well as a low quantity of specimens in the early studies on Asian thrips, and it is very difficult to observe detailed character states of such taxa. Description of taxa based on low quality specimens in low quantities can cause various problems. For example, observation of surface structure on unmacerated specimens is often impossible, and cover slip pressure can greatly change the proportions of the body and head of a thrips specimen. From a species described based on few or single specimens we cannot understand its intraspecific variation as well as its distribution. As a result, there have been many poorly defined genera and species, and these increase the difficulty of further studies. Moreover, the specimens described in the early studies were collected from limited areas, such as Java, Sumatra and Peninsular Malaysia. In recent years, the present authors and their colleagues have accumulated many specimens from Southeast Asia through repeated investigations. Amongst these collections are more than 1500 slide-mounted specimens representing the genus Azaleothrips.

The genus Azaleothrips is presumably endemic to Asia between India and Japan, and it may be a member of the Phlaeothrips-lineage (Dang et al. 2014). Until now, only 10 fungus-feeding species have been listed in this genus, of which four were described from India, two from Thailand, one from Japan and Taiwan, and one each from Indonesia, Japan and Taiwan. Species of this genus are commonly found living on dead branches, and sometimes on the prop roots of Banyan trees. Most of the species seem to have somewhat limited distributions, but one species described from northern Thailand, lepidus, was recorded recently from Australia (Mound et al. 2013). Moreover, another species described from southern Japan, laevigatus, is here newly recorded from a wide range of tropical and subtropical Southeast Asia. At present it is unknown why the difference in such a distribution patterns arises.

The objective of this paper is to demonstrate the species-richness of the genus Azaleothrips, and to provide an identification key to the 33 species including 26 newly described species based on a long series of recently collected specimens.
among reticles, tuberculate along reticles at posteromedian portion. Cheeks convex, distinctly narrowed at base. Compound eyes about 0.3 times as long as head. Postocular setae about half the length of eyes. Antennal segments VII and VIII closely fused; segment IV a little shorter than segment III; segment III with two (1 + 1), segment IV with four (2 + 2) sensoria. Pronotum (Fig. 158) distinctly sculptured with reticles, tuberculate along reticles at posteromedian portion; with 29 short setae in holotype. Basantra present, but very weak. Mesonotum (Fig. 159) with small dentate microtrichia or tubercles along transverse lines of sculpture, almost smooth among lines. Metanotum (Fig. 159) entirely with polygonal reticulations, with delicate wrinkles among reticles; anterior half with 9 short setae in holotype. Fore tarsus unarmed. Fore wing with 7/7 duplicated cilia in holotype. Pelta distinctly reticulate, almost smooth among reticles. Abdominal tergites entirely distinctly reticulate, but somewhat weak at middle (Figs 160–161); tergites III to VII with dentate microtrichia along striae; interdistance of posterior pair of wing-retaining setae on tergite IV about 110 microns in holotype; tergite IX with 8 short setae at middle; S1 setae on tergite IX longer than half the length of tube; S2 setae on tergite IX expanded at apex. Tube about two-thirds the length of head. Anal setae much longer than tube.


**Male macroptera.** Color and structure very similar to holotype female. Body somewhat paler; head about 1.1 times as long as wide; fore tarsus unarmed; fore wing with 6/7 duplicated cilia; pore plate on abdominal sternite VIII distinct, but narrow at middle; S2 setae on abdominal tergite IX expanded at apex.


**Remarks.** This new species belongs to the *moundi* group. The entirely reticulate head and metanotum of this species is shared with *reticulatus*, described above from West Malaysia. However, it can be distinguished from *reticulatus* by the shorter head proportion, convex cheeks and longer median pair of setae (S1) on the abdominal tergite IX. Moreover, the distance between right and left wing-retaining setae is much wider in this species. A non-paratipic male collected from Thailand listed above cannot be distinguished satisfactorily from this species.

**Acknowledgements**

We wish to express our cordial thanks to Dr. L. A. Mound of CSIRO, Australia, for his kindly advice and expert suggestions through this study, and to Dr Toshifumi Nonaka, Saitama, Japan, for helping to field surveys. We also thank the editor and three anonymous referees for their valuable suggestions and comments to an earlier draft.

**References**


