

A review of the leafhoppers of the genus *Thaia*
(Hemiptera; Cicadellidae; Typhlocybinae)
from rice in Asia

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Submitted for publication: 3.VII.1989

Summary

The rice-feeding species of the cicadellid genus *Thaia* GHAURI, are reviewed. Five species are found as minor pests of rice in parts of Asia: *Thaia assamensis* (MAHMOOD), *T. gaurii* DWORAKOWSKA, *T. oryzivora* GHAURI with which *T. rubiginosa* KUOH is newly synonymised, *T. longipenia* THAPA & SOHI with which *T. rustica* KUOH is newly synonymised, and *T. subrufa* (MOTSCHULSKY). The distribution of each species is given and the male genitalia are illustrated.

Résumé

Les espèces oryzophages du genre Cicadellide *Thaia* GHAURI sont révisées. Cinq espèces ont été trouvées représentant des pestes mineures de riz dans certaines parties de l'Asie: *Thaia assamensis* (MAHMOOD), *T. gaurii* DWORAKOWSKA, *T. oryzivora* GHAURI dont *T. rubiginosa* KUOH est un synonyme nouveau, *T. longipenia* THAPA & SOHI dont *T. rustica* KUOH est un synonyme nouveau, et *T. subrufa* (MOTSCHULSKY). La distribution de chaque espèce est donnée et les génitalia mâles sont illustrés.

Introduction

Over thirty Auchenorrhyncha (leafhoppers, planthoppers, spittlebugs etc) are found regularly as pests of rice (*Oryza sativa* L.) in Asia (WILSON & CLARIDGE, 1985). Leafhoppers (Cicadellidae) form an important part of this fauna. Among them are minor pests of the genus *Thaia* (sub-family Typhlocybinae) sometimes known as red-headed, orange-headed leafhoppers, or «white leafhopper» (WU & RUAN, 1982). The identity and distribution of some of these species have been much confused in the literature. Over 20 *Thaia* species are now described from throughout Asia but the host plants of the majority are unknown. The results of studies on rice-associated *Thaia* species are presented here as a preparation for a handbook for the identification of leafhoppers and planthoppers of rice (WILSON & CLARIDGE in prep.) and to validate two new synonyms.

Nymphs and adults of *Thaia* species feed, like many of the sub-family Typhlocybinae, by ingesting the contents of mesophyll cells of the leaves of their host plants causing patches of white cells to appear as air replaces the cell contents. Infestation by large numbers of individuals may cause the condition known as hopperburn in which the leaves are killed by the intensity of feeding. The pest status of each *Thaia* species is given under individual species below.

Depositories of specimens.

BMNH: British Museum (Natural History), London, UK.

USNM: US National Museum of Natural History, Washington, D.C., USA.

Thaia GHAURI

Thaia GHAURI 1962: 253. Type species *T. oryzivora* GHAURI 1962.

Hardiana MAHMOOD 1967: 14. Type species *H. assamensis*. syn. by DWORAKOWSKA 1970: 80.

Thaia was established by GHAURI (1962) for a newly described species *T. oryzivora* GHAURI (type species) from Thailand, and *Thamnotettix subrufa* MOTSCHULSKY (1863) from Sri Lanka. MAHMOOD (1967) described *Hardiana* with *H. assamensis* MAHMOOD from Bangladesh as type species. DWORAKOWSKA (1970) redefined the genus.

Diagnosis. Rather robust typhlocybina leafhoppers, 3.0-4.0 mm. long. Head and thorax orange or red-coloured, forewings white or grey suffused. Male genitalia: sides of pygophore possessing a distinct large process (e.g. Fig. 3) directed upwards, at least at its base. Anal tube with a very well developed process (e.g. Figs 11, 12). Aedeagus with long stem and apical gonopore, often with shorter paired appendages arising at the upper part of the preatrium (e.g. Figs 1, 2).

Identification of *Thaia* species.

This paper is concerned only with the *Thaia* species known to occur on rice and a key for their separation is given below. Those *Thaia* species not included here are illustrated in the following papers: DWORAKOWSKA 1970, 1972, 1976, 1979, 1980, 1984, DWORAKOWSKA & VIRAKTAMATH, 1979.

Key to rice-associated *Thaia* species (males only).

- 1 - Aedeagus with long paired processes of the preatrium (e.g. Fig 1, 4) 2
 - Aedeagus with short processes of the preatrium (Fig. 13) *longipenia*
- 2 - Pygophore process short, broad and curved inwards (Fig. 8) *ghaurii*
 - Pygophore process long and finger-like (e.g. Fig. 3) 3
- 3 - Aedeagus with basal paired processes wide and twisted slightly with apices diverging (Figs 1, 2), shaft strongly s-shaped in lateral view (Fig. 2) *oryzivora*
 - Aedeagus with basal paired processes thinner and almost straight in dorsal view (Figs 4, 6) 4
- 4 - Species distributed in Sri Lanka and southern India *subrufa*
 - Species distributed in Bangladesh, N.E. India and Nepal *assamensis*

Thaia oryzivora GHAURI; figs 1-3.

Thaia oryzivora GHAURI 1962: 255; SOHI 1983: 61; LEEWANGH & LEUAMSANGH 1967: 30; DWORAKOWSKA 1984: 15.

Thaia subrufa (MOTSCHULSKY); DWORAKOWSKA 1970: 89, figs misident.; WU & RUAN 1982: 178 misident.; Anon. 1982: 7 misident.

Thaia katoi DWORAKOWSKA 1976: 48; DWORAKOWSKA 1976: 1. syn. by SOHI 1983: 61

Thaia rubiginosa KUOH 1982: 397; KUOH 1983: 277, syn. n.

Diagnosis. *T. oryzivora* may be distinguished from other *Thaia* species by the strongly s-shaped aedeagus shaft (fig. 2). The lateral (basal) processes are wide and twisted slightly with their apices diverging (fig. 1).

Distribution. Burma, W. Malaysia, S. China, Japan, Thailand, Taiwan, Vietnam.

Specimens examined. Holotype ♂ and paratypes of *T. oryzivora* GHAURI; Paratypes of *T. katoi* DWORAKOWSKA; paratypes of *T. rubiginosa* KUOH. Additional specimens have been examined from China, Thailand, Taiwan and W. Malaysia (Perak) (all BMNH).

Comments. *T. oryzivora* has a more easterly distribution than the other species considered here with Burma (Rangoon) (DWORAKOWSKA 1976) its westernmost locality. It does not overlap with either *T. assamensis* or *T. ghaurii*.

Thaia katoi was described from specimens from S. China (Fochow) and Taiwan and the aedeagus of specimens (as *T. katoi*) from China and also Burma was figured (DWORAKOWSKA, 1976). Comparison with the holotype of *T. oryzivora* indicated the synonymy given by SOHI (1982). Figures of the male genitalia of *T. subrufa* given by DWORAKOWSKA (1970) are referable to *T. oryzivora*. Figures of the male genitalia given as *T. oryzivora* by DWORAKOWSKA (1976: 43, figs 362-366; 1977: 287, figs 40, 41) are referable to *T. assamensis*.

Although recorded in Japan (ESAKI & ITO, 1954) (as *T. subrufa*) no specimens have been examined in this study.

Biology and pest status. *T. oryzivora* was originally described from specimens found feeding on rice seedlings in Thailand (GHAURI, 1962), and LEEWANGH & LEUAMSANGH (1967) studied the ecology of the species in Thailand. They concluded that although the species was not at that time considered to be of economic importance they could cause considerable damage if present in large numbers at the seedling stage.

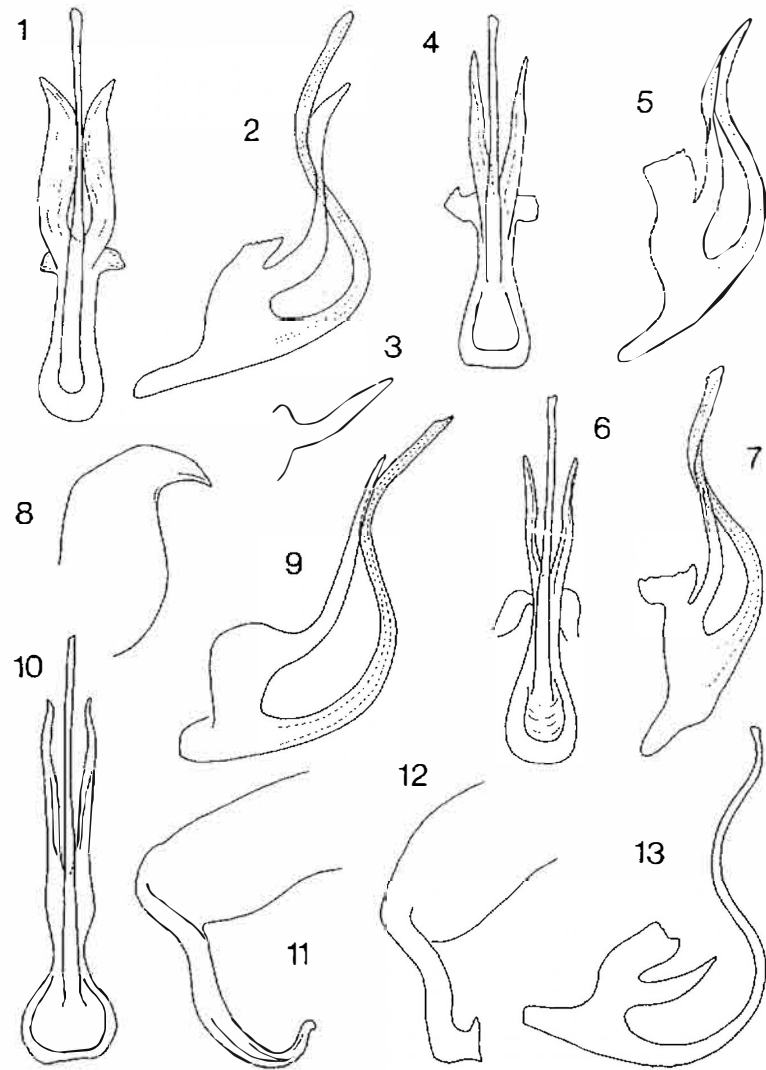
T. oryzivora (as *T. subrufa*) in China was investigated by WU & RUAN, 1982 and Anon., 1982. WU & RUAN recorded two generations per year while Anon. (1982) recorded three. This latter study reported that *T. oryzivora* fed on rice in summer but on barley, wheat and gramineous weeds in winter. These authors and KUOH (1983) (as *T. rubiginosa*) consider *T. oryzivora* an important pest of rice in China.

KIFUNA (1983) described a new strepsipteran parasite *Halictophagus thiaiae* from males of *T. oryzivora* in Thailand.

Thaia assamensis (MAHMOOD); figs 4, 5.

Hardiana assamensis MAHMOOD 1967: 15; SOHI 1983: 60.

Thaia assamensis (MAHMOOD); DWORAKOWSKA 1970: 88; SOHI & DWORAKOWSKA 1983: 183 (listed).



Figs 1-13: *Thaia* spp., male genitalia: *Thaia oryzivora* GHAURI: 1 aedeagus, dorsal view; 2 aedeagus, lateral view; 3 pygophore process, *Thaia assamensis* (MAHMOOD): 4 aedeagus, dorsal view; 5 aedeagus, lateral view, *Thaia subrufa* (MOTSCHULSKY): 6 aedeagus, dorsal view; 7 aedeagus, lateral view, *Thaia ghaurii* DWORAKOWSKA: 8 pygophore process; 9 aedeagus, lateral view; 10 aedeagus, dorsal view; 11 anal segment process, *Thaia longipennis*: 12 anal segment process; 13 aedeagus, lateral view.

Thaia oryzivora AHMED & SAMAD 1972: 177 misident.; DWORAKOWSKA 1976: 43, figs 362-366 (Bangladesh specimen) misident.; DWORAKOWSKA 1977: 288, figs 40, 41. misident.; ALAM & ALAM 1979: 17 misident.; THAPA & SOHI 1982: 99 misident.

Diagnosis. *Thaia assamensis* may be separated from *T. oryzivora* and *T. subrufa* by the thin, diverging, lateral aedeagal processes (fig. 4). The aedeagal shaft is also less strongly s-shaped than *oryzivora*. This species is very similar to *T. subrufa* but the distributions do not overlap (see below under *T. subrufa* for further discussion)

Distribution. Bangladesh, N.E. India (Bengal, Bihar), Nepal (Kathmandu).

Specimens examined. Holotype ♂ and paratypes (4 ♀ 1 ♂) of *Hardiana assamensis* MAHMOOD (USNM). Specimens from various localities in Bangladesh, N.E. India (Bengal, Bihar) and Nepal (Kathmandu) (BMNH).

Comments. *T. assamensis* has been frequently confused with *T. oryzivora* but in distribution does not overlap in its distribution. Figures of *T. oryzivora* given by DWORAKOWSKA (1976) as from Bangladesh (Chittagong) and DWORAKOWSKA (1977) are referable to *T. assamensis*. Specimens recorded from Nepal as *T. oryzivora* by THAPA & SOHI (1982) are referable to *T. assamensis*.

Biology and pest status. AHMED & SAMAD (1972) reported *T. assamensis* (as *T. oryzivora*) as the most dominant leafhopper on rice in Bangladesh, affecting many rice varieties as well as being found on other grass species. It is regarded as a potentially important rice pest by these authors. ALAM & ALAM (1972) reported *T. assamensis* as causing «hopperburn» (drying-off of the leaves) through the intensity of feeding.

***Thaia subrufa* (MOTSCHULSKY); figs 6, 7.**

Thamnotettix subrufa MOTSCHULSKY 1863: 100; GHAURI 1962: 256 (new combination); SOHI 1983: 61; DWORAKOWSKA & VIRAKTAMATH 1979: 52, figs 56-58; SOHI & DWORAKOWSKA 1983: 183 (listed)

Diagnosis. *T. subrufa* closely resembles *T. assamensis* but differs in the slightly thinner lateral aedeagal processes (fig. 6)

Distribution. Sri Lanka, S. India (Karnataka)

Specimens examined. Specimens from various localities in Sri Lanka and from India (Karnataka) (BMNH).

Comments. The anal segment and aedeagus were illustrated by DWORAKOWSKA & VIRAKTAMATH (1979) from a specimen from India (Karnataka, Jog Falls). The species illustrated by DWORAKOWSKA (1970) is referable to *T. oryzivora*. Literature references to *T. subrufa* given in Metcalf's (1968: 357) «General Catalogue of the Homoptera» certainly concern several species and only those references to Sri Lanka records are likely to be *T. subrufa*.

T. subrufa is closely related to *T. assamensis* in the form of the male genitalia as noted above but the distributions of the two species as presently recognised do not overlap. No *Thaia* spp. specimens have been available for this study that have been collected from rice between the southern India distribution of *T. subrufa* and the north-eastern Indian distribution of *T. assamensis*. The examination of specimens from this region would be very valuable in assessing the status of these two species.

Biology and pest status. *T. subrufa* was recorded in large numbers on seedling rice in Karnataka, India and caused hopperburn damage (GOWDA *et al.* 1983). CHAKRAVARTHY (1987) recorded the species on ratoon rice in Karnataka but did not state if any damage was caused.

Thaia gaurii DWORAKOWSKA; figs 8-11.

Thaia gaurii DWORAKOWSKA 1970: 90; DWORAKOWSKA & VIRAKTAMATH 1979: 55, figs 59-61. *Thaia oryzivora*; SOEHARDJAN 1973: 1-10 misident.

Diagnosis. The male genitalia of *T. gaurii* are distinctly different from *T. oryzivora*, *assamensis* and *subrufa* in the character of the pygophore process which is short, broad and curved inwards (fig. 8). It differs from *T. longipenia* in the shape of the anal tube process (fig. 11).

Distribution. Indonesia: S. Sumatra, Java, Bali

Specimens examined. Numerous specimens from throughout the distribution (all BMNH).

Comments. *T. gaurii* was described by DWORAKOWSKA (1970) from Java and is common on both rice and grasses around rice fields in Java. It is undoubtedly the species referred to as *T. oryzivora* by SOEHARDJAN (1973). The aedeagus and anal segment were illustrated by DWORAKOWSKA (1970) and DWORAKOWSKA & VIRAKTAMATH (1979).

Biology and pest status. *T. gaurii* is found in low numbers on rice in Java, Bali and in southern Sumatra. There is no evidence at present that this species damages rice. Recorded from rice in West Java by SOEHARDJAN (1973) (as *T. oryzivora*).

Thaia longipenia THAPA & SOHI; figs 12, 13.

Thaia longipenia THAPA & SOHI 1982: 99.
Thaia rustica KUOH 1987: 123, syn. n.

Diagnosis. The male genitalia are the most distinctive of those considered here. The aedeagus is very long, strongly s-shaped with a short basal process (fig. 13). In addition the bifurcate apical process of the anal segment appendages (fig. 12) is quite unlike other species (e.g. fig. 11).

Distribution. Nepal (Kathmandu), N. Thailand, S. E. Tibet.

Specimens examined. Paratypes and other specimens from Nepal (BMNH).

Comments. The type series was collected at a light trap but I. DWORAKOWSKA (pers. comm.) has collected the species from rice in N. Thailand. The drawings in KUOH give no doubt that *T. rustica* is a synonym of *T. longipenia*. KUOH noted that his specimens were collected from rice.

Acknowledgements

I would like to thank Dr I. DWORAKOWSKA for her comments on certain taxonomic aspects of the work; T. J. HENRY (USNM, Washington) who kindly arranged the loan of specimens and Dr V. THAPA (Kathmandu, Nepal) for sending specimens. Mr M. D. WEBB and Ms A. K. WALKER made useful suggestions on the manuscript.

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