

# *Pseudonapomyza asiatica* Spencer (Diptera: Agromyzidae), a recently resurgent pest species which damages rice in Taiwan

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(Accepted for publication: Dec. 29, 2001)

## ABSTRACT

Liao, C. T.<sup>1</sup>, and Shiao, S. F.<sup>2\*</sup> 2001. *Pseudonapomyza asiatica* Spencer (Diptera: Agromyzidae), a recently resurgent pest species which damages rice in Taiwan. Plant Prot. Bull. 43: 235-242

*Pseudonapomyza asiatica* Spencer was recently rediscovered causing damage to rice in central Taiwan in August 2001. Although this species is conventionally treated as a minor pest of rice in its younger stages, its resurgence and wider distribution still deserve our special attention. This note focuses on taxonomic and morphological descriptions of this pest species in order to assist further diagnostic discrimination; a redescription and illustration in greater detail of the external morphology and male terminalia are given. Moreover, some preliminary data on its ecology and a damage survey are also provided for additional reference to producers and control workers.

(Key words: *Pseudonapomyza asiatica*, Agromyzidae, rice)

## INTRODUCTION

*Pseudonapomyza asiatica* Spencer used to be a minor pest that usually attacked rice in its early stages<sup>(10, 12)</sup>. Recently, it was again discovered causing damages in central Taiwan. The distribution area was estimated to be about 500 ha around Hsiushui (秀水), Huatan (花壇), and Tatsuen(大村) in Changhua County. According to our survey in August 2001, this pest species had already caused partial damage to rice in central Taiwan, especially in the Taichung and Changhua area. The most obvious symptom was the whitish longitudinal leaf

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mines caused by larval feeding, and also the black pupa attached to the ends of the mines<sup>(1, 10)</sup>. This pest usually attacks young rice, and if it is not at a high-density, it will not necessarily cause serious economic losses at that moment. Nevertheless, the resurgence and wider distribution of this species still deserve our special attention. Spencer<sup>(12)</sup> mentioned that the economic importance of the *Pseudonapomyza* pest species group attacking cereals is not so serious. But he still suggested including these species, including *Ps. asiatica*, on the list of leaf miners of quarantine significance. On the other hand, the agromyzid pests are always minute and difficult to identify<sup>(11)</sup>. To avoid unnecessary confusion, we provide some morphological characters, especially more-detailed descriptions and illustrations of the external morphology and male genitalia, in this note to assist in making accurate identification and for further applications. Moreover, some preliminary survey data and observations are also provided for additional reference to rice producers and control workers.

***Pseudonapomyza asiatica* Spencer, 1961 (Figs. 1 – 10)**

*Pseudonapomyza asiatica* Spencer<sup>(9)</sup>, 1961: 92. Spencer<sup>(10)</sup> 1973: 264. Sasakawa<sup>(6)</sup> 1980: 192. Spencer<sup>(13)</sup> 1990: 375.

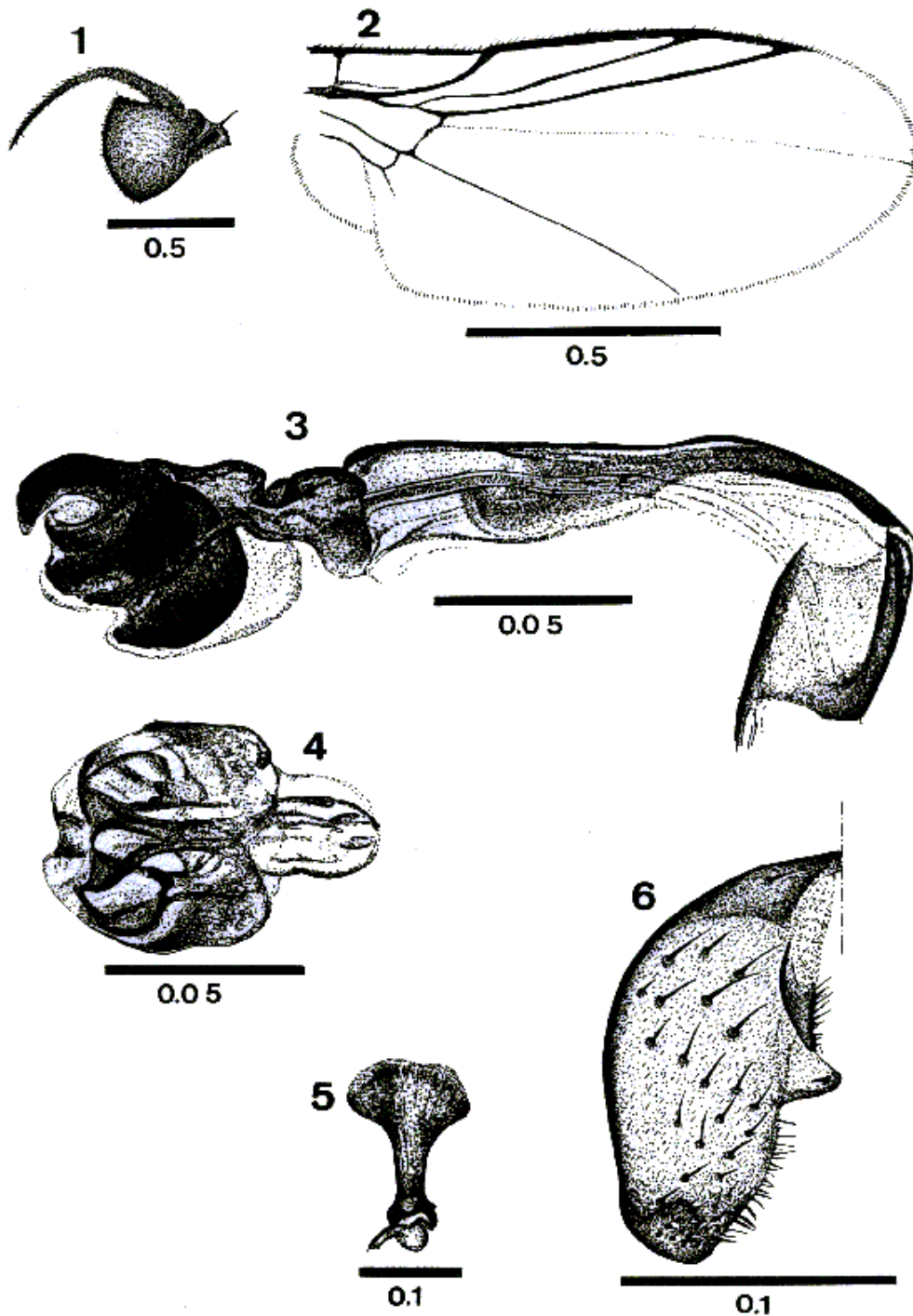
**Description:**

**Adult:** Small black species; wing length 1.2 mm in male, 1.6 mm in female. Head mostly mat black to brown. Frons narrow, slightly wider or as wide as eye. Third antennal segment with distinctive angle at upper corner from lateral view, arista dark brown and pubescent. Orbital bristles 4 pairs; upper pair directed upwards, 2nd and 3rd pairs inclinate and slightly proclinate, lowest pair obviously reclinate. Dorsocentral bristles 0 + 3 type, 1st pair minute. Acrostichals in about 4 irregular rows. Halter milky white. Costa extending to  $R_{4+5}$ ;  $M_{1+2}$  weak and ending near wing tip; inner cross vein near fork of  $R_{2+3}$  and  $R_{4+5}$ , outer cross vein lacking; proportion of 2nd and 3rd costal sections about 2:1. Squama and fringes white. Male terminalia: Surstylus bearing some longer sensory hairs from posterior aspect and also bearing about 20 stout but short spines on inner corner. Cercus covered with hairs, some stronger ones on inner tip. Sperm pump elongated with basal bulb not specially enlarged. Phallus length about 0.23 mm; distiphallus symmetrical and complicated from ventral view and claw-shaped from lateral view; mesophallus weakly developed and mostly membranous but with only a small bump on ventral side; basiphallus highly sclerotized. Female terminalia: 9th sternite with 4 pairs of marginal setae. Cercus with 6-7 setae and 3 tactile sensilla.

**Immature stages:** Fully developed 3rd instar larva whitish yellow, length about 2.1 mm; posterior spiracles on short conical projection, with about 5 pores. Pupa brownish black, length about 1.6 mm.

**Material examined:**

TAIWAN: CHANGHUA COUNTY: Tatsuen (大村), 4 males, 13 females, Aug. 2001, C. T. Liao, ex *Oryza sativa* L.



Figs. 1-6. *Pseudonapomyza asiatica* Spencer, male adult; 1, antenna, lateral view; 2, wing; 3, phallus, lateral view; 4, distiphallus, ventral view; 5, sperm pump; 6, left half of genital arch (with one surstylus and one cerci), posterior view. (scale units = mm)

**Parasites:**

*Chrysocharis* sp. (Eulophidae)

**Host Plants**<sup>(1, 4, 8, 10, 13)</sup>:

*Zea mays* L., *Cynodon dactylon* (L.) Pers., *Oryza sativa* L., *Eragrostis pilosa* (L.) Beauv., *Echinochloa crus-galli* (L.) Beauv. var. *formosensis* Ohwi, *Eleusine indica* (L.) Gaertn., *Setaria viridis* (L.) Beauv., *Paspalum conjugatum* Berg., *Leptochloa chinensis* (L.) Nees.

**Distribution:**

(widespread or restricted distribution in the following countries (areas))<sup>(3, 10)</sup>

Africa: Ethiopia (Addis Ababa), South Africa (Natal (= Zululand)), Cape Verde Is.

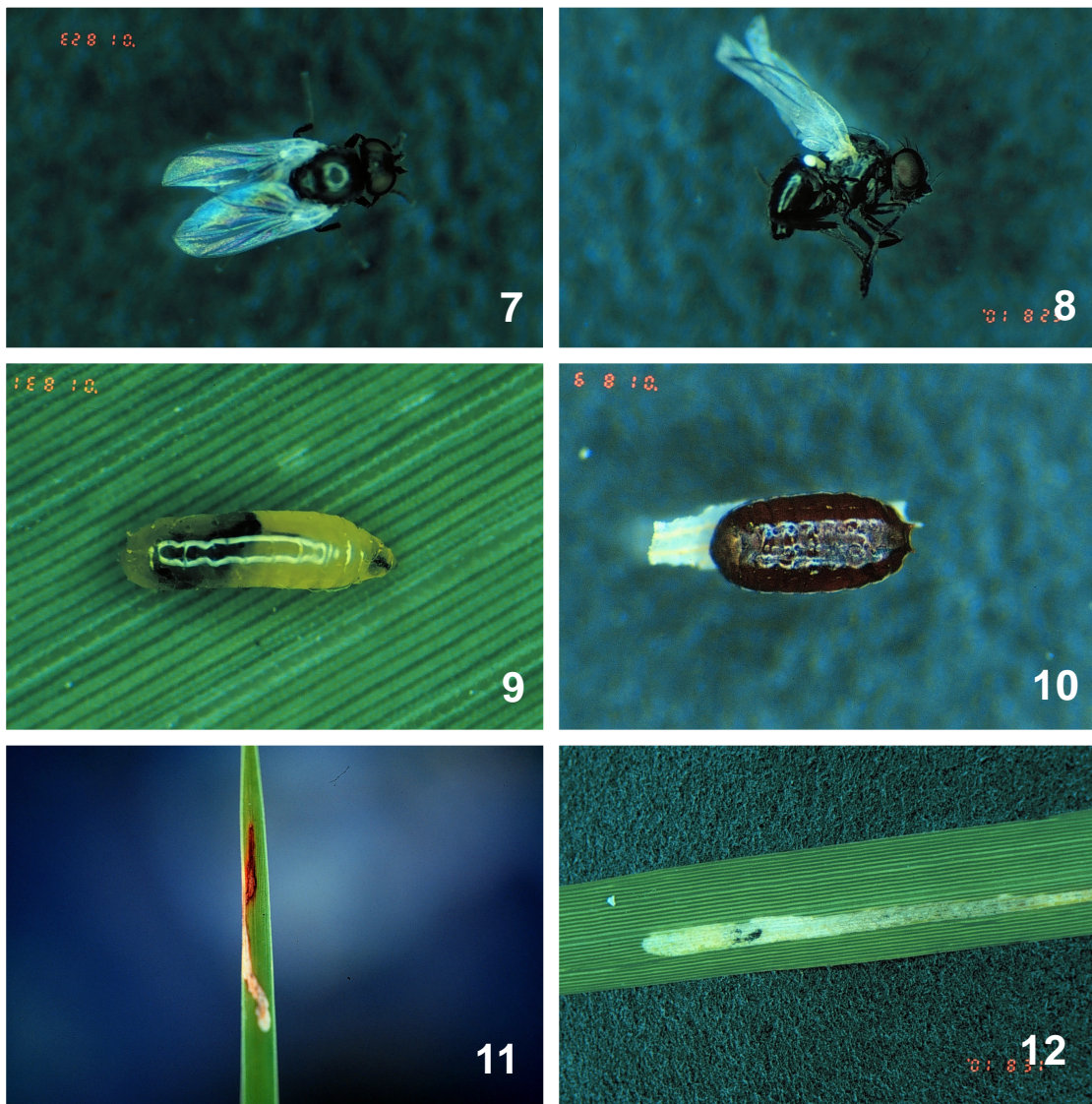
Asia: Bangladesh, India (Chandigarh and Hyderabad), Singapore, Philippines (Mindanao), Taiwan.

**Taxonomic remarks:**

There are only 3 *Pseudonapomyza* species recorded from Taiwan to the present<sup>(5, 7)</sup>. Except for the questionable taxonomic status of *Ps. atrata*<sup>(7)</sup>, the other 2 Taiwanese species of *Ps. asiatica* and *Ps. spicata* have similar morphologies of the male terminalia. Meanwhile, *Ps. asiatica* also has a partially overlapping distribution with *Ps. spicata* and another better-known species, *Ps. spinosa*, which is also distributed in tropical and subtropical regions<sup>(10)</sup> but not yet recorded from Taiwan. Generally, the external morphologies of *Pseudonapomyza* adults are all quite similar; the only character of *Ps. asiatica* that is distinguishable from other similar congeneric species is the more-obtuse angle on the 3rd antennal segment. Spencer<sup>(10)</sup> also mentioned that the color of the mesonotum is more mat in *Ps. asiatica* than in any other species, but this comparative character is somewhat hard to follow without observing more species in this group. The shape of the phallus of *Ps. asiatica* belongs to the typical type in this genus, which has a well-developed and highly sclerotized distiphallus. The structure of the distiphallus is somewhat complex in *Ps. asiatica* but it is always characteristic. The claw-shaped distiphallus from the lateral view is readily distinguishable from other closely similar species, such as *Ps. malayensis*, *Ps. spicata* and *Ps. spinosa*; whose distiphallus have more-compact and -rounded lateral shapes. *Ps. atra* is another species which is easily confused with *Ps. asiatica* also due to the similar distiphallus, but they can be separated from each other using the ventral aspects of the distiphallus. Therefore, careful examination of male genitalia is required, both from the lateral and ventral aspects, to prevent mistaking some similar closely related species.

**Symptoms:**

The larva forms a conspicuous whitish leaf mine (the length of the mine is about 12-45 mm, and the width is about 1-4 mm) at the apex of young leaves, and the mines usually run parallel to the leaf vein (Fig. 11, 12). Each mine contains a single larva; pupation takes place within the mine. After pupation, the mines turn from white to yellow, damaged leaves begin withering from the apex, and this usually blocks the normal photosynthesis. Whenever 2 or more mines occur on a single leaf, it always causes the leaf or even the entire plant to shrivel or die.



Figs. 7-12. Photo plates of *Pseudonapomyza asiatica* and the damage symptoms on rice leaf; 7, female adult, dorsal view; 8, female adult, lateral view; 9, larva, 3rd instar; 10, pupa; 11, mine, after larva pupation; 12, mine, close-up with a larva feeding within it.

**Economic importance:**

As we mentioned previously, this species actually causes no great economic losses at present. Spencer<sup>(10)</sup> also indicated that this species occurred very commonly on young rice from Taiwan in the 1970s, but no significant damage was reported at that time. Unfortunately, Spencer only provided the above injury description, which was cited as personal communication with Dr. Sung-Yang Lee. As far as we know, there is no other additional reference reporting the damage situation in those days. However, Spencer emphasized that

any substantial increase in population levels might nevertheless threaten young plants, and so this species deserved to be noted as a potential pest of rice. We agree with his point of view, and treated the present pest resurgence with alarm worth noting. Up to the present, only 4 agromyzid species have been recorded damaging rice around the world: the other 3 species are *Agromyza oryzae*, *Cerodontha orbitona*, and *C. oryzivora*, but again, they usually cause only minor damage to rice<sup>(13)</sup>.

### Ecology:

The span of 1 life cycle of *Ps. asiatica* is about 20 days from eggs to adults, but the number of generations per year and how generations overlap are still unknown. Observations show that this species only attacks young rice during early August to early September; and during this period, only 2 cycles can be completed on the rice. After the period of invasion on rice, the insect population will usually shift back to nearby Poaceae weeds and continue their life cycle, but the detailed life cycle occurring on weeds is still unknown.

### Resistance of rice strains to pests:

Preliminary studies show that the 2 Taiwanese rice strains of “Taikeng 1”(台梗 1 號) and “Taikeng Glutinous 1”(台梗糯 1 號) have potential resistance to this pest. However, further studies and field experiments are needed to confirm this point.

## ACKNOWLEDGMENT

The authors wish to thank two anonymous reviewers for their valuable comments. This work was supported by the National Science Council, Republic of China (NSC 90-2313-B-002-334) and Bureau of Animal and Plant Health Inspection and Quarantine, Council of Agriculture, Republic of China (90AS-6.1.2-BQ-B1(3)).

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## 摘 要

廖君達<sup>1</sup>、蕭旭峰<sup>2\*</sup> 2001 亞洲潛蠅（雙翅目：潛蠅科）- 一種臺灣近來再崛起之水稻害蟲 植保會刊 43: 235-242.（<sup>1</sup>彰化縣大村鄉 臺中區農業改良場；<sup>2</sup>臺北市 國立臺灣大學昆蟲學系）

亞洲潛蠅於 2001 年 8 月再次被發現在臺灣中部地區造成對水稻的為害，儘管此蟲到目前為止只能視為水稻生育初期的次要害蟲，但其較大面積的分布及再猖獗，值得多加注意。本文主要描述其分類學及形態學之內容，包括外部形態特徵、雄蟲外生殖器特徵及為害特徵等，以提供將來對物種區辨之參考；除此之外，並提供生態及為害調查之初步資料，爰供相關生產及防治人員參考應用。

（關鍵詞：亞洲潛蠅、潛蠅科、水稻）

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