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Anagrus incarnatus Haliday, a New Record from Eggs of Brown Planthopper in Taiwan[1]

Bing-huei Chen and Jih-zu Yu[2]

ABSTRACT

Anagrus incarnatus Haliday, an egg parasitoid of rice brown planthopper (BPH), is a new record from Taiwan. Its morphology was described and compared to *A. flaveolus* Waterhouse and *A. optabilis* (Perkins) which are the only two species of BPH egg parasitoids identified in Taiwan. Its biology was also studied and described.

Running head: Chen & Yu: Egg parasitoid of brown planthopper.

INTRODUCTION

The rice brown planthopper (BPH), *Nilaparvata lugens*(Stål)is the most serious insect pest of rice in Taiwan (Lin, 1974) and in most of Asia (IRRI, 1979). Its pest status is due to the resurgence after its natural enemies were killed by insecticide application (Heinrich, 1979), and its genetic variability to adapt to previously resistant rice cultivars (Pathak and Khush, 1979). Therefore, the natural enemies of BPH are its important controlling factors, and study on the utilization of these natural enemies in integrated pest management system becomes important. However, biological control of BPH has been overlooked for a long time under the pressure of over using chemicals. The effectiveness of the natural enemies in suppressing BPH is unable to reach its maximal potential because of the intensive application of insecticide in paddy fields. In Taiwan, farmers now are not willing to spray as frequently as usually because of low price of rice that makes them earn less profit for growing rice. This circumstance may create a favorable habitat for the activities of these natural enemies in rice paddy fields.

BPH has at least 16 species of parasitoids in Taiwan (Chiu, 1978). Among them, the egg parasitoid, *Anagrus* sp. which occupied up to 94% of occurrence is the most promising(Lin 1974). A. *flaveolus* Waterhouse and *A. optabilis*(Perkins) are the only two species have been identified (Miura et al. 1981, Sahad and Hirashima 1984). More species are believed remaining unidentified (Lin, personal communication). *A. incarnatus* Haliday has been reported existing in Europe (Britain, Denmark, Belgium) and Asia (Japan,

1. Contribution No. 1487 from Taiwan Agricultural Research Institute.

2. Entomologist and Assistant, Department of Applied Zoology, TARI. Wu-feng 41301, Taichung, Taiwan, R. O. C.

Korea, Bangladesh) (Sahad and Hirashima, 1984). This paper describes *A. incarnatus* as a new record of BPH egg parasitoid in Taiwan and to compare with related species to facilitate its identification.

Anagrus incarnatus Haliday

Anagrus incarnatus Haliday, 1833, Ent. Mag., 1 : 347.

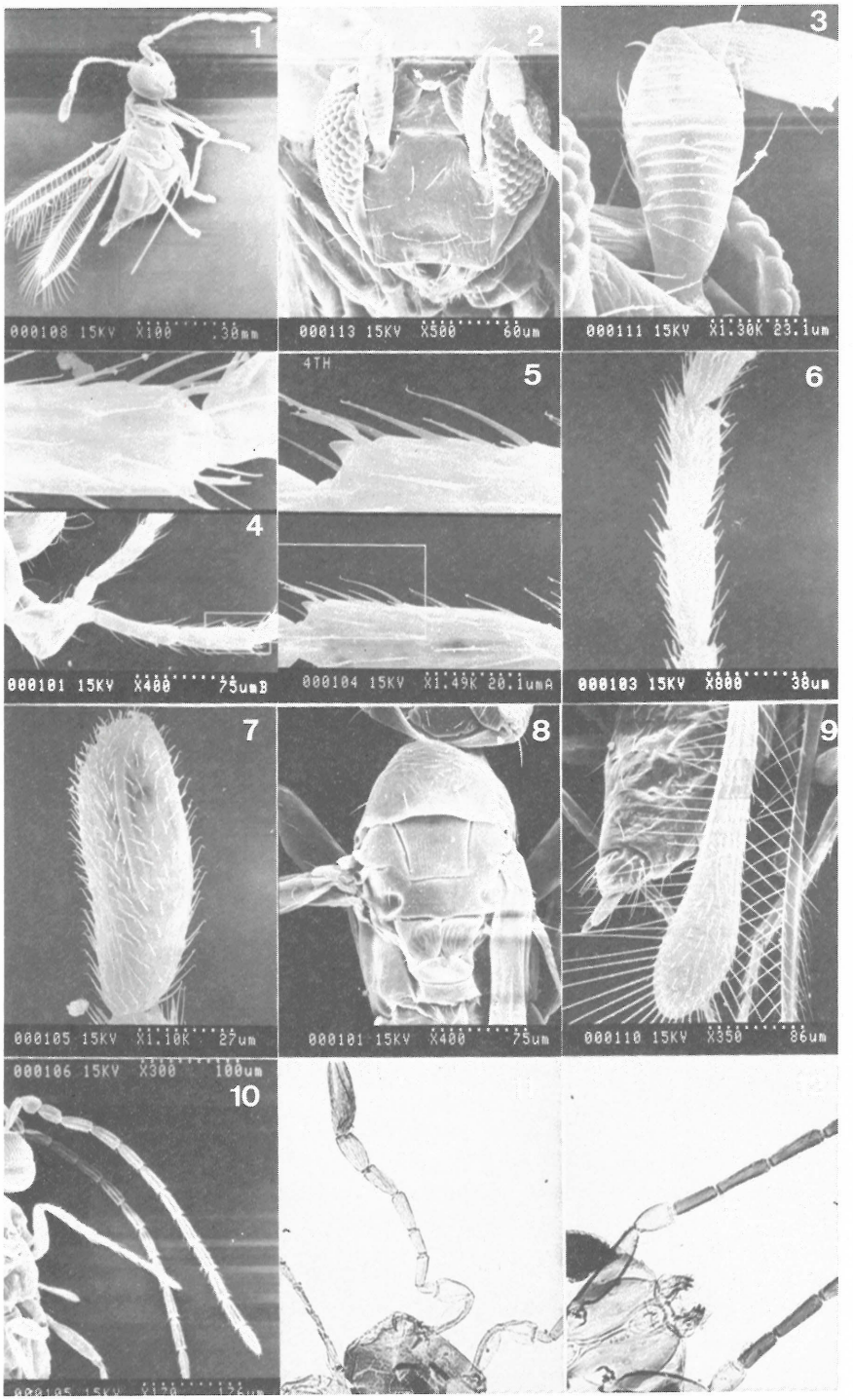
Anagrus incarnatus : Walkder, 1846, Ann. Mag. nat. Hist., 18 : 51.

Female (Fig. 1) : General color brownish orange; head, dark brown; antenna brown with scape, pedicel, 1st funicular segment light brown; eyes brownish red; mesonotum, propodeum pale yellow; wing transparent with marginal vein brownish.

Head subglobular, broader than thorax (Fig. 2); face slightly convex; gena large and elevated; OOL 3 times as long as POL; antennal torulus close to middle of inner margin of eye; scape stout, 3 times as long as wide, 2 times as long as pedicel, with 15—16 transverse lines (Fig. 3); pedicel pear-shaped, 1.5 times longer than wide, 2 times as long as 1st funicular segment; 1st funicular segment shortest, longer than wide; 2nd longest, 4 times as long as wide, gradually curved; 3rd shorter than 2nd but wider, with one sensory ridge (Fig. 4); 4th shorter but wider than 3rd, with one sensory ridge (Fig. 5); 5th and 6th gradually slightly shorter and wider than 3rd but each has two sensory ridges (Fig. 6); club with 4 sensory ridges, ovate (Fig. 7). Parapsidal furrow distinct (Fig. 8). Fore wing (Fig. 9) 9 times as long as wide, with 7—8 irregular lines of discal hairs distributed all over the broadest part of wing providing no bare space there; stigma with 4 circular sensilla compact closely at apex. Hind wing slightly shorter than fore wing with only one line of discal hairs along each margin, and very few hairs at middle of apex. Gaster longer than head and thorax together; ovipositor moderately exserted, exserted part about one-ninth as long as ovipositor.

Male: Generally similar to female, except in antennal structure (Fig. 10) and genitalia. Scape about 3 times as long as wide; pedicel subglobular, about one half as long as scape; 1st funicular segment longer than pedicel but shorter than remaining segments which each has 4 sensories and very similar to each other in length and width.

Biology: In the laboratory, this species has been reared as a solitary egg parasitoid of *N. lugens* cultured on rice plant. Adults usually emerge in the morning. Males that emerged earlier than females surrounded the emerging hole waiting the females for mating. Adult females therefore mated right after emergence and immediately search BPH eggs for oviposition. The way for female to search and probe BPH eggs is similar to that of the most of Hymenopterous parasitoids. It uses its antennae to detect the position of the host, and further identify if they are available or not. If the BPH eggs have not been parasitized, then it protrudes the oviposition duct to parasitize them. It takes 5—12 seconds to complete the process. In general, the female adult always skipps some BPH eggs in an egg mass without parasitizing. It takes about 13—16 days from egg to adult at 25±1°C. The adult longevity varies with temperature and is longer



Figs. 1—10. SEM photographs of *A. incarnatus*. (1) Adult body shape; lateral view. (2) Head; front view. (3) Scape with 15—16 transverse lines. (4) The 3rd, (5) The 4th, and (6) The 5th and 6th funicular segments. (7) Club. (8) Thorax in dorsal view. (9) Fore wing. (10) Male antennal segments. Fig. 11. Female antenna of *A. flaveolus*. Fig. 12. Scape of female *A. optabilis*.

when provided with honey and water. A famale adult is capable of parasitizing BPH eggs and producing up to 31 progenies with an average of 14. The sex ratio of the progenies emerged is about 2.51 : 1 for female : male.

Host : *Nilaparvata lugens* (Stål), *Nephotettix cincticeps* (Uhler), *Nagra nagaragawana* Matsumura, and *Sogatella furcifera* (Horvath) (Sahad and Hirashima 1984).

Distribution: Europe (Belgium, Britain, Denmark) and Asia (Bangladesh, Japan, Korea, Taiwan). This is the first record of this species from Taiwan.

Materials examined: Taipei, 9♀♀4♂♂, 27, V. 1970 (K. S. Lin); Taichung, 17♀♀3♂♂, 16, VII. 1976 (K. S. Lin); Wu-feng, Taichung, 33♀♀10♂♂, 2, IX. 1987 (B. H. Chen); Pingtung, 11♀♀3♂♂, 26, VI. 1970 (K. S. Lin).

Key to the species (famale) of *Anagrus* of Taiwan

1. First funicular segment appreciably long and cylindrical; scape without transverse lines (Fig. 11), second to 6th funicular segments equal or subequal; pedicel shorter than 1st funicular segment ..... *A. optabilis*

First funicular segment very short, subglobular; scape with transverse lines (Fig. 3) 2

2. Third funicular segment without sensory ridge, shorter than 4th (Fig. 12); fore wing with 3 rows of discal hairs giving distinct small bare space at the broadest part ..... *A. flaveolus*

Third funicular segment with one sensory ridge(Fig. 4), longer than 4th; fore wing with 7—8 irregular rows of discal hairs providing no bare space at the broadest part (Fig. 9) ..... *A. incarnatus*

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Anagrus incarnatus Haliday 臺灣新記錄之褐飛蝨卵寄生蜂[1]

陳炳輝 佘志儒[2]

摘 要

Anagrus incarnatus Haliday 爲水稻褐飛蝨之有效卵寄生蜂，係臺灣新記錄種，本文記述該種之形態與習性，並與臺灣已記錄之 *A. flaveolus* Waterhouse 與 *A. optabilis* (Perkins) 進行分類特徵之比較 *A. incarnatus* 每雌蜂最多可產卵31粒，平均約14粒，從卵到成蜂約需13—16天，雄蜂先羽化而出，再守在羽化孔，待雌蜂羽化時，立即交尾，雌蜂交尾後，即找尋褐飛蝨卵進行產卵寄生。

1.臺灣省農業試驗所 研究報告第 1487 號。

2.本所應用動物系副研究員及助理。臺灣省 臺中縣 霧峰鄉。