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Anagrus elegans (Hymenoptera, Mymaridae), a new egg parasitoid of the rice-feeding planthoppers (Homoptera, Delphacidae) in the Orient

Abstract - A new species of mymarid, *Anagrus elegans*, an egg parasitoid of the brown planthopper, *Nilaparvata lugens* (Stål), and the white-backed planthopper, *Sogatella furcifera* (Horvath), in the South Asian region is described. The new species is compared with the other *Anagrus* belonging to the *atomus* species group.

Riassunto - Anagrus elegans *(Hymenoptera, Mymaridae), nuovo parassitoide oofago delle cicaline del riso (Homoptera, Delphacidae) in Oriente.*
Viene descritta una nuova specie di mimaride, *Anagrus elegans,* ooparassitoide delle cicaline *Nilaparvata lugens* (Stål) e *Sogatella furcifera* (Horvath), nell'Asia meridionale. La specie nuova viene confrontata con le altre specie del genere *Anagrus* appartenenti al gruppo *atomus.*

Key words: *Anagrus elegans*, taxonomy, Mymaridae, parasitoid.

INTRODUCTION

Anagrus elegans n. sp., was previously indicated as new by Subba Rao (1983) and Claridge *et al.* (1988) who never described it. I studied both Claridge's material preserved in ethanol and Subba Rao's slide-mounted specimens collected in India and kept in the Natural History Museum, London, England.

Subba Rao (1983) refers to it as a new species "close to *flaveolus*" among those parasitizing the brown, *Nilaparvata lugens* (Stål), and the white-backed, *Sogatella furcifera* (Horvath), planthoppers in southeast Asia (India, Sri Lanka, West Malaysia). Subsequently, Claridge *et al.* (1988) report that one out of seven species they recognize from *N. lugens* and *S. furcifera* is the "sp. nov. of Subba Rao (1983)" and differs from *A. flaveolus* Waterhouse by "its much longer ovipositor". They collected an arrhenotokous population from Sri Lanka and a thelytokous one from the Philippines. This new species occurs therefore in the Oriental region.

The Oriental species of *Anagrus* have never been reviewed although a checklist is available (Chiappini *et al.*, 1996). Of the 11 species listed there (i.e., ?*A. columbi* Perkins, *A. dalhousieanus* Mani and Saraswat, ?*A. flaveolus*, ?*A. incarnatus* Haliday,

A. longitubulosus Pang and Wang, *A. nilaparvatae* Pang and Wang, *A. optabilis* (Perkins), *A. osborni* (Fullaway), *A. paranilaparvatae* Pang and Wang, *A. perforator* (Perkins), *A. toyae* Pang and Wang), 4 have proved to be synonymous of other species – *A. osborni* of *A. optabilis* (Triapitsyn and Beardsley, 2000), *A. toyae* of *A. frequens*, *A. paranilaparvatae* Pang and Wang of *A. optabilis* Perkins, and *A. longitubulosus* Pang and Wang of *A. perforator* Perkins (Triapitsyn, 2001) - and 2 (*A. columbi* and *A. flaveolus*) were misidentified. In fact, *A. columbi*, a Nearctic species, does not occur in the Oriental region: all previous records of that species from India were misidentifications of *A. flaviapex* Chiappini and Lin (Triapitsyn, 1999). Also all *A. flaveolus* and *A.* nr. *flaveolus* reported by Subba Rao and Hayat (1983, 1986) and Claridge *et al.* (1988) are different from the real *A. flaveolus* (Chiappini *et al.*, 1996) which is a New World species, and seem to correspond to *A. nilaparvatae* (Chiappini and Lin, 1998). The record of *A. incarnatus* by Sahad and Hirashima (1984) from Bangladesh is probably also that of *A. nilaparvatae*, which is so similar to the Palaearctic *A. incarnatus*, that the only reasons to keep them as separate species appear to be the different distribution and hosts.

Seven new species, together with 3 new records from the Oriental part of China of *A. atomus* (Linnaeus), *A. hirashimai* Sahad and *A. frequens* Perkins (Chiappini and Lin, 1998), were added to the remaining valid species previously recorded for this region.

The new species *A. elegans* belongs to the *atomus* group of the subgenus *Anagrus* s. str., together with other 4 out of the 14 valid species in the Oriental region:

A. atomus (Linnaeus), *A. flaviapex* Chiappini and Lin, *A. frequens* Perkins, and *A. setosus* Chiappini and Lin. Of these, *A. frequens* is the most similar species to *A. elegans* n. sp., from which it differs by having a much shorter ovipositor. This difference is supported by biological observations, too: in the field, *A. elegans* was reared from *S. furcifera*, whose eggs are deeply inserted in leaf tissue, while *A. frequens* was reared from *N. lugens*, whose eggs are more superficially laid (Claridge *et al.*, 1988). In addition, females of the new species, having a longer ovipositor, reach host eggs in a different way than females of *A. frequens* (M. F. Claridge, personal communication).

Measurements are given in micrometers, those of the holotype are followed, in parentheses, by the medium and the range of all the specimens measured. In the description, F is used for funicular segment, FWL for forewing length and FWW for forewing width.

The specimens of *A. elegans* n. sp. studied are deposited in the collections of the following Institutions:

BMNH, The Natural History Museum, London, England, UK;
CNCI, Canadian National Collection of Insects, Ottawa, Canada;
EMEC, The Essig Museum of Entomology, University of California, Berkeley, USA.
IEFA, Istituto di Entomologia e Patologia vegetale, Università Cattolica del Sacro Cuore, Piacenza, Italy.
UCRC, Entomology Research Museum, University of California, Riverside, USA.

***Anagrus (Anagrus) elegans* Chiappini** sp. nov. (Figs. 1-4)

FEMALE. Head orange-yellowish with mouthparts and antenna brown, except for scape, pedicel and F1 lighter; body yellow with anterior and lateral parts of mesoscutum, axilla, base and lateral apex of metasoma and tip of ovipositor brown. Wings hyaline, with brown venation, and infuscated with brown along margins. Legs light brown.

Head. Antenna (Fig. 1): scape slightly curved, F_1 almost globular, F_2 about 3 times as long as F_1, dilated distally; F_3 shorter than F_2 and subequal to F_5; F_4 subequal to F_2; F_2 without sensory ridges, F_3 without or with one sensory ridge; F_4 usually with 1 (but sometimes with 2) sensory ridge(s); F_5 with 1 sensory ridge and F_6 with 2 sensory ridges, clava with 3 sensory ridges, as is typical of the species group.

Mesosoma. Mesoscutum without adnotaular setae (Fig. 3). Forewing (Fig. 2) very long (reaching ovipositor apex) and narrow: FWL/FWW about 12.5. One longitudinal row of setae running from just beyond the end of stigmal vein to wing's apex; from it to anterior margin of wing there are one or two incomplete rows of setae while the posterior third of wing is usually hairless. Ratio between lengths of distal and proximal macrochaetae much more than 2, as is typical of the species group. Marginal fringe with longest cilia about 3.5 times the wing width. Hindwing blade with submarginal rows of setae along posterior margin and a row of about 9-10 setae in the middle of the distal third of disk.

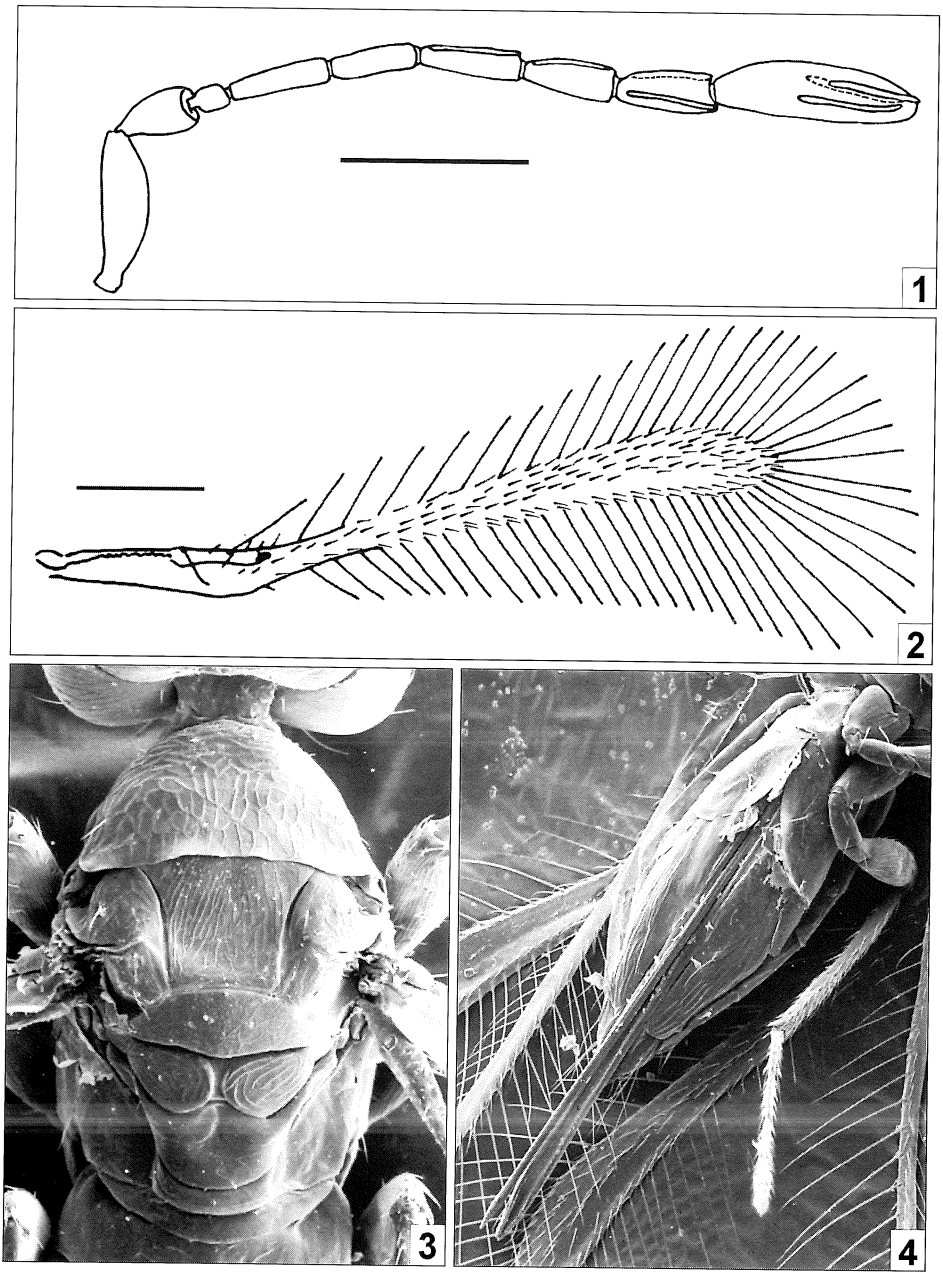
Metasoma. (Fig. 4). Ovipositor base extended to base of middle coxa and therefore overlapping mesophragma for almost half of the length of the latter; apex markedly projecting from apex of metasoma, ratio of total ovipositor length to length of its exerted part less than 5 (usually ranging from 5 to 3.7). Ovipositor length/foretibia length more than 3, ranging from 3.0 to 3.8.

Measurements (n=12): Antenna: scape: 81 (83; 92-75); pedicel: 41 (44; 48-40); F_1: 22 (21; 24-20); F_2: 52.5 (58; 67-52); F_3: 48 (52; 60-44); F_4: 54.5 (58; 67-53); F_5: 60 (54; 61-47); F_6: 55 (58; 63-53); club: 105.5 (110; 120-104). Forewing: length: 565 (590; 630-531); width: 45 (48; 54-41); longest marginal cilia: 168 (170; 180-162). Hindwing: length: 540 (554; 603-486).

Legs:	Femur	Tibia	Tarsus
Fore	140 (143; 167-126)	135 (138; 149-124)	162 (161; 176-117)
Middle	122 (129; 144-117)	180 (196; 212-171)	140 (156; 167-140)
Hind	131 (139; 149-124)	207 (219; 239-196)	158 (175; 194-158)

Ovipositor: 414 (484; 513-414).

MALE. Unknown. The males indicated in the material studied probably belong to the same species, particularly those collected by J. C. Morgan in Sri Lanka as it was stated that they collected there an arrhenotokous population (Claridge *et al.*, 1988). These males are similar to the female except for the antenna, typical of the sex, with F_1 almost as long as, or only slightly longer than, the pedicel and with following flagellomeres subequal, and the genitalia typical of the *atomus* species group (Chiappini, 1989).



Figs. 1-4 – *Anagrus elegans*, female: 1) antenna; 2) forewing; 3) mesosoma; 4) metasoma. Bars = 0,1 mm.

HOSTS: *N. lugens*, *S. furcifera* (Delphacidae) and *Nephotettix* sp. (Cicadellidae).
TYPE MATERIAL: HOLOTYPE. female on slide labelled as follows: "India, Orissia, Cuttack, ex Brown plant Hopper eggs, CRRI 1981 *Anagrus*" and "? new sp. nov. [1983]" (in pencil) (BMNH). PARATYPES. 2 females, same data as holotype (BMNH). OTHER MATERIAL STUDIED: 10 females on slide (one of them is without the head and another one has deformed antennae) labelled "West Malaysia, Selangor, 05.III.1980, C.L. Ian Coll. CIE 12081 *Anagrus*? and "new sp. n. [1983]" (in pencil) (BMNH); 1 female on slide (together with other 5 of a different species) same data as previous one and "*flaveolus* + new [1983] ?" (in pencil) (BMNH); 3 females on slide (together with other 3 of a different species) labelled "Sri Lanka, ex eggs of brown leaf hopper. 30.VI.1977, *Nilaparvata lugens*, K. Yasumatsu. *Anagrus*" and "*flaveolus*" (in pencil) (BMNH); 2 females and 1 male on slide labelled "CIE 11133 India Cuttak, ex brown plant hopper eggs. 1979. *Anagrus*" and "? new + *optabilis*" (in pensil) (BMNH); 6 females and 7 males on slides labelled "Sri Lanka Gurandukotte, 17.VIII.88 ex *Sogatella furcifera* eggs in rice, leg. Morgan (A6 SLX), prep. Chiappini" (IEFA); 1 female on card labelled "Indonesia, Java, Cianjur, Limbangansari, trapping, host: *Nilaparvata lugens* eggs, plant: rice, 2.VIII.1993, N. Marayana" (IEFA); 3 females on slides labelled "South Thailand Phatthalung ex leafhoppers on rice (sp. N°17) Field 95 – Trap PRRC race. 01.XI.95 leg. Jensen, prep. Chiappini" (IEFA). 4 females, 2 males on 3 slides (together with 1 female of *A. frequens* and 1 male which can belong to either species): Thailand, Bangkok, 3.II.1967, T. Nishida, ex. *Nephotettix* eggs on rice [EMEC, UCRC]. 1 female on slide: Malaysia, Selangor, Grombak Stn., 3-19.VII.1970, C. T. Hing [CNCI]. 2 females on points: INDONESIA, Java, Cianjur, Limbangansari, 11.VIII.1993, trapping. Ex. *Nilaparvata lugens* on rice [CNCI]. 1 female on point: INDONESIA, Java, Sukamaju, Cianjur, 27.IX.1993, trapping. Ex. *Nilaparvata lugens* on rice [CNCI].
DISTRIBUTION: Oriental, from India to Indonesia.
DIAGNOSIS: *A. frequens* and *A. aegyptiacus* Soyka are the most similar species to *A. elegans* sp. n. The new species can be easily distinguished from *A. frequens* by its much longer ovipositor (ovipositor length/foretibia length ratio more than 3:1, whereas it is less than 3:1 in *A. frequens*), with the base projecting forwards to reach middle coxae base and very much overlapping mesophragma. *A. elegans* sp. n. differs from *A. aegyptiacus* by having F4 with sensory ridges and the forewing with a narrow hairless area.
COMMENTS: Specimens close to *A. elegans* are those identified as *A. frequens* and collected in China (Chiappini and Lin, 1998): the ovipositor is shorter than in *A. elegans* but is still longer than in the typical *A. frequens*. Nevertheless, in the Oriental region another species, with a narrow forewing and a high ovipositor length/foretibia length ratio, was recognised by Claridge *et al.* (1988) (sp. nov. 2) on the biological basis. This form has a ratio of total ovipositor length to length of its exerted part usually higher than 6 and an ovipositor length/foretibia length ratio usually less than 3. It parasitizes *N. lugens* eggs in the field, but also *S. furcifera* eggs under laboratory conditions, if no other eggs are present.

Derivatio nominis: Latin adjective referring to the elegant habitus of the females, due to their very long ovipositor.

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