Research Note**First records of natural enemies from Chinese blackflies
(Diptera: Simuliidae)**Peter H. ADLER,¹⁾ Zunming WANG²⁾ and Charles E. BEARD¹⁾¹⁾Department of Entomology, Clemson University, Clemson, SC 29634-0365 U.S.A.²⁾Institute of Zoology, Academia Sinica, 19 Zhongguancun Lu, Beijing, China

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Abstract: Five species of natural enemies are reported for the first time from blackfly larvae in mainland China. The chytrid fungus *Coelomycidium simulii* infected less than 15% of two species. The microsporidian protozoa *Amblyospora bracteata*, *Janacekia debaisieuxi*, and *Polydispyrenia simulii* infected 2.4% of *S. equinum*, 8.3% of *S. nikkoense*, and 3.8% of *S. taiwanicum*, respectively. The trichomycete *Harpella melusinae* was attached to the peritrophic membrane of *Simulium taiwanicum*.

A recent survey of the blackflies of mainland China lists 131 species and 134 relevant publications (Crosskey *et al.*, 1996). Although the number of recorded species is probably a significant underestimate of the total species in China, the list of publications provides a fairly complete picture of research that has been conducted on Chinese blackflies. No more than six works actually deal with the biology of Chinese blackflies; all other treatments are taxonomic or faunistic in nature. Consequently, a vast gap exists in our knowledge of the biology of Chinese blackflies. We were struck, for instance, by the absence of reports on natural enemies of blackflies in China. Here we report the first records of microsporidian protozoa, a trichomycete fungus, and a chytrid fungus in Chinese blackflies.

We collected larvae in Jilin Province (Mt. Changbai Region) and Hubei Province (Shennongjia Forest Region and outskirts of Beijing) during July and August 1992 and 1993. All larvae were preserved in acetic ethanol (1 part glacial acetic acid:

3 parts 95% ethanol) and subsequently deposited in the Institute of Zoology, Academia Sinica (Beijing) and the Clemson University Arthropod Collection (CUAC; Clemson, South Carolina). Larvae of the following species were screened under a dissecting microscope (150×) for patent infections of microsporidia and chytrid fungi: *Simulium kirgisorum* Rubtsov (2 larvae), *S. vernum* group (7), *S. equinum* (L.) (82), *S. nikkoense* Shiraki (12), *S. taiwanicum* Takaoka (26), *S. shogakii* (Rubtsov) (1), *S. arakawae* Matsumura (2), *S. rufibasis* Brunetti (19), and *Simulium* spp. (159). Larvae with patent infections of microsporidia were stained using the Feulgen technique (Rothfels and Dunbar, 1953). Stained, infected tissue was placed in a drop of 50% acetic acid, macerated, pressed under a cover slip, and examined with a compound microscope (1250×).

The following larvae were screened for trichomycetes by splitting the abdominal wall ventrally, extracting the midgut, removing the peritrophic membrane, and then relieving the membrane of the food

bolus and mounting it under a coverslip in lactophenol containing aniline blue: *S. kirisorum* (1 larva), *S. equinum* (10 larvae), *S. nikkoense* (2), and *S. taiwanicum* (2). Slides of trichomycetes are housed in the CUAC. Trichomycetes in the hindgut are not readily extracted from larvae preserved in acetic ethanol and were not investigated in this study. All natural enemies were photographed at 125 $\times$, 500 $\times$, or 1250 $\times$ and the negatives were deposited in the CUAC.

Two larvae (2.4%) of *S. equinum* had patent infections of the microsporidium *Amblyospora bracteata* (Strickland), a pathogen reported previously (Crosskey, 1990) from *S. equinum* in the Palearctic Region. One larva (8.3%) of *S. nikkoense* was infected with the microsporidium *Janacekia debaisieuxi* (Jírovec), and one larva (3.8%) of *S. taiwanicum* was infected with the microsporidium *Polydispyrenia simulii* (Lutz et Splendore). One larva (14.3%) of the *S. vernum* group and one larva (8.3%) of *S. nikkoense* harbored patent infections of the chytrid fungus *Coelomycidium simulii* Debaisieux. These infection rates are similar to those reported for microsporidia and chytrid fungi in Japan (Takaoka, 1982).

Two larvae (100%) of *S. taiwanicum* contained the trichomycete *Harpella melusinae* Léger et Duboscq (thalli: $379 \pm 52 \mu\text{m}$ long, $6.4 \pm 0.5 \mu\text{m}$ diam; immature trichospores: $91 \pm 6 \mu\text{m}$ long, $6.5 \pm 0.6 \mu\text{m}$ diam; $n=5$). The relationship of *H. melusinae* to its larval hosts is presumably commensalistic, but infections in adult female blackflies are pathogenic (Lichtwardt, 1996). *Harpella melusinae* is known from blackfly larvae in Japan, Europe, Australia, New Zealand, and North America (Lichtwardt, 1986; Lichtwardt *et al.*, 1987), and we have unpublished records from Yunnan Province, China (*S. sakishimaense* Takaoka) and from Magadan, Russia (*P.*

alpestre Dorogostaisky, Rubtsov et Vlasenko).

The fungi and microsporidia in our study are nearly cosmopolitan. Based on the exceptionally broad host ranges and geographic distributions, as well as morphological variation (e.g., Vávra and Undeen, 1981), we suspect that each so called species in our study is a complex of two or more structurally similar species.

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