

Some stored-product insects of increasing importance in China

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Abstract

Insect pests infesting the medicinal fungus *Ganoderma lucidum*, other edible fungi and tamarinds have become economically important with the greater use of these commodities that has occurred in recent years. This paper outlines the morphology and economic importance of the four insects involved, *Cis mikagensis*, *Ennearthron* sp., *Octotemnus* (s. str.) *parvulus* (Coleoptera: Ciidae) and the tamarind weevil, *Sitophilus linearis* (Coleoptera: Curculionidae).

Introduction

Edible fungi are becoming a very important commodity in China. In 1993, the production of mushrooms was over 110000 t in Hunan province alone. Fresh mushrooms are normally 2–4 times as valuable as wheat, and the medicinal fungus, *Ganoderma lucidum*, is worth much more than that. While beetles of the family Ciidae (Coleoptera) have not been treated as serious stored-product pests previously, the situation is changing. Here we discuss 3 species that have been found in edible fungi in China.

Tamarind (*Tamarindus indica*) is used as food in Burma and Thailand and also used to make beverages. Imports of tamarind into China are increasing annually, and large numbers of the tamarind weevil, *Sitophilus linearis* (Herbst), have been found on import inspection.

Details of the Insects

Cis mikagensis Nebachi et Wada [Ciidae]

Morphology

Length 1.72–2.02 mm, breadth 0.58–0.70 mm. Body cylindrical, dorsum convex, brown to dark brown, with vestiture of short, erect light brown hairs. Head and legs with colour darker than antennae and palpus. Antennae 10 segmented: segment 1, 2 short and stout, segments 3,4 long and slender, segment 1 plus 2 about equal to 3,4 in length, three terminal segments clavate and loosely articulated. Anterior margin of head in male with 2 pairs of dentate processes. Pronotum broader than its length, widest at base, narrowing gradually from the base to the anterior margin with 2 angulate processes produced forward. Tarsal formula 4–4–4. Tarsal segments 1,2,3 of hind leg about half the length of segment 4.

Economic value

Cis mikagensis is often found on export Ling Zhi mushroom (*Ganoderma lucidum*). It is also reported that the insect infests Fu-Lin (*Poria cocos*) and Zhu Lin (*Polyporus umbellatus*). Ling Zhi mushroom is a raw material of traditional Chinese medicine. More than 45 t of Ling Zhi mushroom is exported to Korea and the United States with a value of about \$4500 per t in 1993. The adults and larvae of this insect bore in the mushroom, rendering it powdery, honeycombed and useless, resulting in severe economic loss.

Distribution

China (Provinces of Sichuan, Henan, San'xi, Sanxi, Liaoning, Guangdong and Hunan, as well as Tianjin city).

Ennearthron sp. [Ciidae]

Morphology

Length 1.6–1.9 mm, breadth 0.65–0.72 mm. Body cylindrical, dark brown, shiny, vestiture of short, erect, yellowish-brown hairs. Anterior margin of head with 2 angulate processes produced forwards. Antennae 9-segmented, three terminal segments clavate, loosely articulated, the third slightly shorter than the second, segments 5,6 smallest and length about as long as breadth, moniliform. Elytra parallel-sided, apex oval.

Economic value

Only a few specimens were found in an inspection.

Distribution

China (Provinces of Tianjin, San'xi, Hunan and Guizhou, as well as Tianjin city).

Octotemnus (s.str.) *parvulus* Mutsuo Miyatake [Ciidae]

Morphology

Head slightly convex in both sexes, finely and somewhat feebly reticulate, rather closely punctate, the punctures minute and weak, and somewhat densely setose, the setae more distinct and longer than those of *omogensis* and *glabriculus*, anterior margin slightly arcuate, reflex and narrowly ridges from eye to clypeus on either side. Antennae with the third segment slender, subclavate, longer than twice as long as broad, 4 slightly shorter than one-half as long as 3, a little broader than long or as long as broad. Pronotum slightly but distinctly broader than long, almost evenly arcuate on sides, very slightly narrowing from base to apex; fore margin simply rounded in both sexes; side margins invisible from above almost throughout their lengths, in lateral view rather strongly arcuate, fore and hind corners broadly rounded, not at all angulate; hind margin very slightly arcuate; dorsum more coarsely and densely reticulate than in *glabriculus* and less than in *omogensis*, and very sparsely with slender obscure setae, each arising from a puncture. Scutellum triangular, dis-

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tinctly broader than long, with a few strong punctures. Elytra very slightly broader than pronotum at base, about 1.8 to 1.9 times as long as pronotum, about 1.4 times as long as broad, very slightly widened from base to basal half on sides, thence broadly roundly narrowing to apex; side margins invisible from above almost throughout their lengths; dorsum closely and irregularly punctate, the punctures uneven in size, somewhat weaker and smaller than those on the pronotum, appearing to be somewhat confluent in some places on basal part, and comparatively densely setose on apical inclined surface, the setae somewhat stiff, longer than those of *glabriculus* and *omogensis*. Anterior tibiae not strongly expanded but almost straight on outer edge, armed with 7–10 spine-like teeth on apical half of outer edge, the apical 3 or 4 of them much larger than the others. Body beneath roughly and partially feebly reticulate, sparsely and inconspicuously punctate setose, but somewhat densely and conspicuously on venter; the first ventrite with a conspicuous bill-shaped process at middle in male.

Economic value

Only 2 specimens were found in an inspection. In Japan it was found from *Coriolos versicolor* (L. ex Fr.) Quelet.

Distribution

Japan, China.

Sitophilus linearis (Herbst) [Curculionidae]

Morphology

Body cylindrical, length 4–4.5 mm from base of snout to end of abdomen, reddish brown to dark brown, slightly shiny. Head and thorax with darker colour than elytra. Ventral surface of abdomen with darker colour than surface of head and ventral surface of thorax. Snout produced forward, shorter and stouter, length to breadth 3:1, snout one half as long as prothorax, the base of the snout slightly expanded, not global, snout in female longer than in male, snout punctures parallel. Antennae 8-segmented; antennal fovea connected with compound eye compared to separated from compound eye by a line of punctures in *S. oryzae*, *S. zeamais* and *S. granarius*. The anterior of the pronotum more narrow than the posterior

of the pronotum, densely punctulate. Scutellum dark brown, subround, low at middle. Tarsal formula 5–5–5, 4 concealed by 3. Elytra subparallel-sided, 10 lines on each elytron and irregularly maculated with yellow. Hind wings well developed, membranous, about 3 times as long as elytra. Aedeagus wide and short, lateral margins curved up, epiphallus subequilateral triangle with blunt and rounded ends; lobatus of y-sclerite in female very short, apex wide and blunt.

Keys to distinguish the 4 species of stored product *Sitophilus* can be found in Whitehead (1991) and Haines (1991).

Economic value

S. linearis was given the common name of tamarind weevil by Zimmerman (1968). Details of the biology can be found in Cotton (1920) and Usman (1953).

Tamarind is imported into China from Thailand and Burma through the ports of Kunmin and Reili. Damage by *S. linearis* can be very high; sometimes 4–5 insects were found in a single kernel. In one 1000g sample inspection, adults of *S. linearis* had damaged 100% of the kernels.

Distribution

India, Burma, Thailand, Africa, Seychelles, Hawaii, North and South America.

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