**Plesiocis sp. (Coleoptera: Ciidae) – A pest insect infesting the Mount Tai gloosy ganoderma in Shandong province, China**

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**Abstract**

The Mount Tai gloosy ganoderma (Ganoderma lucidum) a priceless Chinese medicine fungi, which can prevent people from decrepitude and some cancer, is an important economic product for export. Since 1994, the pest Plesiocis sp., genus species with no record in China, has been damaging these fungi and its product so seriously that some medicine quality reduced, price lowered, and some even became useless at all. This paper will focus on its morphology, biology and control, etc.

**Materials and Methods**

**Preparing for observation of morphological characteristics**

The pest insects were collected from the Mount Tai gloosy ganoderma in 1994 in Shandong Province, reared in these fungi in big beaker (500 ml), covered with gauze, incubated at laboratory temperature. Size test with living specimen except the dry adult.

**Preparing for biological research**

Fresh eggs within 12 hrs were put on wet filter paper in culture container at 25 ± 0.5°C in incubator. Every first instar larva within 12 hrs after hatching was put on a thin piece of the Ganoderma lucidum in the same condition for observation of development every day.

**Results and Discussion**

**The identification of Plesiocis**

The insect’s body of this genus is shorter and broader. The EL/EW is less than 1.5 and the prosternum in front of coxae is slightly longer than intercoxal process. Its outer apical angle of prothorax round 4 without spinose, vesture consisting of short, stout bristles, apex of pronotum in male possessing 2 horns and 4 sharp teeth on the frontoclypeal bridge, antenna 9-segmented, metasternum suture present. The updated information shows that there is no other species but the new one recorded in this genus in China and a new species perhaps.

**Morphological characteristics**

Adult (Fig. 1, 2, 3) female body length 2 – 2.5 mm, width 0.9 – 1.0 mm, shorter cylinder shapes, dorsal hump, out of sight of head in dorsal view, yellow brown to black colour, densely short-straight setae. Pronotum semicircle shape, width longer than length; Arc anterior margin without any process there; small lateral margin. Black compound eyes and anteclypeus, yellow colour, scape smaller than the first flagellum than pedicel. The first flagellum is bigger, circle shape, the second and third are thinner, the forth, the fifth and the sixth are smallest, the same size; the club seventh, eighth and ninth, the biggest one with densely fine hairs. Femur enlargement, tarsus are 4-4-4 type, tarsus 1 plus 2 plus 3 is shorter than half-length of 4; five visible abdominal sternites are free. Elytra have densely short standing-up hairs, very small scrobes, and five strips inside, but the third one reach only the middle of the elytra. Its hind wing has stigma and other black spots in the apical angle and the outer top of remigium area respectively.

Male’s body length is 2.35 – 2.75 mm, width is 1.0 mm, its colour is black brown to very black colour except bright antenna and appendages, and two pairs of small angulus processes at the same base respectively locate on the anteclypeus. The pronotum front equipped with 2 big angulate processes. Other descriptions are the same as female.

Pupae (Fig. 6) is white colour. Body length is 1.8 mm and the width is 0.7 mm. Male pupa has two angulate processes in the front margin of pronotum.

Larvae (Fig 4): The first instar is white colour (the common instars gradually blackened). Its body length is 0.8 mm and width is 0.2 mm. Every instar with 3 black spots in line near the position of future compound eyes, of which the distance of outer two spots two times is more than that of the inner two ones.

Egg (Fig 5): White colour and long-oval shape.
Fig. 1. *Plesiocis* sp. Male, dorsal view, and antenna.

Fig. 2. *Plesiocis* sp. Male, ventral view (Photo by Yan Jian).

Fig. 3. *Plesiocis* sp. Female, ventral view (Photo by Yan Jian).

Fig. 4. *Plesiocis* sp. Larvae, dorsal view (Photo by Yan Jian).
Biological habits

Life cycle of *Plesiosis* sp. consists of four stages including egg, larvae (first instar, second instar and third instar), pupae and adult. Both larvae and adult can bore and eat. Individual observation shows the larva can grow into adult in its single boring channel, or come out of the channel after emergence and then bore into another channel for eating continuously. Eggs were found scattering or gathering on the surface of or inside the ganoderma. The larvae tend to spread into their own channel and secret a lot of excrement. Adults like to bore and feed together and fail to fly.

At the constant temperature of 25°C in the incubator, the mean hatching period is 6.5 days, the larval period is 30.5 days and the pupal period is 6 days. Adult begins to lay eggs 25 days after mating. Egg peak comes after the 10th day and then decreases. About 12 eggs or so collected per female. Eggs were broken when relative humidity 60% below while eggs were parasitized by mould when 85% RH above.

The updated information suggests only gloosy ganoderma as its hosts.

Damage (Fig. 7, 8 and 9)

The pest insects were found infesting the weak gloosy ganoderma in the field, especially the roots and stems. After harvest, they transfer to damage the good host. Larvae and the adults always feed together on the host until nothing left except the skin in the end. Sometimes more than 50 insects crowded in the bored cave of a stem top. Larvae likes to spread out to consume the host and secret excrement in their channel, so that the higher moisture foster the mould growing quickly, with the other factors the ganoderma either reduces its medicine quality or even fails to utilize thoroughly.

Control strategy

The above information leads to a control strategy to depress the field population to a limit level as the first step, then harvest selection, dry and sanitary condition, check on time and protection by phosphine in storage period. Fumigation treatment by methyl-bromide (CH$_3$Br) should be carried out before being exported.

Discussion

This species is similar to *Cis mikagensis* (with 10 antenna segments) but different with a bigger body and 9 antenna segments, also similar to *Ennearthron* sp. (with 2 angulatus processes) but different with a bigger body and 2 pairs of angulate processes on anteclypeus. The single species *P. cribrum* remained in this genus by John F. Lawrence in 1971 is also similar to this one but different with a smaller body and metasternal suture.
Because of the important medical value for its protecting people from decrepitude and cancer, it refers to this necessary research. Effective control over the field population, pre-harvest selection, sanitary measures and protection by phosphine in stored period can be applied in practice. Of course, obvious lack of enough information about this pest, such as their hosts, spread accesses, yearly increase model of field population, and efficient management, it is needed to conduct more research in the future.

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