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インドネシア・バリ島のマングローブ造林地に多発したカイガラムシ

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Outbreak of Chionaspis sp. (Diaspididae: Coccoidea)on reforested mangrove trees in Bali, Indonesia

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1992年より実施されてきたインドネシア・マングローブ林資源保全開発現地調査事業の一環として，造林対象地域のひとつとされたバリ島において，カイガラムシの多発が観察されたのでその実態を調査した。造林地はベノア湾に面した天然マングローブ林の内陸側の一部がかつて伐採され，タンバックと呼ばれるエビの養殖池となっていた跡地で，約150ha が畔によって20～30ａの区画に仕切られている。各タンバックは干潮時には干潟となるが，満潮時の水深は約１ｍで，ここにオオバヒルギの実生苗木が２ｍ間隔に植栽され良好に生育していた。ところが，植栽木（３年生）の樹高が約 1.5mに達したタンバックにおいて，葉層が満潮線を越えた1994年８月ころから，カイガラムシの一種が多発し，1995年２月には大部分の植栽木が枯死した（図１）。調査の結果，多発したカイガラムシは，これまで少なくともマングローブからは記録されたことのないChionaspis sp.（マルカイガラムシ科シロカイガラムシ属の一種）と同定された（図２，３）。本種は主として葉面に寄生し，単に吸汁による加害のみでなく，寄生部に黄斑を作り，とくに若い葉では孵化幼虫の定着，吸汁によっても顕著な黄斑が生じ，後に葉に凹凸ができたりカールしたりして被害が拡大される。さらに黄斑は互いに癒合して褐色の大きな壊死斑となり，早期落葉や枝枯れを引き起こし，連続的に加害された木は樹勢を回復できずに枯死することが判明した。

本種の生活環は雌雄で異なり，雌は２齢幼虫を経て無翅の成虫となるが，雄は２齢幼虫から前蛹・蛹を経て有翅の成虫となる。寄主植物に移動・定着できるのは孵化直後の幼虫のみで，孵化後１～２日のうちに寄主植物に定着できなかったものは死亡する。寄主に定着した個体は体表から分泌したろう質物で介殻を形成し，終生，寄主に固着して寄生生活を営む。本種はカイガラムシとしては海水に耐性をもつ種と想像されるが，満潮線以下には寄生が認められず，一定時間海水中に没する部位には生息できないと思われ，苗木による人為的拡散は考え難い。孵化幼虫が歩行して自力で移動できる範囲は限られており，樹木間やさらに広い範囲への移動分散は，孵化幼虫が水面に浮いて流されることによるものと考えられる。本種の寄主植物としてはオオバヒルギの他，フタバナヒルギ，オヒルギ，ホウガンヒルギが確認され，タンバックに隣接する天然林マングローブにも発生が認められた。しかし，天然林における個体群密度は極めて低く，ギャップに芽生えた幼木にも全く被害は認められず，本種がバリ島に土着の種である可能性が示唆された。

カイガラムシ多発の原因としては，天然林から隔絶されたタンバックに単一の樹種が人工的に植栽されたため，生物相の単純化による天敵圧の低下が考えられる。

TRANSLATION

Outbreak of Chionaspis sp. (Diaspididae: Coccoidea) on reforested mangrove trees in Bali, Indonesia.

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We studied the current situation of reported outbreaks of scale insects in Bali island; one of the designated reforestation areas of the Indonesian Mangrove Forest Natural Resource Preservation and Development Project that started in 1992. The reforestation area faces Benoa Bay, in a land where once inland mangrove trees grew naturally and were cut down for shrimp farming pools known locally as Tambaks. The area is approximately 150 ha, and each Tambak is separated by a bank every 20~30a. Each Tambak is dry during low tide but will have a water depth of about 1mt during high tide. Seedlings of the Asian mangrove *Rhizophora mucronata* Lamk. grown from seeds were planted at 2mts interval and were growing healthy. However, in August 1994 when the plants were about 1.5mts tall and the leaves were growing above the water line at high tide in the Tambaks and ready for replanting (3 year seedlings), outbreaks of a species of scale insect was observed. By February 1995 most of the plants that were ready for reforestation use have died (Fig. 1). As a result of our investigation, the scale insects causing outbreaks was identified as *Chionaspis* sp. (Diaspididae: Diaspidini); a species that has never been recorded on red mangrove and may possibly be a new species (Figs. 2, 3). This species feeds on the leaves and not only causes damage by direct feeding, but also causes the yellowing of areas where attached. Especially in young leaves, the yellowing of the infested areas can also be caused by the feeding of first instar nymphs (crawlers). Feeding of the scale insect increases the damage by causing the deformation and curling of the leaves. The yellow patches on the leaves will merge together to form larger brown patches of dead tissue. This causes the early dropping of leaves and dieback of twigs. It was observed that trees that are continuously attacked by the scale insect cannot recover and die as a result.

The life cycle in this species differs between the sexes. The wingless female reaches the adult stage after 2 nymphal stages, and the winged adult male will go through a prepupal and pupal stage after the second nymphal stage. The insects can only disperse and attach to a new host during the crawler stage, and those crawlers that cannot settle on their host within the first 1 or 2 days will die. Insects that are successful in settling on their host will make a thin cover of waxy material, and will live a parasitic life attached to the host. This species is believed to be highly tolerant to salt water, however no infestation was observed on those trees that submerge under water during high tide. Thus we believe that the scale insect cannot survive when submerged under water for a certain amount of time, and therefore it is unlikely that the insect is spread by human aid dispersal in the seedling stage of the mangrove trees. The distance that crawlers can disperse by their own is limited, and it is probable that crawlers can move by floating on the surface of water during the dispersal between trees and further distances. Besides *R. mucronata*, *Chionaspis* sp. was also collected on *R. apiculata* Bl., *Bruguiera gymnorrhyza* (L.) Lam., and *Xylocarpus granatum* Kuenig. The insect was also observed on natural mangrove forests close to the Tambaks, however the numbers in the natural mangrove forests was very low, and no damage was observed in the gaps between the Tambaks, suggesting that this species is endemic to Bali. As an explanation for the outbreaks of this species, the isolation of the artificially monocultured Tambaks have resulted in the simplification of the fauna which is believe to have resulted in the decrease of the pressure of natural enemies.

Translation by Takumasa Kondo, August 9, 2002.

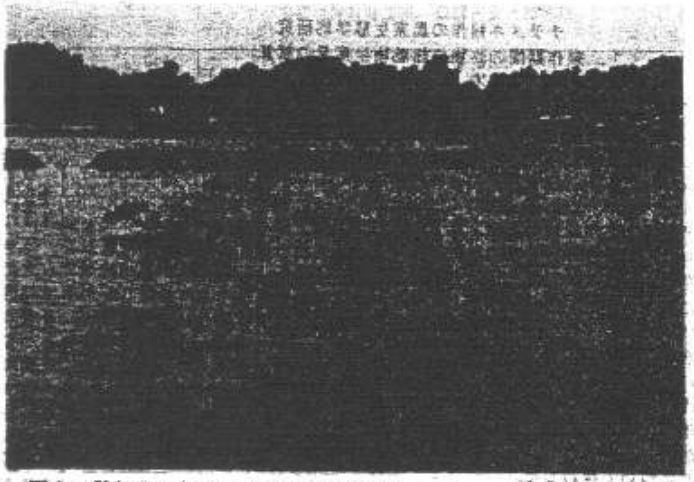

図1　Chionaspis sp. による被害状況

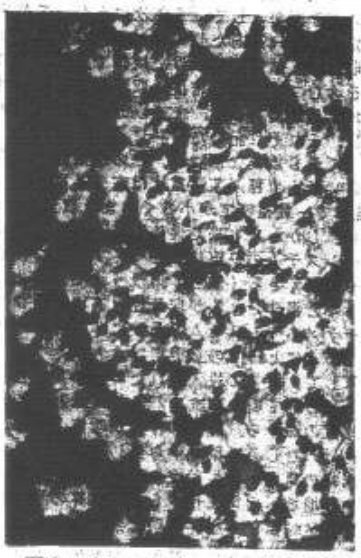

図2　Chionaspis sp.　雌の介殻

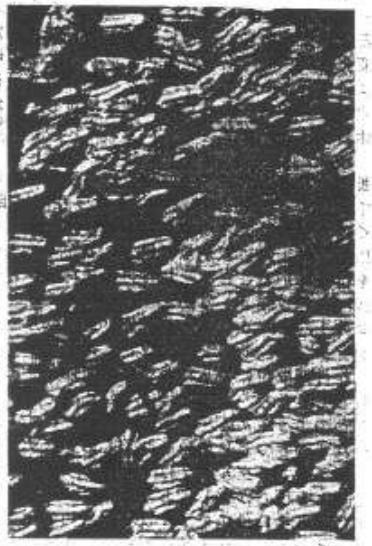

図3　Chionaspis sp.　雄の介殻