

Pests of Coconut and Their Natural Enemies in Micronesia

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Abstract—Common pests of coconut in Micronesia include coconut hispid, *Brontispa* spp.; red coconut scale, *Furcaspis oceanica* Lindinger; coconut scale, *Aspidiotus destructor* Signoret; rhinoceros beetle, *Oryctes rhinoceros* L.; and New Guinea sugarcane weevil, *Rhabdoscelus obscurus* (Boisduval). A number of other minor pests also occur in this region. Their distribution, and the history of introduction and establishment of their natural enemies in Micronesia are described. Possible accidental introduction of a destructive pest, *Aceria guerreronis* Keifer is cautioned.

Coconut (*Cocos nucifera* L.) (Palmae) is one of the major crops in Micronesia. It is attacked by over two dozen insect pests. In this paper, the distribution, biology, symptoms of damage and attempts to suppress the population utilizing natural enemies of these pests are briefly described.

Coconut hispid: *Brontispa* spp. (Coleoptera: Chrysomelidae)

There are three species of *Brontispa* that occur in Micronesia:

B. mariana Spaeth - Saipan, Rota, Tinian, Yap and Chuuk.

B. palauensis (Esaki & Chujo) - Palau and Guam

B. chalybeipennis (Zacher) - Pohnpei, Kosrae and Marshalls.

B. mariana is a native to Yap (Gressitt 1955) and it was introduced to Saipan in 1931 (Esaki 1940). *B. palauensis* is native to Palau. It was introduced to Guam in 1974 (Muniappan et al. 1980). *B. chalybeipennis* is native to East Caroline Islands.

The damage caused to coconut trees by *Brontispa* spp. in their native Caroline Islands has not been studied. However, in the introduced islands in the Marianas, they cause severe damage to coconut fronds. It was accidentally introduced to Saipan around 1928 and soon afterwards to Rota. By about 1937, it had killed about 70% of the coconuts in Saipan. By 1946 about 90% of trees were severely damaged (Townes 1946). The descriptions of *B. mariana*, *B. palauensis* and *B. chalybeipennis* are reported by Gressitt (1955). The biology of *B. mariana* is given by Bryan (1949) and Lange (1950). The biology of the other two species are similar to *B. mariana*.

Adult females lay eggs between folded young leaflets either singly or in chains of 2-6, all end to end. Eggs are flat, dark brown and about 1.5 by 0.75 mm

in size. The larvae are flat, yellowish white and with a pair of terminal hooks. They feed on the surface of the leaflets by scraping. Affected leaf area becomes discolored. Pupation takes place in the folded leaflets. Adults also feed on the leaflets by scraping. Egg stage is about 6 days; larval stage is 22 to 23 days with three molts; and pupal period is 7 to 8 days.

The larval-pupal parasitoid, *Tetrastichus brontispae* Ferriere (Hymenoptera: Eulophidae) was introduced from Java, Indonesia and established in Saipan in 1948. It was also introduced to Yap, Chuuk and Palau (Clausen 1978). *Hispidophila (Haekeliana) brontispae* (Ferriere) (Hymenoptera: Trichogrammatidae) was introduced for control of *B. mariana* but it did not establish (Lange 1950). *Tetrastichus brontispae* was introduced to Guam in 1974 and established (Muniappan et al. 1980). In the Mariana Islands, the introduced parasitoid, *T. brontispae* and the predatory earwig, *Chelisoches morio* (L.) (Dermaptera: Chelisochidae) are the two natural enemies observed on *Brontispa* spp. A parasitic wasp, *Chrysonotomyia* sp. (Hymenoptera: Eulophidae) has been reported to parasitize fourth instar larvae of *Brontispa* sp. in Western Samoa (Waterhouse & Norris 1987).

Red coconut scale: *Furcaspis oceanica* Lindinger (Homoptera: Diaspididae)

It is a native to West Caroline Islands, strictly an oceanic species (Pemberton 1954) and has spread throughout the Marianas, Caroline and Marshall islands. It is flat, circular, deep purplish-red in color and slightly raised in the center to form a flat cone (Bryan 1949). In the absence of natural enemies this scale becomes abundant, covering leaflets, petioles, nuts and other parts in the tree crown and sucking the sap. Also, the thick covering of the scales on the leaves reduce photosynthesis.

This scale was observed on Saipan during World War II. However, the introduction of the parasitoid, *Adelencyrtus oceanicus* Doutt (Hymenoptera: Encyrtidae) in 1948 from Ulithi has effectively suppressed this pest. *A. oceanicus* was introduced and established in Guam in 1988 (Marutani et al. 1992). The status of this pest in the Caroline and Marshall Islands has not been assessed.

Coconut scale: *Aspidiotus destructor* Signoret (Homoptera: Diaspididae)

Coconut scale is a polyphagous armored scale and it attacks some of the important crops like coconut, breadfruit, cocoa, guava, papaya, mango and sugarcane. It is widely distributed in tropical and subtropical regions.

The coconut scale was introduced from the Philippines to Yap in 1892 and thence to Palau in 1899 (Waterhouse and Norris 1987). It reached Saipan in 1911 on baskets woven from infested coconut leaves and reached Rota and Guam about 1920. Great outbreaks of this scale occurred in Yap 1904 – 1907, in Saipan 1914 – 1921 and in Guam 1923 – 1926 (Esaki 1940). The infestation in Guam was brought down by the lady beetle, *Telsimia nitida* Chapin (Coleoptera: Coccinellidae) and *Cryptogonus nigripennis* Weise (Coleoptera: Coccinellidae) and some chalcid parasitoids (Swezey 1940). When this scale became economically important in Pohnpei in 1939, the coccinellid *T. nitida* was introduced from

Saipan (Esaki 1952). In 1970's, *Chilocorus nigritus* (F.) (Coleoptera: Coccinellidae) and *Pseudoscymnus anomalus* Chapin (Coleoptera: Coccinellidae) have fortuitously established in Guam (Nafus & Schreiner 1989). In 1988, *P. anomalus* and *C. nigritus* were introduced to Majuro from Pohnpei (Suta & Esguerra 1993).

Other Scales and Mealybugs

Additional scales and mealybugs attacking coconuts in Micronesia were reported by Beardsley (1966) and Nafus (1996, 1997). Most of these were of minor importance.

Rhinoceros beetle: *Oryctes rhinoceros* L. (Coleoptera: Scarabaeidae)

The coconut rhinoceros beetle occurs only in Palau in Micronesia. The adult beetle is about 4.0 cm in length. The adults bore into the crown of the coconut trees and cause serious damage. Eggs are laid in piles of rotting organic matter, dead coconut trunks or compost piles. The grubs feed on rotting organic matter.

A larval parasitoid, *Scolia patricialis* var. *plebeja* Gribodo (Hymenoptera: Scoliidae) was introduced to Palau in 1948 from Malaysia but it did not establish. *Scolia ruficornis* F. (Hymenoptera: Scoliidae) was introduced to Palau from Zanzibar in 1947, 1948, 1950 and 1951 and it has established (Pemberton 1954). Other parasitoids introduced were *Pachylister chinensis* (Quensel) (Coleoptera: Histeridae) from Western Samoa in 1952, *Hololepta* spp. from Trinidad in 1952, *Placodes ebeninus* Lewis (Coleoptera: Histeridae) from Kenya in 1952, *Platymeris laevicollis* Distant (Hemiptera: Reduviidae) from Zanzibar from 1961–1969, *Megascolia procer* (Illiger) (Hymenoptera: Scoliidae) from Malaysia in 1953 and 1963, *Oryctes baculovirus* from Western Samoa in 1970 and *Bacillus popilliae* from USA in 1951.

This beetle is controlled by releasing adults infected with the *Oryctes* baculovirus and spraying the breeding sites with a fungal pathogen, *Metarrhizium anisopliae*, and trapping the adult beetles with pheromone traps in many countries in the Pacific and Asia.

New Guinea sugarcane weevil: *Rhabdosceles obscurus* (Boisduval) (Coleoptera: Curculionidae)

The New Guinea sugarcane weevil is a pest of sugarcane, coconut and other palms. This pest occurs in Marianas, East Carolines, Chuuk and Ailingalaplup in Micronesia (Oakley 1946, Bryan 1949). The adult weevil lays eggs in cracks, and crevices or in holes they have drilled with their mandibles in the trunk or petioles of coconut trees. The larvae bore into the living tissue producing frass filled tunnels. Pupation takes place in a cocoon of plant fibers in the host plant. It has been causing serious damage to some of the introduced ornamental palms. A tachinid parasitoid, *Lixophaga sphenophori* (Vill.) (Diptera: Tachinidae) was introduced from Hawai'i to Guam in 1926 and 1927 (Vandenberg 1929, 1930) and then

transferred from Guam to Saipan in 1928; but it died out in Guam in 1929 and never established in Saipan (Gressitt 1954).

Currently there is a project at the Guam Agricultural Experiment Station to reintroduce this parasitoid from Hawai'i. Another species *Rhabdosceles asperipennis* (Fitch) occurs in Palau.

Coconut walking stick: *Acanthograeffea denticulata* (Redtenbacher) (Orthoptera: Phasmatidae).

This stick insect feeds on the margins of the coconut leaves. It was also reported on pandanus in the Marianas. *Acanthograeffea modesta* occurs in Chuuk and *Graeffea coccophaga* in Pohnpei. Another species of stick insect *Graeffea crouanii* (Le Guillou) occurs in the South Pacific Islands including American Samoa.

Coconut flat moth: *Agonoxena pyrogramma* Meyrick (Lepidoptera: Agonoxenidae)

It occurs in Guam, Northern Marianas, Papua New Guinea and the Solomon Islands (Waterhouse and Norris 1987). The larvae of this moth are found mostly on older leaves. They feed on the tissue near the midribs of the leaflets in a narrow straight line, sometimes causing the leaflets to split (Oakley 1946). The pupal parasitoid, *Brachymeria hammari* (Crawford) (Hymenoptera: Chalcididae) and a larval parasitoid, *Macrocentrus pallidus* Fullaway (Hymenoptera: Braconidae) occur on this pest in Guam.

Grasshoppers

A longhorned grasshopper, *Segestes unicolor* Redt. (Orthoptera: Tettigoniidae) sometimes causes severe damage to coconut fronds in Palau (Oakley 1946, Muniappan et al. 1999). Nafus (1997) reported *Valanga excavata* Stål (Orthoptera: Acrididae) in Marianas and *Valanga nigricornis* (Burmeister) (Orthoptera: Acrididae) in Palau, Yap and Chuuk to feed on coconut leaves.

Bagworm (Lepidoptera: Psychidae). An unidentified bagworm has been causing serious damage to coconuts in Majuro and Likiep in the Marshalls. It scrapes the outer rind of the tender coconuts in the tree causing them to turn brown and crack. This pest was also reported in Guam in late 1970s and in Mokil, Pingelap, Sapwuafik, Nukuoro and Kapingamarangi by Esguerra et al. (1990).

Termites: *Nasutitermes brevirostris* Oshima (Isoptera: Termitidae), a termite that builds tunnels on the trunk reaching up to the tops of coconut trees. It occurs in Yap, Palau and Pohnpei (Oakley 1946). *Microcerotermis* sp. is a problem in Yap. Kanehira termite, *Neotermes kanehirae* (Oshima) (Isoptera: Kalotermitidae) was reported on coconuts in Palau by Nafus (1996).

Coconut lace bug, *Stephanitis typica* Distant (Hemiptera: Tingidae). It is also known as banana lace bug and occurs through out tropical Asia as far east as New

Guinea (Howard et al. 2001). It has been reported only from Peliliu in Micronesia (Muniappan et al.1999). Adults and nymphs feed on the leaves of coconut and banana and cause chlorotic flecks.

Conclusion

Of the many insects recorded on coconut in Micronesia in the past, *Oryctes rhinoceros* has not spread from Palau to other islands; *Brontispa palauensis* got introduced to Guam in early 1970s; *Brontispa chalybeipennis* has reached Hawai'i from the Western Carolines and Marshalls; an unidentified bagworm, which has been reported in Pohnpei, has become a problem in Majuro and Likiep in the Marshalls Islands; scale and mealybugs have spread within Micronesia and also have been introduced from outside the region and coconut lace bug is a recent introduction to Peliliu and to the region. The possibility of accidental introduction of the coconut mite, *Aceria guerreronis* Keifer (Acari: Eriophyidae), which was first observed in Mexico in 1965 has spread to West Africa in 1986 and South Asia (India in 1998 and Sri Lanka in 1999), (Howard et al. 2001) is of great concern to the Pacific. This mite attacks the young fruits and causes them to fall immaturely or if they develop they are distorted. Plant quarantine regulations and enforcement in the Pacific should be strengthened to prevent the introduction of this mite and also the spread of other insect pests within Micronesia.

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