

Distribution of the red coconut scale, *Furcaspis oceanica* Lindinger (Homoptera : Diaspididae) and its introduced parasitoid, *Adelencyrtus oceanicus* Doutt (Hymenoptera : Encyrtidae) in Guam

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ABSTRACT : A survey conducted from January to March 1996 to determine the distribution of the red coconut scale, *Furcaspis oceanica* Lindinger (Homoptera : Diaspididae) and its natural enemy, *Adelencyrtus oceanicus* Doutt (Hymenoptera : Encyrtidae) introduced to Guam in 1988-89, showed that both have spread to all the villages of Guam except the southern most village of Umatac. There were more male scales than females in the samples collected. Males were not parasitized by *A. oceanicus*. A high rate of parasitization by *A. oceanicus* was noted in the villages of Talofofo, Harmon and Merizo.

KEY WORDS : *Adelencyrtus oceanicus*, coconut, distribution, *Furcaspis oceanica*, parasitoid

The red coconut scale (RCS), *Furcaspis oceanica* Lindinger (Homoptera : Diaspididae), a serious pest of coconut trees, is a native of the Caroline Islands (Pemberton, 1954). It was described by both Lindinger in 1909 and Green in 1910 from specimens collected at Jaluit in the Marshall islands and the Ulithi Atoll in Yap, respectively (Beardsley, 1966). In the late 1940's RCS spread to Saipan (Doutt,

1950). It accidentally entered Guam in the early 1970's (Muniappan, 1987a). Marutani and Muniappan (1989) reported the presence of this scale in the Caroline, Marshall, and the Northern Mariana Islands.

In 1987, RCS was observed only in the central part of Guam with varying degrees of infestation of coconut trees and

was not found in the northern and southern parts of the island (Muniappan, 1987b). Since then, the scale has spread to the rest of the island, except the southern village, Umatac. The introduction of the parasitoid, *Adelencyrtus oceanicus* Doult (Hymenoptera : Encyrtidae) to Saipan in 1948 has effectively suppressed RCS in that island (Marutani and Muniappan, 1989). Hence, it was decided to introduce this parasitoid to Guam to suppress RCS population. The parasitoid was collected from Ulithi Atoll in May 1988, Koror and Peleliu islands in October 1988 and again in Koror in April 1989 and was released in Guam (Marutani *et al.*, 1992). A total of 623 adults of *A. oceanicus* were released at three different sites in the villages of Mangilao and Barrigada in Guam from May 7, 1988 to April 28, 1989. The recovery of the parasitoid from the released sites was made in June 1989. In 1990, the parasitoid was found in villages located in the central part of Guam (Marutani *et al.*, 1992). This paper presents the current status of both the RCS and its natural enemy, *A. oceanicus* in Guam based on a survey conducted in 1996.

MATERIALS AND METHODS

To assess the distribution and effectiveness of the natural enemy, *A. oceanicus* on RCS a survey was conducted from January to March, 1996. Twenty seven sites scattered throughout the island excluding the areas occupied by the US Navy and the US Air Force were sampled. In each site, one to three coconut trees were selected depending upon RCS infestation.

From each coconut tree, a frond (3rd from the basal leaf) where live RCS are most often observed, was removed. From this frond, a sample of 10 leaflets infested with RCS were selected at random and placed in a plastic bag for observation in the laboratory.

In the laboratory, each coconut leaflet was cut to 10 cm length. These sample pieces, a total of 10/site, were examined under a binocular microscope to identify the emergence holes made by *A. oceanicus* on both male and female RCS. The coconut leaflet samples were then transferred to a clean plastic bag (42 x 28 cm) for incubation in the laboratory for one week period to account for any further emergence of *A. oceanicus*. The total numbers of male and female RCS found in each coconut leaf sample were also recorded. The data were analyzed using ANOVA and means separated by LSD.

RESULTS AND DISCUSSION

The distribution and the population of both male and female RCS based on this survey is shown in Fig.1. The male population of RCS was more than the female population in all the sites examined. Population of RCS was found to be high in the central villages than in the southern and in the northern villages of Guam. Villages of Asan, Mangilao, Barrigada and Mongmong had a high level of infestation and Piti, Tumon, Harmon, Merizo, Maina and Tiyan had less (Table 1).

Table 1. Incidence of *F. oceanica* in different villages of Guam

Location	Av. scale population/10 samples
Piti	43.0 a ¹
Tumon	59.1 ab
Harmon	63.3 ab
Merizo	63.5 ab
Maina	67.5 ab
Tiyan	71.2 abc
Toto	86.0 bcd
Agana	106.1 bcde
Chalan Pago	108.2 bcde
Yigo	125.8 cdef
Agat	133.2 defg
Santa Rita	150.6 efg
Ordot	165.1 fgh
Talofofo	165.5 fgh
Tamuning	175.0 fgh
Yona	177.5 fgh
Maite	182.6 gh
Inarajan	185.2 gh
Dededo	214.3 hi
Windward Hills	215.4 hi
Agana Heights	216.0 hi
Sinajana	247.3 ij
Asan	267.6 ijk
Mangilao	268.9 ijk
Barrigada	280.7 jk
Mongmong	312.7 k

¹ Means followed by the same alphabet are not significantly different at 0.05 level (LSD)

Adelencyrtus oceanicus has spread from the two central villages of the island where it was first released in 1988-89 to the rest of the island with the RCS except the southern most village of Umatac. The males were not parasitised by *A. oceanicus*.

Only females were parasitised. The population of female RCS and the female RCS parasitized by *A. oceanicus* in each location is also shown in Fig. 1. The highest per cent parasitization was noted at the Talofofo and Harmon sites and the lowest

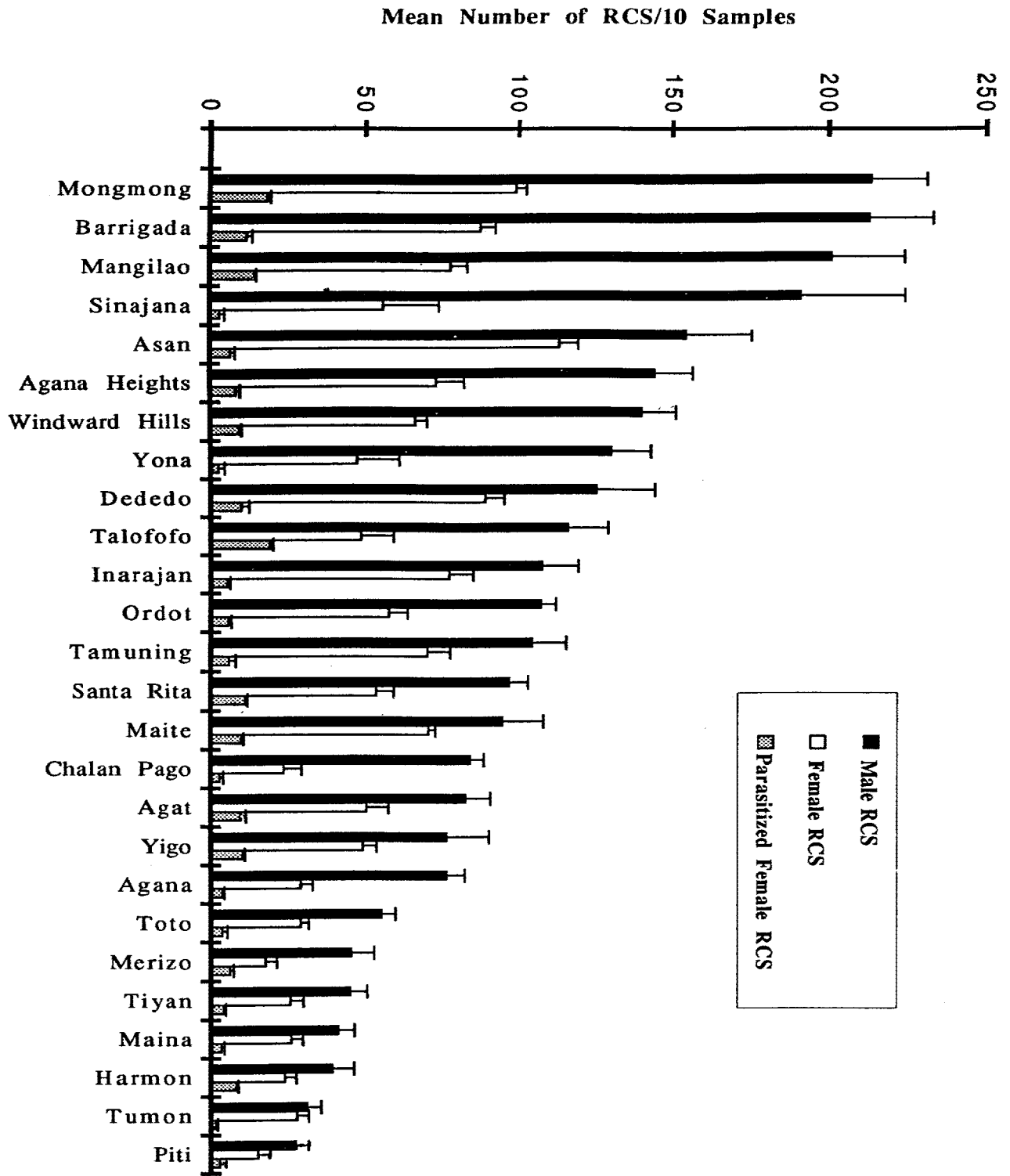


Fig. 1. Mean population of male and female of *F. oceanica* and parasitized females by *A. oceanicus*

at Sinajana, Yona, Asan, Inarajan and Tamuning sites (Table 2). Even though, there is a significant variation in percentage of parasitization among the sites sampled, it is expected that *A. oceanicus* will

suppress the population of RCS in Guam in the next few years similar to what has happened in Saipan (Marutani and Muniappan, 1989).

Table 2. Per cent parasitization of female *F. oceanica* (RCS) by *A. oceanicus* in different villages of Guam

Location	Parasitized female RCS (%)
Sinajana	5.2 ¹ a ²
Yona	5.6 a
Asan	5.7 ab
Tumon	6.5 abc
Inarajan	7.5 abc
Tamuning	8.4 abcd
Ordot	10.3 abcd
Dededo	11.2 abcde
Chalan Pago	12.2 abcdefg
Maina	12.3 abcdefg
Toto	12.4 abcdefg
Agana Heights	13.0 bcdefg
Barrigada	13.4 cdefg
Tiyan	14.0 defgh
Maite	14.7 defgh
Agana	14.7 defgh
Windward Hills	16.5 efghi
Mongmong	18.4 fghi
Mangilao	18.8 ghi
Santa Rita	20.9 hij
Agat	21.2 hij
Yigo	22.1 ij
Piti	26.7 jk
Merizo	30.3 kl
Harmon	35.9 lm
Talofoto	39.0 m

¹ Mean of 10 samples

² Means followed by the same alphabet are not significantly different at 0.05 level (LSD)

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