

Note

Biological Control of the Weed, *Mimosa invisa* Von Martius, on Pohnpei and Yap

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Abstract—The giant sensitive plant, *Mimosa invisa* Von Martius, became a serious weed pest on the main islands of Pohnpei and Yap, states of the Federated States of Micronesia in the early 1990's. Pure cultures of a psyllid, *Heteropsylla spinulosa* Muddsman, Hodkinson and Hollis, imported from Australia were released in several sites infested with *M. invisa* around Pohnpei and Yap. A few months after release, the psyllid became established and controlled *M. invisa*. Initially, infested *M. invisa* looked unhealthy, then turned brown and died.

Introduction

Mimosa invisa Von Martius, commonly known as giant sensitive plant, is a fast-growing thorny shrub. Like most species of *Mimosa* the weed is of tropical American origin. Because it is a thorny plant, it interferes with daily manual farm activities. *M. invisa* occurs on Pohnpei, and Yap of FSM and in Palau. It is also considered a serious weed in many South East Asian countries and Pacific Islands (Holms *et al.* 1977). It is a major pest of tropical pastures and sugar cane plantations of North Queensland, Australia where it has been controlled by an expensive government herbicide spraying program for nearly 40 years (Willson & Garcia 1992). Furthermore, *M. invisa* has been reported to be a major weed pest of agriculture, pastures, wastelands and roadsides in Western Samoa (Whistler 1983). *M. invisa* has been listed as a weed pest in Nigeria, Sri Lanka, Mauritius, Taiwan, Malaysian Borneo, Indonesia, the Philippines, Papua New Guinea, Fiji, French Polynesia, Solomon Is., New Caledonia, Vanuatu, Cambodia, Thailand and India (Holms *et al.* 1997).

In 1991 *M. invisa* was observed to occur on roadsides, cultivated lands and in pastures on Pohnpei, Yap, and Palau. It spread rapidly and invaded coconut and black pepper plantations in Pohnpei.

Herbicidal control of *M. invisa* is not a viable technique in the FSM. Furthermore, there are no herbicides registered for use to control weeds in the FSM. It was therefore decided in 1991 to import a biological control agent from Australia, *Heteropsylla spinulosa* Muddiman, Hodkinson and Hollis.

H. spinulosa is a psyllid native to Brazil. Host specificity studies conducted in Australia by Willson (1987) and Garcia (1985) revealed that the psyllid was specific to *Mimosa invisa*. Oviposition by the psyllid occurred on 37 plant species out of 188 species of plants tested. However, nymphs died on all those plants where psyllid eggs were laid. Hence, the request to release it in Western Samoa and Australia on *Mimosa* infested field was done.

This paper reports the effect of introducing the psyllid to suppress *M. invisa* on Pohnpei and Yap.

Materials and Methods

A shipment of the psyllid, *H. spinulosa*, was received from Queensland, Australia on April 15, 1992. The psyllids were reared on potted *M. invisa* seedlings in the quarantine room for one generation to produce pure cultures. The cultures were examined daily to remove whatever other organisms were contained in the shipment.

H. spinulosa were released directly on *M. invisa*-infested fields in different locations on the main island of Pohnpei (Figure 1, Table 1).

Release areas with actively growing *M. invisa* were examined monthly for the presence of *H. spinulosa*. Since it took time for *H. spinulosa* to increase in number in the released sites, counting on the number of *H. spinulosa* was started in September 1993. The total number of *H. spinulosa* was counted on 30 cm long stem sections of plants selected at random in the release area. A total of 100 plants were



Figure 1. Actively growing *Mimosa* before release of *Heteropsylla spinulosa*.

Table 1. Number of releases of *H. spinulosa* on Pohnpei

Date of Release	Number released	Location
May 16 1992	100	Palikir
Sept. 8 1992	47	Nett (Near Ishmael Lebehn's House)
Nov. 4 1992	154	Nett (Robi Gas Station)
Nov. 5 1992	160	Black Pepper Plantation, Nett
Nov. 10 1992	150	Sekere Pah Sokehs
Nov. 11 1992	100	Black Pepper Plantation, Nett
Nov. 12 1992	400	Nett (Yvettes Place)
Nov. 12 1993	300	Near Leo Store, Nett
Nov. 13 1992	200	Near Gas Station, Nett
Dec. 1 1992	100	Near Ishmael Lebehn's place, Nett)
Dec. 1 1992	100	Palikir
Dec. 2 1992	150	Near Ishmael Lebehn's place, Nett)
Dec. 11 1992	200	Robi place, Nett
Dec. 21 1992	200	Robi place, Nett

Table 2. Number of releases on Yap

Date released	Number released
Dec. 5 1993	60
April 7 1994	150
April 8 1994	130

sampled. Observations were made in the early morning hours when the psyllids were not active and counting was easier.

In two areas of Pohnpei where *H. spinulosa*, had never been released before, *H. spinulosa* populations were monitored monthly in 1996. Samples of *H. spinulosa* was based on 100 *M. invisa* plants selected at random in each site.

Pure cultures of *H. spinulosa* maintained in rearing cups were collected from Pohnpei and handcarried to Yap. Cups containing the psyllid were provided with *M. invisa* seedlings in which the roots were wrapped with wet cotton balls to prevent wilting.

The number of *H. spinulosa* released in three locations in Yap is shown in Table 2. Because of long distance and high cost of travel, counts were done only twice, once in April 1995 and once in March 1996. Counts of the total number of *H. spinulosa* were made from 30 cm long stem of each plant, using a total of 100 randomly selected plants in the release site.

Results and Discussion

The number of *H. spinulosa* on each *M. invisa* weed is shown in Table 3. Initial field counts of the psyllid were made one year after release. *H. spinulosa* populations slowly increases in the release sites infested with *M. invisa*.

Table 3. Number of *H. spinulosa* on *M. invisa* at six sites around Pohnpei and on one location in Yap.

Location	Post release of <i>H. spinulosa</i>				
	September 1993	February 1994	August 1994	November 1994	February 1995
Palikir, Sokehs	82 ¹	71	100	742	Killed
Nanpohnmal	356	destroyed			
Escheit area	140	50			
Yvette area	152	144	73	94	Killed
PMA Teketik	127	13	Killed		
Near Tiny Bubble Bar	109				
Near Ace Hardware	95	78	103	Killed	
Near Nan Madol	18				
Yap (Main island)	66 (April 1995)	18 (April 1996)	Killed		

¹Total number of *H. spinulosa* was based from 30 cm long stem sections of 100 randomly selected *M. invisa*

H. spinulosa was established in most of the release sites on Pohnpei. More than one adult could be recovered from 30 cm long stem of *M. invisa*. In some cases more than 5 adults were counted. The plants began to look sickly 6 months after the psyllid establishment when younger leaves started to become yellowish. In subsequent counts, fewer leaves and general yellowing occurred and the stems turned brownish. Two months later the plants died (Figures 2, 3). Similar observations were made on *Mimosa* a few months after *H. spinulosa* was established on the two previously non release sites on Pohnpei (Table 4). In less than a year, *M. invisa* became sickly and died.

In 1996, *H. spinulosa* was established on *M. invisa* infested area in Kanif Municipality of Yap State. High *H. spinulosa* populations caused stunting of *M. invisa*. The leaves were yellowish and the growing tips of the weed were deformed and stems became brown. Two to three months later, the weed died.

The growth abnormalities exhibited by *M. invisa* may be attributable to the toxic effects of salivary injection by the psyllid during feeding (Hodkinson 1974). It could also be caused by the loss of plant sap due to continual direct feeding. As soon as yellowing of leaves became noticeable and stems started to become brown, the stems became brittle.

Similar observations on *M. invisa* when attacked by *H. spinulosa* were noted by Willson & Garcia (1992) and Willson (1987) in Australia and Brazil. High pop-



Figure 2. Sickly looking *Mimosa* 8 months after releasing *H. spinulosa*.



Figure 3. Dead *M. invisa* due to *H. spinulosa*.

Table 4. Population of *Heteropsylla* sp. on *M. invisa* on two selected non release sites on Pohnpei, FSM

Month	Number of <i>Heteropsylla</i> ¹	
	Palikir	Dolon, Sokehs
January 1996	32	
February 1996	16	
March 1996	7	
April 1996		
May 1996	90	
June 1996	130	49
July 1996	166	123
August 1996	105	44
September 1996	132	88
October 1996		
November 1996	186	157
December 1996	99	163
January 1997	33	87

¹Total numbers of *H. spinulosa* were based from 30 cm long stems of 100 *M. invisa* weeds

ulations of *H. spinulosa* caused severe damage to *M. invisa* by the action of salivary secretions of the nymphs. Severely damaged *M. invisa* were stunted, leaves distorted and flowering reduced.

Four years after introduction on Pohnpei, *H. spinulosa* is still well established on *M. invisa*. It can be recovered from small patches of *M. invisa* growing on newly opened land. Similarly on Yap, psyllids are still present and severely damaging *M. invisa* two years after adults psyllids were introduced.

M. invisa is no longer considered a threat to the vegetation on Pohnpei and Yap. In areas where *M. invisa* used to occur extensively, common grasses and low growing shrubs have taken over. *H. spinulosa* has significantly contributed in reducing the threat of *M. invisa* to the vegetation of both islands.

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