

SIREX NOCTILIO (HYMENOPTERA: SIRICIDAE)—THE NEW ZEALAND EXPERIENCE

John Bain

Forest Biosecurity and Protection, Forest Research, Private Bag 3020, Rotorua, New Zealand

Abstract

Sirex noctilio F. is a wood wasp that is widely distributed in the Palearctic region. It has become established in New Zealand (first record 1900), Australia (1952), Uruguay (1980), Argentina (1985), Brazil (1988), South Africa (1994) and Chile (2001). The usual hosts are *Pinus* spp. but sometimes *Abies*, *Larix*, *Picea* and *Pseudotsuga* spp. are attacked. The wasp oviposits in the trunks of live trees (and moribund trees and logs) and at the same time deposits a phytotoxic mucus and arthrospores of *Amylostereum areolatum* (Fries) Boidin into the wood. The mucus kills the sapwood tissues and as the wood dries out it becomes suitable for the growth of the fungus. The *Sirex* larvae tunnel through the wood and derive their nourishment from the fungus. Susceptible trees may be killed.

No serious *Sirex* damage in New Zealand was noted until the 1920s; between 1946 and 1951 serious outbreaks were associated with extreme drought conditions and overstocked stands. In the central North Island 33% of trees were killed over an area of about 120,000 hectares. In the main it was sub-dominant and suppressed trees that succumbed, but in many areas dominant (crop) trees died as well.

In 1928-29 and 1931 *Rhyssa persuasoria* (L.) (Ichneumonidae) was deliberately introduced from Europe as a control measure. It was first recovered from the field in 1936 and is well established in nearly all exotic pine plantations. In 1956 *Rhyssa lineolata* (Kirby), a Nearctic species, was found in New Zealand and probably entered the country in timber cut from *Sirex* infected trees; the host siricid could not have been *S. noctilio* because this species does not occur in the Nearctic. *R. lineolata* is now found in several exotic forests. *Ibalia leucospoides* (Hockenwarth) (Ibaliidae) was introduced in 1950, 1951 from England and again in 1966-68 from Australia (the original source was California). It was first recovered in 1957 and is well established throughout the country. *Megarhyssa nortoni* (Cresson) (Ichneumonidae) was introduced from the USA between 1962 and 1964

and was first recovered from the field in 1968; it is now widespread. This complex of introduced parasitoids may kill over 70% of *Sirex* larvae in particular forest areas and in some localities *M. nortoni* has achieved parasitism rates of about 90%.

In the 1960s several other parasitoid species, mainly species of *Rhyssa* and *Megarhyssa*, were imported but for various reasons no liberations were made.

In 1962 *Deladenus siricidicola* Bedding (Neotylenchidae), a nematode associated with *Sirex*, was first found in New Zealand. It has subsequently been found in Europe and must have come from there in *Sirex* infested timber. The nematodes feed on the *Amylostereum* fungus in *Sirex* infested wood but when they come close to a *Sirex* larva they change into an “infective form” and penetrate the integument of the larva. When an infected female larva pupates, the nematodes migrate to the ovaries and penetrate the eggs rendering them sterile. The nematodes also enter the testes of the male *Sirex* but this infection does not result in sterility. The nematode can be cultured on wheat inoculated with *Amylostereum* and it has been introduced in plantations where it does not occur naturally in an agar-based medium. The nematode often causes 90% of emerging *Sirex* females to be sterile.

The combined effect of the nematode, the introduced insect parasitoids and improved silviculture, resulting in more vigorous stands of trees, has kept *Sirex* populations in New Zealand at a very low level and today it is considered to be a minor problem with just the occasional flare up in activity in isolated stands that are under extreme stress, usually as a result of overstocking due to lack of timely thinning regimes.

The biological control of *Sirex*, not only in New Zealand but elsewhere, has been an excellent example of cooperation between several countries including Argentina, Australia, Brazil, Chile, United Kingdom, USA and Uruguay.