

CURRENT SITUATION OF INSECTS ASSOCIATED WITH *Pinus radiata* D. DON IN CHILE AND A STRATEGY DEVELOPED FOR *Sirex noctilio* FABR.: AN INSECT WHICH MAY GET INTRODUCED

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INTRODUCTION

The forestry sector in Chile is important to the Chilean economy, providing about \$2.37 million dollars in foreign exchange and representing about 15% of the country's exports. The principal products that are exported include cellulose, wood chips, sawnwood, and logs, as well as many secondary products (Instituto Forestal (INFOR), 1996). The principal buyers are Japan, South Korea, Belgium, and the United States (Corporación Nacional Forestal (CONAF), 1996).

The growth of the sector began in 1974 with the promulgation of a law that granted subsidies to reforestation projects. Since then, there has been a significant increase in new areas of forest plantations, which today cover about 1.8 million hectares of which 76% use *Pinus radiata* D. Don, 17% use *Eucalyptus*, and 7% use other species (INFOR, 1996).

On the world level, *P. radiata* is one of the species most utilized in forest plantations, especially in the Southern Hemisphere where it is important to the forest industries of Chile, South Africa, New Zealand, and Australia (Ohmart, 1980, Corporación Chilena de la Madera, 1995, Tribe, 1995). It is undeniable from an ecological point of view that the intensive cultivation of an exotic species implies an unstable system, contributing to the possibility that the resource will be susceptible to pest attacks given the absence of natural enemies and the great number of potential hosts. Such an event would lead to significant economic losses. For this reason, the principal insects that are currently found in plantations of *P. radiata* in Chile and the potential of introducing other agents are important topics of investigation. Much emphasis is placed on preventative actions that have been developed in the country to prevent or slow down the introduction of *Sirex noctilio* (Hymenoptera:Siricidae), as this insect is quarantined in Chile and many other countries that have commercial ties.

PRINCIPAL INSECTS ASSOCIATED WITH *P. radiata*

In general, available literature indicates that the greatest problems with insects in *P. radiata* have occurred in the Southern Hemisphere, where this resource has been introduced extensively as an exotic species. Billings et al, (1971) state that the insects associated with *P. radiata* in Chile do not constitute a serious problem, but suggest the importance of several insects such as *Rhyacionia buoliana* (Lepidoptera: Tortricidae), which attack pine buds, and *Sirex noctilio*, a wasp that bores into the tree's bark.

In 1975 the National Forestry Corporation, a state-owned company, became aware of potential risks to forestry resources and, in association with the Austral University of Chile, created the National Plan for Plant Protection. Afterwards, in 1977, it was included as one of the activities of the project PNUD/CONAF/FAO regarding "Forestry Development and Research". For several years, these projects confronted diverse issues of plant protection in natural forests as well as plantations, (Cameron y Peredo , 1974; Dafaucé, 1974; Osorio et al, 1977).

In 1982, the first cooperative agreements between CONAL and Forestry Companies were established in order to study the principal problems present in *P. radiata*. Also in this decade, the presence of the bark beetles *Hylurgus ligniperda*, *Hylastes ater* and *Orthotomicus erosus* (Coleoptera: Scolytidae) (Ciesla y Parra, 1988; Ciesla, 1988), which have a secondary role in pine plantations and are considered potentially harmful for countries such as Chile which sell wood as logs (USDA, 1993). It is likely that their originally introduction occurred by means of containers.

The detection of *R. buoliana* in 1985, associated with the principal forestry resource of the country, marked an important change in the health of *P. radiata*, resulting in the creation at the end of the decade of the National Committee on Plant Protection, led by CONAF in conjunction with private and state companies and universities (Ramírez y De Ferrari, 1991) and which had as a principal objective the eradication of pests and other forest health problems. In an experience unique at the world level, the sector chose to use biological control for *R. buoliana* through the introduction of the parasite *Orgilus obscurator* (Hymenoptera: Braconidae). In the ten years that have passed since the detection of this pest, there has been a great amount of research completed in relation to this insect which is well distributed throughout the country and, in some area, is considered an great economic liability.

Regarding the insects native to Chile that have caused harm to *P. radiata*, isolated pest attacks have been observed under certain environmental conditions in *P. radiata*. This situation occurs with several defoliators, most important among them are *Ormiscodes* spp. (Lepidoptera: Saturniidae), *Bacuncullus phyllopus*. (Phasmatodea: Pseudophasmatidae), *Tanatopsyche chilensis* (Lepidoptera: Psychidae), *Antandrus viridis* (Orthoptera: Acrididae)

and *Coniungoptera nothofagi* (Orthoptera: Tettigonidae) (Villa and Ojeda, 1981; Baldini and Villa, 1992; Lewis, 1996).

POTENTIALLY HARMFUL INSECTS IN CHILE

The majority of the insects that are able to become established in new areas are species that are transported in wood cuts or other products, implying the need to establish strict quarantine measures. It is most likely these are the circumstances which have surrounded the accidental introduction of pests like wood or trunk borers which are considered the most destructive in *P. radiata*.

In Chile there are many insects that are considered to be potentially harmful, however the wood wasp, *S. noctilio*, is considered to be the most significant (Béeche et al, 1993). In South America, it is present in Argentina, Brazil and Uruguay. In this context, following the National Committee of Forest Health, the subcommittee *S. noctilio* was created in 1989 which implemented a strategy for action that included the following aspects: a bibliographic reference collection, training, education, and early detection. Seven years have passed since the study of this potentially harmful agent began, and its principal successes are summarized below:

- Collection of bibliographic references at the world level, resulting in two publications on the subject (Aguilar y Lanfranco, 1988 ; Lanfranco y Aguilar, 1990).
- Training at the national and local level dealing with aspects of detection and recognition of the harmful effects.
- Education through posters and brochures, made by CONAF and the Agriculture and Cattle Service (SAG).
- Visits to other countries. Chilean professionals employed by the state, private companies and universities visited countries that have this problem, establishing contacts with other experts in the area. In 1990, an special investigation of *S.noctilio* was carried out in Bariloche, Argentina, where an infestation was discovered at that time in sawn wood which had come from Northern Argentina (Aguilar et al, 1990).
- Early detection. In Chile, there are more than 600,000 hectares of plantations considered susceptible (11 to 25 years old) to *S. noctilio*, and thus since 1990 a program for early detection has been developed at the national level which involves quarantine measures. This program has been led by SAG and supported by private forestry companies. Its

activities encompass three main areas: the establishment of check points at the national level, installation of trap tree for monitoring, and the development of an international agreement of cooperation with Argentina oriented primarily toward detection and control of *S. noctilio*¹ (Klasmer y Fritz, 1995). In addition, since August 1994, the SAG has implemented a law that regulates the entrance of wood containers into the country.

COMMENTS

A retrospective analysis allows us to see that through time, various insects have been associated with plantations of *P. radiata*, seemingly in direct relation to the increase in the total area of plantations. The largest impact has been caused by those insects that have been introduced, as in the case of *R. buoliana*. As a result of this problem, a national strategy of integrated pest management is currently being developed which involved the entire forestry sector. It can also be observed that several defoliators native to Chile are in the process of adapting to the pine resources and cause sporadic infestations. Although these situations may not be permanent and are only presented under certain environmental conditions, they place pressure the resource and carry potentially large ecological and economic impacts.

In relation to the insects that might potentially be introduced, it is clear that there are many. Yet, as in other countries that possess large areas of pine forest plantations, the insects that bore into tree bark and wood are the most common. Given the types of products that Chile exports and the requirements of the countries that buy them, *S. noctilio* is the most important. Thus it is necessary to develop a national strategy that prevents or slows down the introduction of this insect. In this endeavor, two aspects are very important to avoid the introduction and development of new pest infestations:

- To strengthen at the national level the intensive forest management of plantations of *P. radiata*, permitting an increase in growth at the level of individual tree, stand, and plantation. When establishing a plantation, aspects such as site selection, planting density, and quality of seedlings should be considered carefully.
- Another important aspect is a protocol for quarantine. The various commercial agreements that Chile has recently made imply that, without doubt, the establishment of a system of international cooperation regarding quarantine procedures is fundamental to build awareness about the subject at the national level. As is evident, sufficient human

¹ *Personal Communication with Sr. M. Beéche and Sr. M. A. Poison, personnel of SAG Santiago, Chile, 1996.*

and financial resources should be allocated to this effort. With these efforts, it is certain that the plantations of *P. radiata* will become less susceptible to pest infestations and other forest health problems.

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