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## Progress Report on Importation of Natural Enemies of Insect Pests in the U.S.A.<sup>1</sup>

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In this report on importation of natural enemies of insect pests into the United States, I propose to limit my comments to current projects and those either completed or in progress during the past ten years. The earlier work has been summarized by Clausen (1956) and Dowden (1962). More recently, results of work done in the United States have been included in a world review of activities involving movement of natural enemies between countries (Clausen, 1978). This comprehensive treatment was edited by C. P. Clausen and is based in great part on records that Clausen compiled during the years he was in charge of the U.S. Department of Agriculture (USDA) beneficial insect introduction work and his later tenure as Chairman of the Division of Biological Control at the University of California (Riverside). Although published in 1978, this review does not include work done after 1968.

A second source of information about results of past work on biological control of pests in the United States is also a world review (Laing and Hamai, 1976) and in tabular form gives the name of the pest, location of work, name and origin of the natural enemies and finally, an indication of degree of success and a documenting reference.

Sailer (1973) summarized the major accomplishments of biological control work done by personnel of the USDA from 1888 to 1972. At that time, 128 species of beneficial insects were reported to have been imported and successfully established in the United States. A tabulation just completed has raised this number to 199 (Sailer, 1978). Regrettably, this is not a measure of recent progress in importation but actually an updating of results of much earlier work.

While it is my intention to emphasize work done during the past ten years, because of the nature of biological control it will be necessary to discuss some activities that go back as much as 20 years. My sources of information are of three kinds: (1) published results and (2) report materials, as well as (3) personal communications and first-hand knowledge. During this period, three federal and three state organizations have played major roles in importation programs. However, in later phases, many other cooperating agencies and private individuals have made important contributions to successful projects.

The federal agencies referred to above are Agricultural Research, Science and Education Administration (AR, SEA), Animal and

Plant Health Inspection Service (APHIS), and the Forest Service (FS) all of the U.S. Department of Agriculture. The three state agencies are the University of California, Hawaii State Department of Agriculture, and the University of Florida in cooperation with the Florida Department of Agriculture and Consumer Services. The federal services and states of California and Hawaii have been engaged in parasite introduction work since the beginning of biological control in the United States. Florida is a newcomer, having established a quarantine laboratory in 1974.

One characteristic of beneficial insect importation programs in the United States has been the almost complete autonomy of the major importation agencies. On occasion, there have been joint efforts by agencies and more often, cooperation or collaboration between individual workers. However, by and large, each agency has operated independently of the others. This creates a problem for anyone attempting to summarize the overall picture as it relates to progress toward biological control of pests in the United States.

Traditionally, the USDA Beneficial Insect Introduction Laboratory, or its organizational antecedents at Beltsville, Maryland, has served as a repository of information on importation activities of all U.S. agencies. Unfortunately, records are reasonably complete only for species received from foreign countries and for those released. Information as to results of efforts to colonize the foreign species and of economic benefits following successful colonization is not easily accessible. Results of successful projects are usually publicized. Those that fail or are less than successful are seldom well documented. To the extent that the records at Beltsville reflect traffic into and out of the quarantine laboratories of the federal and state agencies, they provide an indication of the pests against which natural enemies have been imported as well as the source of the enemy species and something of the magnitude of effort involved. In the case of the federal agencies I have relied, for the most part, on information from the Beneficial Insects Research Laboratory (AR, SEA) in Newark, Delaware, where Dr. Richard Dysart, Director of the Laboratory, has computerized information relating to outgoing shipments.

In terms of traffic in and out, the Quarantine Laboratory associated with the Newark Laboratory has handled the greatest volume of beneficial insect material, both in terms of species and number of individual insects, of any U.S. facility. Full data for the past ten years are not readily accessible but those for the period 1972-1978 show that the Laboratory shipped out 214 imported

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