BENEFICIAL INSECT OR PLANT PEST?
THE REGULATORY AGENCY'S DESIGN 1/

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The Agricultural Quarantine Inspection Division of the United States Department of Agriculture is charged with the responsibility of preventing foreign plant and animal pests and diseases from entering the United States and becoming established there. The legislation underlying this mission consists of a number of Federal statutes affecting the import of both plants and animals. The only two that are relevant to the context of this symposium are the Plant Quarantine Act of 1912 and the Plant Pest Act of 1957.

Lost you get the impression that we are newcomers in this field, I should mention that the predecessor of the Act of 1957 was the Insect Pest Act of 1905. As the title indicates, we were limited by law to the regulation of "notoriously injurious insect pests."

What Is a Plant Pest?

The Plant Quarantine Act gives us control of the movement of plants and plant products that may harbor pests. The Plant Pest Act gives us control of pests as such, pests in non-plant commodities, in soil, in garbage, and of all carriers that may be the means of introducing pests. Now let us examine the definition of plant pest. By law, "plant pest means any living stage of: any insects, mites, nematodes, slugs, snails, protozoa, or other invertebrate animals, bacteria, fungi, other parasitic plants or reproductive parts thereof, viruses, or any organisms similar to or allied with any of the foregoing, or any infectious substances, which can directly or indirectly injure or cause diseases or damage in any plants or parts thereof, or any processed, manufactured, or other products of plants."

Our law makes no distinction between good plants or bad plants, and it is this lack of distinction that has drawn the Division into the midst of this remarkable scientific discipline, the biological control of weeds. I would like to commend the investigators in this field in the United States and their counterparts abroad that they have seen fit to work cooperatively with the regulatory agencies rather than trying to circumvent them. To my knowledge, we have not been challenged. We, in turn, have tried to take a reasonable approach in evaluating biocontrol organisms, quarantine facilities, State apprehensiveness, and related regulatory aspects.

In the 66 years that have elapsed since the Insect Pest Act of 1905 was passed, the number of inspectors engaged full time in monitoring avenues of entry for plant pests into the United States has increased to more than 700. In the course of their inspections, they have examined millions of aircraft, vessels, railroad trains, automotive vehicles, and persons for plant pest stowaways and for commodities that might harbor pests. The most recent figures, those for 1971, show 304,379 aircraft; 53,073 ships; 69,930 freight cars; 38,904,809 vehicles; and in excess of 22 million persons inspected.

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Interception Files

When an inspector "Intercepts" an organism, alive or dead, in any stage of development, he preserves it properly and identifies it as far as possible. Our men and women are trained to recognize cosmopolitan pests on sight, and to key less common insects to family and often to genus. Twenty of our ports of entry are staffed with insect and disease identifiers, who can determine routine interceptions to species. Unusual interceptions suspected of being quarantinable are referred to specialists at the United States National Museum as "URGENTO." These are identified at once and the port is informed by telephone or teletypewriter.

As a result of these activities, the Division has accumulated approximately 500,000 records of foreign pests damaging plants and plant products from virtually every country of the world. We have published an annual List of Intercepted Plant Pests since 1912. Unfortunately, it contains the names of only those pests determined to species. Incomplete determinations are not listed, and these represent 50 percent or more of our interceptions.

Our interception records are typed on color coded cards and stored in a 24-shelf power file. They are indexed by pest, host, country of origin, and port of entry. In 1969, we began storing our interception records on tape for use in an IBM 360 computer belonging to the Agricultural Research Service. It is located in the National Agricultural Library at Beltsville, Maryland. Our input device is an IBM magnetic tape selectric typewriter. This eliminates the use of punched cards. Our most recent issue of the List was produced by computer in both upper and lower case type.

FPPA and FPPR

The legal basis for enforcement by a regulatory agency is the Statute or Act of Congress, and the Regulations promulgated by the Secretary (of Agriculture). The Federal Plant Pest Act of 1957 states the intent of the legislation, the Federal Plant Pest Regulations state the procedures. In the Code of Federal Regulations, we find Title 7, Chapter III, Part 330.200 states as follows:

"No person shall knowingly move any plant pest into or through the United States from any place outside thereof, or interstate, or knowingly accept delivery of any plant pest so moving unless such movement is authorized under permit...."

Part 330.201 tells us that only residents may apply for permits by application, by letter, or verbally, and that they must furnish the following information: (1) scientific name of the pest, (2) stage, (3) quantity, (4) origin, (5) destination, (6) whether established in the State of destination, (7) method of shipment, (8) proposed port of first arrival, (9) approximate date of arrival, (10) number of parcels expected to be moved, (11) intended use, (12) measures to be employed to prevent danger of plant pest dissemination, and (13) method of final disposition.

Part 330.200 contains 12 subparts in all. One that is pertinent here deals with (c) inspection of premises.

"The Director may inspect the site where plant pests are proposed to be handled in connection with or after their movement under permit, to determine whether existing or proposed facilities will be adequate to prevent plant pest dissemination in case a permit is issued, provided that the person in possession thereof is the applicant, or such inspection is otherwise authorized."
The most frequently designated site for the importation of pests of weeds is the Entomology Research Division quarantine laboratory at Albany, California. I have not personally visited this facility, but all of the reports that I have received indicate that the risk of escape of foreign organisms is minimal. For rearing studies with most arthropods, we believe that a carefully screened, limited access laboratory or greenhouse equipped with bio-climatic chambers or properly constructed cages meets our specifications for a quarantine facility. If the scope of weed control expands in the use of fungi, bacteria, mycoplasmas, and viruses, we will require more sophisticated facilities to reduce risk.

CASE NO. 1

Soon after my initiation into permit work in the fall of 1967, I was presented my first dilemma. This was a request from the University of California to release the tephritid, Urophora siruna-seva Hb., in California for the biological control of yellowstar thistle, Centaurea solstitialis.

The permit to import live specimens from Europe for screening in the Albany, California, laboratory had been issued by my predecessor in February of that year.

To understand my sense of shock at being asked to deliberately release foreign fruit flies in the United States, you would need some knowledge of Plant Quarantine policy. Ever since 1905, the principal mission of quarantine operations has been to prevent species of Tephritidae from becoming established in North America. I had stressed this for ten years as a training officer to both international trainees and our own recruits.

After reviewing the PL-480 research on yellowstar thistle available to me, I searched our files for interceptions of Urophora siruna-seva or closely related species. There I found that on eleven different occasions between 1935 and 1964, we had intercepted Sp. of Tephritidae in globe artichokes from Italy and France. The number of specimens was 31 larvae, 12 pupae, and 7 adults. On the one occasion that adults were found, they were determined to genus as Terellia sp.

From safflower seeds, we had intercepted six different genera of tephritids including Urophora. The others were Anastrophilus, Chaetostoma, Oreella, Rhagoletis, and Terellia. None was identified as Urophora siruna-seva.

Since these were natural, tephritid infestations of safflower and globe artichoke in the Mediterranean area, I forwarded these records to California and to the members of the Subcommittee on the Biological Control of Weeds. Since my Division was not represented on the Committee at that time, I did not know that the Committee had already given its approval to release the species.

It will suffice to say that we concurred in the release of Urophora siruna-seva in California and a representative of our Division was invited to join the Subcommittee.

We now know, from Dr. Zwolfer's excellent studies on Urophora affinis, that the species of Tephritidae attacking globe artichoke, edible cardoons, and safflower in the Mediterranean area are neither U. affinis nor U. siruna-seva. Since they are not the permitted species, we need not concern ourselves with them further.
CASE NO. 2

On March 4, 1971, a permit request to import 500 adults of *Lema cyanella* L. from England, France and Switzerland for the control of Canada thistle, was initiated.

Since France was mentioned, we opened our thumb-worn copy of Balachowsky & Measni (1935), *Les Insectes Nuisibles aux Plantes Cultivées*, and found disturbing information. *Lema cyanella* L. was synonymized with *Lema lichenis* Voet. The latter was said to be distributed all over Europe and to be a serious pest of cereals, comparable to *Lema meleagris* (Linnaeus). Dr. Andres referred us to Bonnemaisson (1953) *Les Parasites Naturels des Plantes Cultivées et des Forêts*. This author merely confirmed that *Lema lichenis* Voet, fed on the leaves of cereals, preferably wheat and barley. A subsequent memorandum from Dr. Richard E. White, systematic entomologist, revealed that Balachowsky and Measni were in error in synonymizing *Lema cyanella* of Linnaeus with *L. lichenis* Voet. It should have been *Lema cyanella* (Paykull), not Linnaeus.

Of course, Kenneth D. Frick's (1971) paper on Canada Thistle resolved this dilemma by pointing out the basis for the separation of *Lema* and *Dulema*, two species in the former genus and eight species in the latter. It would have been helpful if all of the species mentioned by Steinhausen had been listed.

CASE NO. 3

This spring, about the middle of April, we received a permit request from a professor of entomology at South Dakota State University to introduce the tortoise beetle, *Cassida rubiginosa* Muhl., into South Dakota for the biological control of Canada thistle. A fact sheet accompanying the request stated that the beetle was accidentally introduced into Canada from Europe in 1927. It was recorded in New York State in 1945 and in New Jersey in 1962. Host plants for feeding and breeding were given as *Articus, Carduus, Cenarea, Cirsiun, Cynara, Lappa, Onopordon, Silvium*, and *Tanacetum*.

Since it was the first request of this kind, we decided to refer it to the Subcommittee for consideration. The majority of committee members who replied were in favor of granting the request to collect the beetle in Pennsylvania and ship them to South Dakota, provided feeding studies were conducted in the laboratory and releases were in consonance with the results of those tests.

State of California

It has been mentioned that the State of California enjoys a status, with regard to the importation of insects for biological control purposes, not shared by anyone else, even the Entomology Research Division of Agricultural Research Service. As long ago as 1951, an agreement was entered into between the former Bureau of Entomology and Plant Quarantine, the California State Department of Agriculture, and the University of California, setting forth the conditions under which beneficial organisms, principally parasites and predators, could be imported for confinement in quarantine and subsequent release. This so-called Tripartite Agreement, renegotiated in 1963, is still in effect. One of the terms of the Agreement provides that the University and the State shall be advised, in writing, prior to execution, of all projects undertaken solely by the U.S. Department of Agriculture and dealing with the direct importation into California of beneficial insects or organisms intended primarily for ultimate liberation within the State.

The document further states that liberations of phytophagous organisms imported under the Agreement shall be made in California only after written approval of the parties to this Agreement.
It is my conviction that these two terms and the remaining five mutual terms of the Agreement are being carried out to the satisfaction of all parties concerned. For the enlightenment of others, I am willing to send a copy of the Agreement if requested.

When the imported species are ready for release, the Department of Biological Control at Riverside sends us a Quarantine Release Authorization form for each lot indicating (1) species, (2) number received alive, (3) field host, (4) stage attacked, (5) country of origin, (6) locality, (7) date of receipt, (8) collector, (9) taxonomic determination, and (10) summary of biological data.

As an example, in May of 1961 we received a permit request for the interstate movement of Meliters spp., Olvella juncoidea (Bust), and Cheloneus tabulis (Hume) to the State quarantine facility for propagation. Dr. C. A. Fleischner explained that their intention was to release colonies of these species on Santa Cruz Island for the biological control of Opuntia sp. which is a serious pest on the Channel Islands. He stated further that H. S. Smith had released two of the species in 1945 without success.

In September of 1961, the releases were made. We have no information on the effectiveness of these species on Opuntia.

State of Hawaii

Our records of insect importations into Hawaii for the control of Lantana begin with July, 1955. I am sure that Hawaii has been engaged in biological control activities much longer than 16 years.

The work is conducted by the Department of Agriculture of the State of Hawaii. Dr. C. J. Davis, Chief, Entomology Branch, is currently in charge.

After reviewing 16 years of reports, I am left with the impression that a considerable number and diversity of insects, both immatures and adults, are imported each year.

As in California, an Agreement was informally negotiated some years ago between the Hawaii Department of Agriculture and the U.S. Department of Agriculture. Under the terms of the Agreement, permits are issued by representatives of this Division in Hyattsville, Maryland. Because of an instance some years ago, in which the collector for Hawaii shipped fruits from Hainan back to the islands that were heavily infested with live Hapax cognatus Hardy, provision is made for a representative of this Division to be present when shipments of significant foreign insects are opened in the Hawaiian quarantine facility.

Quarterly reports of importations of parasites, predators, and weed insects are furnished the Agricultural Research Service. If a phytophagous import turns out to be promising and worthy of release, our approval is sought before the specimens are liberated.

Insects and snails have been imported for colonizing and release against 20 different species of weeds. At least half of the lots are not identified beyond "leaf-feeding caterpillars," "undetermined stem borers," or "blotch leaf miners." Perhaps for those larvae succumbing soon after arrival or for those showing no promise, this does suffice. It would seem to me, however, that accurate identification information on failures possesses considerable value. If nothing else, it should reduce repetition and promote efficiency.

I can appreciate the virtual impossibility of obtaining generic and specific determinations of larvae attacking obscure weeds in Mexico, most South American countries, and
may other undeveloped areas of the world. It is difficult enough getting an accurate identification of a significant pest attacking an important crop. Since some of the collections are now being made in Florida, Puerto Rico, and the American Virgin Islands, a greater number of determinations should be possible.

An interesting collection of larvae of Lampedorea pyritinae Dyar from Mexico was shipped to Hawaii for release against Lantana camara. Just recently, an FAO entomologist working in Central America sent me some large larvae and reared adults that had been doing considerable damage to avocado trees in El Salvador. They were identified to the genus Lampedorea.

Fifty States

Of the 50 States that make up the United States of America, 14 States have agricultural pest laws regulating the movement of anthropods and diseases into and within their boundaries. The remaining 36 States depend entirely upon the Federal regulatory agencies to safeguard their interests.

When permit requests are received from persons residing in one of the 14 States, we invariably seek the reaction of the appropriate agricultural official. If he disapproves the request, we would do likewise. If he approves the request, we may or may not grant the permit depending upon our own evaluation of the request.

Since some States initiate requests for biological weed control, we would expect few permit refusals in those instances. Where the request comes from industry, a college faculty member, or an individual, the State could show considerable apprehension and disapprove permit issuance. To date, however, such requests have been rare.

Conclusion

In 1959, C. A. Hufnaker stated that in the early years of biological control, criticism took the understandable form of fear that introduced insects would become pests. He said that the examples of "remarkable" changes in host of insects customarily cited do not, however, represent basic changes. The insects cited were not originally of demonstrated specificity. Yet, the statement of Williams must be a cornerstone of thinking: "The critical phase of biological control works against weeds is the selection of species that will not harm other plants, or at least useful plants. All other considerations are subordinate..."  

In analyzing my own reactions and anxiety when asked to approve species of Cenchrus, Calliphora, Hylemya, Pavillodes, etc. for biological control of weeds, I would like to assure Dr. Hufnaker that the old fears still linger among regulatory officials and members of the Weed Committee. We assured, however, that all of us are doing our best to exercise them.

I believe that the following quotation comes very close to reflecting this Division's current attitude toward your science:

"Two of the major competitors for man's food are weeds and insects. It is a challenge to pit these two forces against one another and tip the biological balance in man's favor!"
Literature Cited


(4) Prick, K. E. Request to Import into Quarantine in the United States: The European *Loma cyanella* L. (Coleoptera, Chrysomelidae, Criocerinae), a Leaf Beetle that Feeds on Canada Thistle, *Cirsium arvense*, for Additional Biological and Host Plant Specificity Studies, March 1971. USDA,ARS, ERD.


DISCUSSION

BENNETT: Just one comment, I think there is a communication gap about *Cassida viridissima*. We have it in eastern Canada and we have not distributed it across Canada, because we thought it a threat to artichoke in the United States as Dr. Zwirner's host specificity tests show that the species has a relatively broad host range.

BENNET: The reason I cited this is because apparently we had never encountered this kind of request for a permit before. One that concerned an insect that became established in North America and then moved down into some of our Eastern states. The researcher was asking for permission to gather this insect up and move it as far west as South Dakota. It could just as well have been a request from the Pacific coast area.

As Sub-committee on the Biological Control of Weeds was set up by the Department of Agriculture, primarily to review exotic importations, but we thought it would be a good idea to get their views on this particular request and I must say that after Dr. Sailer gave a most reasonable explanation why it should be granted, we concurred.

DELFOS: Taxonomic concepts may have some influence as concerns the evaluation of the safety of candidate insect species. Thus, it is fortunate, as far as biological control of weeds is concerned, that the former genus *Lema* has been split into the genus *Oulema* (which contains agricultural pests) and *Lema* (which contains candidate species for the control of thistles). The situation is less favorable with *Sphenoptera Jugoslavica* nov. subg. a candidate for the control of diffuse knotweed, because *Sphenoptera* is a very large genus which contains a number of pest species. *S. Jugoslavica* is a member of the subgenus *Chiliostigma* which does not contain harmful insects. If we could raise this subgenus to the status of a genus (a procedure which taxonomically might be justified), then there might be less objections against the introduction of the beetle to North America.

Thus, the classification of a phytophagous insect is sometimes an important problem for semantic reasons. Of course, when writing up screening reports, we can stress the fact that our insect species belong to a monophyletic group which does not contain pest species, but if we have to use a genus name which often turns up in the Review of Applied Entomology (e.g. *Cotytomyrrhus* or *Sphenoptera*), it makes a bad impression and can cause hesitation to introduce the candidate species. Hence we should encourage these taxonomists who are splitters to get smaller and biologically more uniform genera.

BENNET: We do have other anxieties and one of them has to do with homogeneity of the collections that are shipped into the United States. The biological control of weeds is only one aspect of quarantine operations. We do have all of these other organisms being shipped in for biological research purposes. We find that when native collectors ship four pieces like Brazil, and the researcher has told us that a single genus and species is going to arrive, not only do many different species arrive in different genera. Then different parts of animals, packaged in an old shoe box, arrive with the end torn open and the creatures coming out, such things as the giant African snail from Africa itself, I think we have some reasonable cause for our anxiety.

I might mention too, I think, just recently one of the weevils that was introduced, after it was submitted to the systematists at the United States National Museum, was found to consist of two species rather than one. And I'm reminded of a story of the pygmy mouse, from the time of the Pharaohs. The entomologists thought this was one species. Then someone got the idea of looking at the genitals and discovered, fairly recently, that there are two species involved. So, I think we do have some cause for anxiety, although I know that you gentlemen are very astute and very dedicated when it comes to bringing these things into the United States.
DEEPEN Just a brief comment about the Santa Cruz Island situation. The program was reviewed by Dr. Planckner and myself in a paper published in Hilgardia in 1967. The fates of some of the insects that you mentioned were discussed.

SANKARAN Dr. Ramsay, the plant quarantine regulations are being revised in India where we have a CICN station. If there is any difference of opinion among the members of the Subcommittee how do you resolve this?

RAMSAY I came here as a representative of my agency more than as a representative of the Subcommittee. Since I have joined the subcommittee very recently, I can't speak with any great knowledge about its procedures. It is made up of members of two departments, the Department of Agriculture and the Department of the Interior. Right now, as all of you know, environment and ecology are in the driver's seat, and agriculture is taking a second place. When one of these requests comes up at the committee meeting, we hear a good deal about the value of this particular plant to wildlife. We have men there who are knowledgeable about these matters, so nothing goes through with a rubber stamp. All aspects of the problem are reviewed. I think the committee takes a reasonable approach in asking for additional research or dropping the project all together.

HARRIS In North America Dr. Andrus and myself get both United States and Canadian approval for the release of a biological control agent of a weed. I think this is good and even though I may give the impression that I am antagonistic to this subcommittee, this is not so. I fully agree that the scientist who does the work should not be the person that judges whether the standards of safety have been met. We must have another body. There will be differences of opinion and approach but these can be overcome by maintaining communication.

FRANK Dr. Ramsay, I notice that you mentioned a number of times that the function of your group is to prevent the introduction of plant pests into the country. What is the status of control of the introduction of pest plants?

RAMSAY The Federal Plant Pest Act only provides legal control over those plants that are parasitic to other plants, such as Striga asiatica and plants of that kind. We don't really have control of plants that are declared by someone to be weeds unless they are being brought in for propagation in which case the Plant Quarantine Act applies. Any plant material that is coming in for propagation is admitted under that Act.

FRANK But I understand that, as of now, plant seed for propagation is not necessarily rejected even if it contains noxious or weed seed.

RAMSAY I'm not in this agency of the government, but I understand that legislation is being prepared so that we, like other countries, can have closer control over the introduction of weed seeds. In fact, a Dr. Reed of Baltimore is in the process of preparing a manual of 1500 weeds and their seeds, with keys, so that whoever is given this responsibility within the Department of Agriculture will be able to identify them. After having been in quarantine for 27 years, it sounds like a terrific job to me, to be able to handle this by quarantine means.

END OF DISCUSSION

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