INTERNATIONAL ORGANIZATION FOR BIOLOGICAL CONTROL OF NOXIOUS ANIMALS AND PLANTS (IOBC)
ORGANISATION INTERNATIONALE DE LUTTE BIOLOGIQUE CONTRE LES ANIMAUX ET LES PLANTES NUISIBLES (OILB)

IOBC NEWSLETTER 8

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IOBC is affiliated with the International Council of Scientific Unions (ICSU) as the Section of Biological Control of the International Union of Biological Sciences (IUBS)

THE GENERAL ASSEMBLY OF IOBC WILL BE HELD TUESDAY, AUGUST 24, 1976, IN THE JEFFERSON BALLROOM EAST OF THE WASHINGTON HILTON HOTEL, WASHINGTON, D.C., BEGINNING AT 8.00 p.m.

PROGRAM OF THE BIOLOGICAL CONTROL SECTION XVth INTERNATIONAL CONGRESS OF ENTOMOLOGY

(Co-sponsored by the International Organization for Biological Control of Noxious Animals and Plants)

Plenary Symposium:

Modern Achievements and Innovations in Biological Control
Organizer and Moderator: P.S. Messenger, Berkeley, California USA
International Ballroom, Wednesday morning, 25 August 1976

Sectional Symposia:

Recent Advances in Microbial Control
Organizers: H.D. Burges, Littlehampton, Sussex, UK and L.A. Falcon, Berkeley, California USA
Lincoln Ballroom West, Friday afternoon, 20 August 1976

The Role of Hyperparasitism in Biological Control
Organizer and Moderator: D. Rosen, Tel Aviv, Israel
Lincoln Ballroom West, Saturday afternoon, 21 August 1976

Standardization and Safety of Microbial Pesticides
Organizer: W.G. Yendol, University Park, Pennsylvania USA
Lincoln Ballroom West, Saturday evening, 21 August 1976

Biological Control by Augmentation of Natural Enemies
Organizer: R.I. Sailer, Gainesville, Florida USA and R.L. Ridgway, Beltsville, Maryland USA
Moderator: E. Biliotti, Versailles, France
International Ballroom Center, Sunday afternoon, 22 August 1976

Ant Manipulation for Biological Control
Organizer: W.H. Whitcomb, Gainesville, Florida USA
Lincoln Ballroom West, Monday afternoon, 1:30 - 3:00, 23 August 1976

Production of Microbial Control Agents
Organizers: K. Aizawa, Fukuoka, Japan and H.T. Dulmage, Brownsville, Texas USA
Lincoln Ballroom West, Monday evening, 23 August 1976

Pesticides and Beneficial Arthropods
Organizer and Moderator: J.M. Franz, Darmstadt, Germany
International Ballroom East, Wednesday afternoon, 25 August 1976

Novel Approaches to Forest Insect Control (Co-sponsored with Forest Entomology Section)
Organizers: H.C. Coppel, Madison, Wisconsin USA and A.T. Drooz, Research Triangle Park, North Carolina USA
Moderator: H. Pschorn-Walcher, Delémont, Switzerland
International Ballroom East, Wednesday evening, 25 August 1976

Biological Control of Tansy Ragwort
Organizer: L.A. Andres, Albany, California USA
Moderator: A.J. Wapshere, Montpellier, France
Georgetown Ballroom West, Thursday afternoon, 26 August 1976

Protozoa, Nematodes and Fungi as Microbial Control Angents
Organizers: W.M. Brooks, Raleigh, North Carolina USA and J. Weiser, Prague, Czechoslovakia
Lincoln Ballroom West, Friday afternoon, 1:30 - 3:30, 27 August 1976

Sectional Paper Reading Sessions:

Lincoln Ballroom West, Monday afternoon, 3:30 - 5:30, 23 August 1976
Monroe Ballroom East, Monday evening, 23 August 1976
Georgetown Ballroom East, Wednesday afternoon, 25 August 1976
Georgetown Ballroom East, Wednesday evening, 25 August 1976
Thoroughbred Room, Wednesday evening, 25 August 1976 (Co-sponsored with Forest Entomology Section).

General Assembly Meeting, International Organization for the Biological Control of Noxious Animals and Plants

Jefferson Ballroom East, Tuesday, 3:00 PM, 24 August 1976

WEST PALAEARCTIC REGIONAL SECTION (WPRS)

Fifth Meeting of the Council (November 1975)

The major part of the Secretariat's activities during the year beginning November 1974 was devoted to various publications, including the General Assembly report, the report of the last meeting of the Council, the proceedings of the Bolzano Symposium, and brochures for the working Group for Integrated Control in Orchards. The Secretariat continued to publish WPRS bulletins as well; probably six numbers will appear in this series.

The Working Groups of WPRS have been extremeley active during the abovementioned period. All with the exception of five held meetings and the work done on these occasions was generally very satisfactory. I shall come back to certain of these meetings in a more detailed discussion of the Working Groups.

The year could be classified as one in which we pursued activities already initiated before the Madrid General Assembly: some members of the Executive Committee had informal discussions with the representative of the Agronomy Division of the Commission of European Communities. The report prepared by the President of WPRS on the possibilities for using biological control and integrated control in Europe was published during the year. The Secretary of WPRS has just finished a study on means of applying integrated control in orchards. However the Commission of European Communities has not yet taken steps to involve itself firmly in actions which could have a more direct importance for the development of integrated control in the Community. As examples one may cite support for developing pesticides which are more selective or for applying an integrated control label.

The Executive Committee of WPRS met three times; mainly administrative questions occupied the discussions. The structure and operation of the Lymantria dispar working group were the topic of discussions in which the Group Convener, L. Vasiljevic and the convener of the group for the Coordination of Forest Projects, P. Grison, participated. On this occasion, it was decided not to undertake any tests on the **L. dispar** virus in the field for the time being. It was also stipulated that the Moscow meeting which will be held during the Congress on Plant Protection will be a time for informal contact with researchers from Eastern Europe. During this meeting, the programme for the 1976 meeting of the group, which was envisaged in Rumania, should be elaborated. I have already cited the numerous activities developed by the Working Groups and you will find in the Annex the list of meetings which have been held since the last meeting of the Council.

The Section welcomed the Ministery of Agriculture of Bulgaria as a new member, bringing our total number to 35. We presently have regular contact with Ireland, and there is a certain possibility that a member from this country will join WPRS before too long. There has also been contact with Denmark — though less extensive — but I do not have a clear idea as to the actual possibility of a Danish member joining the Section.

L. Brader
Secretary of WPRS

WESTERN HEMISPHERE REGIONAL SECTION (WHRS)

Successful biocontrol of musk thistle by an introduced weevil, Rhinocyllus conicus

L. T. Kok and W. W. Surles, Dept. Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061.
Abstract from Environmental Entomology 4: 1025-1027.

Rhinocyllus conicus Froel., a thistle head-feeding weevil introduced from France, successfully controlled **Carduus nutans** L. (musk thistle) at a Virginia release site (Pulaski Co.) 6 yr after the initial release of 100 adults in 1969. Thistle density was reduced by 95%. This is the 1st documented success of musk thistle control by the introduction of **R. conicus.** In 1974 and 1975, ca. 90% of the thistles were attacked by the weevil; over 10% of the terminal heads were aborted. The unaborted heads produced few viable seeds and only the later-blooming, smaller heads escaped severe infestation. Dispersal was only 1.6 km 3 yr after release, but after 6 yr both eggs and adults were detected 32 km from the original release site.

SOUTH EAST ASIA REGIONAL SECTION (SEARS)

Trichogramma culture available

The Entomology Department, Sugarcane Experiment Station, Gula Perak Berhad, has obtained three indigenous species of egg parasites from sugarcane, paddy and maize borers namely: **Trichogrammatoidea nana, Trichogramma japonicum** and **Trichogramma chilotraeae.** In addition to indigenous species, an exotic egg parasite **Trichogramma australicum** was also introduced. The Control of sugarcane moth borers **Tetramoera schistaceana, Chilo sacchariphagus,** and **Emmalocera** sp. by egg parasites has been successfully carried out in Perak recently. Hybrid studies on these parasites are being conducted in this Department. Surveys of **Trichogramma** species on other lepidopterous pests are also being made for the purpose of establishing a centre in Malaysia (from ISSCT Entomology Newsletter No. 2, September, 1975).

Submitted by
G. T. Lim and Y. C. Pan

Entomology Department, Sugarcane Experiment Station, Gula Perak Berhad, Pantai Remis, Dindings, Perak, Malaysia.

PACIFIC REGIONAL SECTION (PRS)

Control of the coconut palm rhinoceros beetle, Oryctes rhinoceros, with a baculovirus

Oryctes rhinoceros is a serious pest of coconut palms in South-East Asia and in some parts of the South Pacific. UNDP has financed research on its control for a period of 11 years. The research was done by the South Pacific Commission (1964 - 1972) and by FAO (1972 - 1975) mainly in Western Samoa. In the South Pacific Islands good control was achieved by introducing a baculovirus into the beetle populations.
After the introduction the palm damage usually decreased to less than half of its original level within a few years (Young, 1974, J. Invertebr. Pathol. **20**, 235-241; Bedford, 1974, Rhinoceros Beetle Project, Annual Report, Apia - Western Samoa). The baculovirus had been discovered by Huger (1966, J. Invertebr. Pathol. **8**, 38-51) in Malaysia, and was later found to occur naturally also in the Philippine Islands (Zelazny, 1974, Rhinoceros Beetle Project, Annual Report, Apia - Western Samoa), and in Sumatra and Borneo (Zelazny, 1975, Control of the Coconut Palm Rhinoceros Beetle in Indonesia, FAO, Jakarta, Indonesia). These regions had on average less rhinoceros beetle damage than the virus-free regions of the South Pacific (before the introduction of the virus) and of Indonesia (Java, Bali, Lombok).
Whereas other baculovirus attack most frequently the larval stages, infections from the baculovirus of **Oryctes rhinoceros** occurred in Western Samoa only in 3% of the larvae but in 35% of the adult beetles, although both are equally susceptible to the disease (Zelazny, 1973, J. Invertebr. Pathol. **22**, 122-126 and **22**, 359-363). Evidence was obtained that the virus is most frequently transmitted between adults during mating when a healthy partner comes in contact with virus material excreted by an infected partner. Occasionally larvae become infected when an infected adult visits a breeding site and excretes the virus (Zelazny, 1976, J. Invertebr. Pathol. in press).
The virus can be most easily established by releasing about 100 virus-infected adults (Swan, 1972, Rhinoceros Beetle Project, Annual Report, Apia - Western Samoa). Infected adults can still fly but stop feeding (Zelazny, 1974, Rhinoceros Beetle Project, Annual Report, Apia - Western Samoa). Females stop laying eggs (Zelazny, 1973, J. Invertebr. Pathol. **22**, 122-126) which is probably the main cause for the reduction of the pest population.
After introduction of the virus into the South Pacific Islands the rhinoceros beetle remained a problem im some isolated areas. In the last few years, studies on the use of the virus had concentrated on examining different strains of the virus from the Philippines (Zelazny, 1975, Rhinoceros Beetle Project, Annual Report, Apia - Western Samoa) and on adding more virus infected beetles to the population after the disease had become established. The latter method caused additional significant reduction of the beetle population on Nukunonu Atoll, Tokelau Islands (Zelazny, 1974, Apia - Western Samoa).

(Contributed by Bernhard Zelazny, FAO Cadang-Cadang Research Project, Guinobatan Experiment Station, Guinobatan, Albany H 104).

CONGRATULATIONS

to Professor Ray F. Smith of the Department of Entomological Sciences, University of California, Berkeley, who in March of this year was awarded the honorary degree of Doctor of Agricultural Sciences by the University of Wageningen, the Netherlands. This distinctive international honor was bestowed upon Professor Smith for his work in developing the technique known as integrated pest control, and particularly for applying it in developing countries. Professor Smith is the director of the University of California/Agency for International Development project in pest management and related environmental protection.

OBITUARY

We regret to report the death of Dr. Curtis P. Clausen in March of this year. Dr. Clausen was one of the «Grand Old Men» of biological control, with a long and distinguished career devoted to that discipline. He was leader of the Division of Foreign Parasite Introductions, Bureau of Entomology and Plant Quarantine of the U. S. Department of Agriculture from its establishment in 1934 until his retirement in 1951. Shortly thereafter, Dr. Clausen was appointed Chairman of the statewide Department of Biological Control, University of California, and made his headquarters at Riverside. He was granted Professor Emeritus status at the University of California, Riverside in 1959 and continued to work at that institution until illness caused his withdrawal from activity in 1969. His monumental work, «Entomophagous Insects» is a classic of world renown. His last contribution to the literature of biological control, a world review of introduced parasites and predators, which he edited, will be published this year as a U. S. Department of Agriculture handbook.

PUBLICATIONS

The Secretary of WPRS informs that copies of the following publications are still available:

Integrated control in glasshouses. SROP/WPRS Bulletin 1973/4 (free of charge

Biological control of citrus coccids and aleurodids. SROP/WPRS Bulletin 1974/3 (free of charge).

Progrès en lutte biologique et intégrée/ Progress in biological and integrated control, SROP/WPRS Bulletin 1975/1 (free of charge).

Les champignons entomopathogènes: évolution des recherches au cours des dix dernières années. SROP/WPRS 1975/3 (free of charge).

Les hôtes et les stades pré-imaginaux des diptères bombyliidae: revue bibliographique annotée. SROP/WPRS Bulletin 1975/4 (free of charge).

Lutte biologique contre les cochenilles et aleurodes des agrumes. SROP/WPRS Bulletin 1975/5 (free of charge).

Contrôle visuel en vergers de pommiers. 2ème édition. 1974 82 p. (4 Swiss francs per copy) (french and german version available).

Les organismes auxiliaires en verger de pommiers. 1ère édition. 1974. 242 p. (14 Swiss francs per copy) (french and german version available).

Proceedings of the 5th Symposium on Integrated Control in Orchards/Comptes rendus du 5ème Symposium sur la lutte intégrée en vergers. Edited 1975. 169 p. (15 Swiss francs/copy)

These publications can be ordered through the Secretariat. The last three on integrated control in orchards can also be obtained from:

H. Steiner, Landesanstalt für Pflanzenschutz, Reinsburgstrasse 107.
7000 Stuttgart-W, German Fed. Rep.

H. G. Milaire, INRA, Station de Zoologie, Route de St. Cyr,
78000 Versailles, France.

P. Gruys, Proefboomgaard De Schuilenburg, Lienden (Gld.), The Netherlands.

M. Baggiolini, Station Fédérale de Recherches Agronomiques de Changins,
1260 Nyon, Switzerland.

FROM THE TREASURY

Two annual membership fees of SF 15 paid one via Australia and New Zealand Banking Group Ltd. and the other via National Westminster Bank Ltd. have been received on 4 March. A third annual fee of SF 65 has been received on 31 December. The names of the persons who paid the above mentioned fees are **unknown.**
All fees paid to IOBC since December 1975 have been acknowledged by the Secretary-General. Those persons who did not receive an acknowledgement sheet are kindly requested to notify it.

ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF AMERICA (ESA

The ESA held its annual meeting November 30 - December 4, 1975, in New Orleans, Louisiana. Many good papers were presented, far too many to be listed here. However, the following is a list of titles which we feel may be of particular interest to IOBC members. We invited some participants to submit brief abstracts of their papers for use in the Newsletter. We are publishing some of those herewith and hope that more will be received for use in our next issue. (* = abstract furnished below)

SYMPOSIUM:
Insect Resistance to Parasitism

* Insect Resistance to Parasites and the Host Circulatory System. J. C. Jones, Dept. of Entomology, Univ. of Maryland, College Park, MD 20742.
* Insect Resistance to Parasitism by Insects. F. A. Streams. Dept. of Zoology and Entomology. Univ. of Connecticut, Storrs, CT 06268
* Insect Resistance to Parasitism by Nematodes. A. J. Nappi. Dept. of Biology, State University College. Oswego, NY 13126
* Insect Resistance to Pathogens. G. R. Stairs, Faculty of Entomology, Ohio State Univ., Columbus, OH 43210.

SYMPOSIUM:
Organized Programs to Utilize Natural Enemies of Pests

Organized Programs in Mexico. Eleazer Jimenez J., Direccion General de Sanidad Vegetal, Mexico Department of Agriculture, Mexico City, Mexico

* Organized Programs in Canada. C.D.F. Miller and J.S. Kelleher, Research Branch, Canada Department of Agriculture, Ottawa, Canada.
* Organized Programs in the United States-State. P.S. Messenger, Entomology Department, University of California, Berkeley, CA 94720.
* Organized Programs in the United States-Federal. J. R. Coulson, Insect Identification and Beneficial Insect Introduction Institute, ARS, USDA, Beltsville, MD 20705.

Organizational Responsibility for Biocontrol-Research and Development Inputs. R. I. Sailer. Dept. Entomology and Nematology. Univ. Florida, Gainesville.

SYMPOSIUM:
Biological Control of Waterhyacinth

The Problem: History, Economics and Non-Biological Control. W. E. Thompson, Aquatic Growth Control Section, USAED, P. O. Box 60267, New Orleans, LA 70160

The Effects of Biotic and Abiotic Stress on the Ecology of Waterhyacinth. N. R. Spencer, USDA-ARS, P. O. Box 1269, Gainesville, FL 32602

Overseas Exploration, Selection, and Evaluation of Biological Control Agents. C. J. DeLoach, USDA-ARS, Blackland Research Center, P.O. Box 748, Temple, TX 76501

Introduced Insects and Their Potential for the United States and Other Countries. B.D. Perkins, Jr., USDA-ARS, Ft. Lauderdale, FL 33314.

SYMPOSIUM:
Crop Protection and World Food

* Role of the International Agricultural Research Centers. J. L. Nickel, Director General, International Center of Tropical Agriculture, Cali, Colombia.
* Rice Losses in the Less-Developed Countries. C. S. Koehler, Department of Entomology, Oregon State University, Corvallis, OR 97331
* The Food and Agriculture Organization's Commitment to Plant Protection. W. R. Furtick, Chief, Plant Protection Services, FAO, Geneva, Switzerland
* Plant Diseases as Limiting Factors in Food Production. H. D. Thurston, Department of Plant Pathology, Cornell Univ., Ithaca, NY 14850
* The United Nations Development Programme's Role. Alexander Davidson, Technical Advisor, UNDP, New York, NY 10017

Other papers:

Population Dynamics and Modeling of **Bracon mellitor** (Say) (Braconidae) on Alternate Host, Boll Weevil. C. S. Barfield, Dept. of Entomology, Texas A&M Univ., College Station, TX 77843

A Pilot Pest Management Program for Soybeans in Brazil. Marcos Kogan, M. Shepard and S. G. Turnipseed, Illinois Natural History Survey, Urbana, IL 61801

Economic Threshold Levels of the Tarnished Plant Bug on Susceptible and Resistant Cotton. J. S. Naresh and M. F. Schuster, Dept. of Entomology, Mississippi State Univ. Mississippi State, MS 39762

Integrated Cotton Crop-**Heliothis** spp. Model for Pest Management Simulation Studies. F. A. Harris, L. G. Brown and J. W. Jones, Dept. of Entomology, Mississippi State Univ., Mississippi State, MS 39762.

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(1) Insect resistance to parasites and the host circulatory system, by Jack Colvard Jones

The circulatory system of insects in general provides parasites with a mechanism for their wide dissemination within the hemocoele through contractions of the dorsal vessel and accessory pulsatile organs. In most insects, the system provides the parasite with a nutritious hemolymph and an abundant fat-body. Many species have too few hemocytes to phagocytize or encapsulate an invader. The pericardial cells and other athrocytes frequently do not seem to affect parasites. In some insects, the plasma fraction of the hemolymph may itself be poisonous to the parasite. The hemocytes may be numerous enough to phagocytize or encapsulate or otherwise immobilize an invader. Hemocytes may quickly kill some parasites within their cytoplasm and/or release substances into the plasma which help to destroy them. The pericardial cells and some other athrocytes (e.g., garland cells) possibly contribute to protection against parasites. Some insects ward-off parasites by release of secretions mixed with hemolymph and air onto the surface of the body as a result of localized increases in hemolymph pressure.

(2) Insect resistance to parasitism by insects, by F. A. Streams

Insects may resist parasites by (1) avoiding attack, or (2) inhibiting parasite development. Evasive behavior (vigorous movement, rolling over, etc.) by potential hosts may provide a measure of resistance in some cases by frustrating attempts of parasitoid females to oviposit. In general, host evasive behavior and other possible means of avoiding parasite attack have not been studied rigorously.

Failure of parasites to develop in attacked hosts can result from host unsuitability (presence of a toxic element in the host hemolymph, lack of a necessary nutrient, or insufficient oxygen) or host resistance. Host resistance usually involves a visible host reaction resulting in hemocytic encapsulation and melanization of the parasite. Invisible humoral reactions may also be involved. Encapsulated parasites die and the host continues normal development. The precise cause of death of the parasite is uncertain but probably results from suffocation or starvation in the capsule.

Although most insects have the ability to encapsulate internal parasites and other foreign bodies artificially implanted in their hemocoele, they generally fail to do so when attacked by some species - their usual parasites. These parasites apparently have evolved a mechanism for preventing a fatal reaction in their usual hosts. The ichneumonid **Nemeritis canescens** produces small particles in the calyx which coat the egg surface before it is oviposited and appear to play a role in preventing encapsulation of the egg in the Mediterranean flour moth. Calyx particles have been found in other ichneumonid species but their highly specific mode of action is still not known. Other hymenopterous parasitoids, including the cynipid **Pseudeucoi'a bochei** and the braconid **Apanteles glomeratus**, are able to prevent encapsulation in their usual hosts by inhibiting the proliferation of hemocytes necessary to form the capsule. As in the case of calyx particles, the inhibition is highly specific, being effective in preventing encapsulation in some host species or genetic strains of a single species but not in others.

Insect resistance to parasitism involves problems of interest to a broad spectrum of biologists, ranging from biochemists and cell biologists to ecologists and evolutionary biologists, and we clearly need their participation in solving these problems.

(3) Insect resistance to pathogens: genetics and «coincidence», by G. R. Stairs

Microorganisms are associated with all insect species and those that penetrate and grow causing disease are known as pathogens. The disease may result in death or serious loss of viability of individual hosts. Certain species of microorganisms may contain genetic strains with variable pathogenicity to a specific host. On the host side, certain genetic lines may be highly susceptible to a particular strain of pathogen while other lines may be resistant. In almost all instances, controlled experiments that have taken into account these genetic principles have yielded valuable information concerning pathogen-host interactions. This approach must be encouraged.

In populations of species, individuals are distributed in space and time, thus, contact with individuals of the same species may be somewhat coincidental. Moreover, contact with individuals of other species may be largely coincidental. Pathogen-host contact is most usually highly coincidental. Pathogenic species often produce «resting» or «resistant» stages that will survive adverse environmental conditions until a suitable host enters the habitat. This is similar to the production of dormant seeds by plants or diapausing stages in insects.

Bacteria, fungi and protozoa produce resistant spores capable of survival outside their hosts. Similarly, certain viruses pathogenic for insects are enclosed in a rigid protein crystal (polyhedron) which may survive outside the host for very extended periods of time (even several years). Consequently, epizootics of disease may result from the resting or resistant stages being contacted by a susceptible host species that had been absent from the habitat for several generations. There is no doubt that many insect pathogens are adapted to survive in the absence of suitable hosts and that coincidental contact with hosts is important in the multiplication and spread of pathogens.

Pathogens may be important to the species balance in ecosystems. For example, the nuclear polyhedrosis virus of the European spruce sawfly, **Diprion** reduces sawfly larval populations to the point where spruce trees are not destroyed, hence, the survival of the plant, insect and pathogen are assured. This virus is of maximum pathogenicity and it seems to function like an «external gene» that prevents the insect from destroying its host plant. Apparently, temporal and spatial equilibria have been reached that allow the survival of the system largely on the basis of coincidence, that is, the incidence of virus disease is immediately and highly dependent on sawfly density.

(4) Organized programs in Canada, by C.D.M. Miller and J.S. Kelleher

Biological control programmes in Canada were at one time centralized under a laboratory established in Belleville, Ontario in 1929. Some changes occurred in 1954 when the Canadian Forest Service was given sole responsibility for the biological control of forest insects in Canada, also importations of quarantineable insects continued to be made through Belleville.

The Belleville establishment was closed in 1972; the importation services moved to Ottawa, the biological control of weeds to Regina and the majority of personnel transferred to Winnipeg. This was necessary in order to incorproate biological control specialists as part of multidisciplinary teams involved in mission-oriented research in a «Management by Objective» approach to agricultural production. Indications have been that this management decision has been successful.

(5) Organized programs in the United States - State, by P.S. Messenger

Research and program development on biological control is supported at the state level primarily by two different types of agencies: state departments of agriculture (or forestry) and state universities. Importation of natural enemies into the respective states is done by staffs of such agencies independently of USDA staff in only a very few cases, the main examples being California and Hawaii, to a lesser extent and more recently in Florida and, for weed control only, Virginia.

In California, biological control explorations, importations, quarantine handling, mass culture, colonizations and post-release evaluations (a complete, vertically organized program) is done at the University of California, Berkeley, and Riverside. The California State Department of Agriculture exercises regulatory authority over importation (by participating in the USDA permit system), but provides no staff and does no research on biological control. In Hawaii the State carries out much of the importation work, operates the quarantine facility, and does some of the cultural and colonization work. The University of Hawaii often shares formally in much of the local work on specific projects in colonization and evaluation, and participates occasionally in the exploration and culture. In Florida the State and USDA together manage the quarantine and cultural work, while the University of Florida participates mainly in the colonization and evaluation phases. In Virginia, staff of the Virginia Polytechnic Institute do the colonization and evaluations of agents for weed control, the materials and quarantine safeguards mostly being provided by USDA staff.

The intensity of effort and vertical organization of biological control research at the two University of California campuses is believed responsible for the substantial record of successes in biological control in this state.

(6) Organized programs to utilize natural enemies of pests in the United States-Federal, by J.R. Coulson

In recent years, three biological control importation programs conducted by the U.S. Department of Agriculture and its cooperators have demonstrated considerable potential in the control of target pests over wide geographic areas. These programs have been directed against the alfalfa weevil, the cereal leaf beetle and the Mexican bean beetle. These three programs illustrate contrasting organizational program approaches and also point out some organizational difficulties within the Federal biological control program.

In the author's opinion, more biological control research workers, e.g., from USDA's Agricultural Research Service (ARS), are needed, to be strategically placed to carry out importation programs on **any** pest in the U.S., from foreign exploration to the point of establishment and/or demonstration of the potential of the exotic natural enemy. Then, **regulatory** agencies such as USDA's Animal and Plant Health Inspection Service, with ARS research workers serving in close consultation, should be available to assist in the application of the newly imported pest management tool, whether by extension of the established range of the natural enemy or in the large scale practical application of proven effective biocontrol agents. Research workers are also required for the final phase of the importation program - the final evaluation of its effects.

(7) Role of the International Agricultural Research Centers, by J.L. Nickel

The international agricultural research centers are a part of the larger effort being made to solve the urgent problems of poverty, malnutrition and hunger in the tropical developing regions of the world. They are working with national programs in the development of new technology to increase food production in these regions. Insect and disease control research in these centers emphasizes integrated pest management systems. While pesticides are essential for some crops, attempts are made to minimize their use due to the special disadvantages encountered in this region. These include: less favorable cost/price relationships in developing countries; a higher degree of natural control under tropical conditions; and increased dangers resulting from illiteracy and lesser use of protective devices. Lack of information on biology and economic levels of pests, and lack of trained personnel, make pest management programs difficult often resulting in dependance on fixed-schedule, blanket applications. For these reasons, and the comparative advantage which these centers have in varietal improvement work, due to their international nature, breeding emphasis and large germplasm collections, major emphasis in crop protection is given to breeding for disease and insect resistance.

Examples of crop protection achievements in these centers include:

IRRI: Resistance to most major insects and diseases of rice has now been incorporated into IRRI varieties. A chart in the recent «IRRI Reporter» showed the degree of resistance to various problems of all varieties released by IRRI. This clearly showed the progression towards more resistance as successive varieties were released.

IITA: Resistance to all major foliar diseases and leafhoppers has been identified in Cowpeas and is being incorporated into IITA lines. This will greatly reduce the numbers of pesticide applications required, especially in the early growth phase, thus enhancing natural control of insects attacking flowers and pods.

CIAT: Resistance to major bean and cassava diseases has been identified and is being incorporated into new hybrids. A system of simple shelters for the **Polistes** nests and egg parasitization by **Trichogramm sp.** results in good natural control of the cassava hornworm in the absence of insecticides. Excellent resistance to thrips in certain varieties has been identified. This will eliminate the need for insecticide applications for thrips control, thus enhancing the possibility of biological control of the hornworm. Resistance to most foliar diseases and moderate resistance to **Empoasca** leafhoppers have been identified in the bean germplasm collection. These lines are being used as parents in the breeding program.

(8) Rice losses in the less developed countries, by C.S. Koehler

Rice is the staple food of over half the world's nearly four billion people. Asia, the most densely populated region of the world, accounts for more than 90 percent of the rice produced and consumed. Unfortunately, most of the land suitable for growing rice in Asia already is planted to that crop and very little additional land is available to expand production. Higher production must be achieved primarily through higher yields and ultimately other areas of the less-developed world must look also to increased yields as a means of increasing production. Protection of rice crops from the depredations in insects, plant diseases, vertebrate pests, weeds, and other pests clearly is an important component of yield improvement.
In Africa, an estimated 66 percent of the potential rice production actually is harvested, and 14, 6, and 14 percent is lost in the field to insects, diseases and weeds, respectively. In South America, 80 percent is harvested and 20 percent is lost to these collective agents. In Asia, excluding Japan and the People's Republic of China, less than 50 percent of the potential rice crop actually is harvested, i.e., more rice is lost to pest insects, plant diseases, and weeds than is harvested. These estimates do not include yet additional losses due to the damaging effects of rodents and various other pests, nor do they include the sizable losses which occur after the harvested rice is placed in storage.

(9) The new international inter-agency secretariat for plant protection, by W.R. Furtick

A major action emerging from the FAO World Food Conference (Rome, November 1974) which will play a significant role in the international agricultural development, is the creation of three new bodies, namely the Consultive Group on Agricultural Production and Investment; the International Fund for Agricultural Development, and the World Food Council, the latter responsible for coordinating the actions of all previous and new international organizations dealing with agriculture.
The World Food Conference also passed a special «Pesticides Resolution», which asked for various coordinated actions in the field of plant protection by the world community. The relevant recommendations adopted by the Conference refer to:

- Pesticide Supply/Demand Information System
- Pesticide Residue Information
- Requirements and Standards for: Pesticide Registration; Application Methodology and Safe Use; Scheme for Development and Registration of Commercially Unattractive Products.
- Problems of Pesticides in the Environment.
- Pesticide Supply and Emergency Operations.
- Assessment of Crop Losses.
- Post-Harvest Loss Control.
- Investment in Pesticide Manufacturing and Formulating Facilities in Developing Countries.
- Integrated Pest Control.
- Breeding for Pest and Disease Resistance.
- Strengthening National Plant Protection Programmes.
- Training in Pest Control.

(10) Plant diseases as limiting factors in food production, by H. David Thurson

More than 160 bacteria, 250 viruses, and 8,000 fungi are known to cause plant disease in addition to mycoplasma-like organisms and viroids which have recently been added to the list. Some include nematodes as disease producing agents. There are many classic cases of catastrophic plant diseases in history which have wiped out entire crops, often resulting in wide spread famine and human disease. Examples are the late blight epidemic of the 1840's in Ireland and coffee rust which last century wiped out coffee in Ceylon and in 1970 was introduced into Brazil where it has caused great economic loss. As recently as 1942 an epidemic due to brown leaf spot caused the failure of the rice crop in West Bengal and an estimated 2 million people died. Many other examples can be cited, but fortunately the great majority of plant disease are not catastrophic. Estimates on losses due to plant disease vary widely and much of the information is simply not believed by administrators, the public, and politicians. Most figures found for losses in tropical (developing) countries are double those found for the temperate countries of North America and Europe.
In addition to the direct losses that occur from plant diseases, the threat of introducing diseases into new areas — countries or continents — is perhaps greater today than at any time. Increased movement of plants from country to country and continent to continent has been highly beneficial to man, but it has resulted in increased movement of diseases around the world. The threat of introducing new diseases is perhaps greatest in tropical areas. Examples of diseases that could move from continent to continent are the Asian downy mildews of maize, the Asian bacterial diseases of rice, African cassava mosaic, moko disease of bananas, lethal yellowing and red ring of coconut, and soybean rust. Traditional agriculture in large areas of the developing world is giving away to modern agriculture which includes many new inputs. These additional inputs paradoxically and unfortunately often have the potential to increase disease problems. The new high-yielding varieties of wheat and rice involve a relatively small range of genotypes most of which have many common genes such as those for dwarfing. New races of a pathogen or a now obscure disease or insect pest might have the potential in a given year with optimal weather conditions, to cause wide-spread and serious losses. No one, least of all the breeders and plant protectionist of the international centers in developing countries where the high-yielding varieties are grown, would dispute this possibility. However, they are aware of these dangers and have extensive activities to monitor changes in pests and pathogens to reduce the change of potential disasters. A world-wide co-operative effort to monitor the world movement of pathogens, perhaps including other pests, should be established.
All plant protectionists; entomologists, plant pathologists, nematologists, and weed scientists should work together to develop pest management systems. The problems that the world faces in crop protection are too challenging not to work together to solve them.

(11) The United Nations Development Programme's Role, by Alexander Davidson.

Crop protection is not just an end in itself, but a means to an end, namely the optimization of agricultural production, one major component within the broad perspective of total development. Special circumstances — ecological, economic and cultural — occur in developing countries rather more intensely than in the more developed countries. Rapidly-increasing human populations, with their demands for more food, require crop cultivation of hitherto uncultivated areas, often irrigated enclaves in semi-arid regions. Such «ecological islands» can lend themselves to integrated control approaches but can also favour rapid build-up of pesticide resistance. The adoption of yield-enhancing factors such as high-yielding varieties, fertilizers and irrigation can alter the susceptibility of crops to pests. The economic decisions to be made by the impoverished, illiterate peasant farmer in risking on crop protection what meager capital he has or can borrow, are radically different from those of the businessmann-farmer of the more developed countries. Integrated control systems devised by crop protection teams for peasant farming must take into account these special ecological and economic circumstances, and must include appropriate and effective extension components to achieve responses from the farmers.

The United Nations Development Programme assists its member nations in all aspects of development where technical inputs in the form of expertise, training and equipment are required to fulfil specific development objectives. UNDP's activities include funding of development projects (currently over US$ 400 million per year, of which 30% is spent in the Agriculture, Forestry and Fisheries sector), execution of these projects, either directly or through an executing agency such as FAO, coordination of projects executed by different agencies, and assisting governments in programming inputs for development. Any project which is undertaken is a project of the recipient government, devised according to the needs of the country, in which UNDP and the executing agency participate, with the objective of making the country self-sufficient in the field as soon as possible. In crop protection, UNDP is currently assisting 85 projects with commitments for approximately US$ 25 million, dealing not only with direct crop-pest relationships but also with pesticide formulation, residue analysis, plant quarantine services and protection of stored products. In FAO-executed projects funded by UNDP in 1974 there were employed 74 entomological scientists, 15 of whom were members of the Entomological Society of America.

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