ORGANISATION INTERNATIONALE DE LUTTE BIOLOGIQUE CONTRE LES ANIMAUX ET LES PLANTES NUISIBLES (OILB)

INTERNATIONAL ORGANIZATION FOR BIOLOGICAL CONTROL OF NOXIOUS ANIMALS AND PLANTS (IOBC)

IOBC Newsletter

n° 9, 1977

Preface

Far-sighted pioneers, long ago, recognized the need for an ecologically oriented crop protection and, despite poor support, considerable difficulties and even antagonism, they have steadily pursued their work. These efforts were not in vain, they gradually provided basic elements without which integrated management systems would be meaningless. Tribute has to be paid to these pioneers among whom were the founders of the early IOBC, then called CILB 1), more than 25 years ago.

In the face of the now too often experienced vulnerability of chemical technology, there is an increased need for true integration of means satisfying economical, ecological and toxicological requirements. IOBC which is primarily oriented towards research on factors for containing pest populations is aiming at fulfilling these requirements on a regional basis. Co-ordinated networks established in bio-geographical regions are in charge of implementing these approaches; they are linked together in sections which are themselves interlinked through the world IOBC, which now has its Secretariat in Paris.

One of the means of tightening the links between regional sections of the Central body consists in exchanging news. The present Newsletter has somewhat changed in presentation with the new Governing Board elected at the beginning of 1977. Understandably, it took some time to start running this issue but, in future, it will be sent to you periodically twice or 3 times a year.

In addition to the scientific publication « Entomophaga » which informs you on research progress, considerable efforts will be devoted to reach fullest recognition for IOBC throughout the world.

E. BILIOTTI
President IOBC

IOBC

A World-wide Organization to Promote the Development of Biological Control Leading to Integrated Systems in Agriculture, Forestry as well as in the Field of Control of Vectors of Medical and Veterinary Concern

General Objectives

As a result of growing concern about environmental pollution, the fast development of strains of pests resistant to chemical control and other undesirable side-effects, a central world-wide co-ordinating body, linking largely autonomous regional sections in different parts of the world, was established in 1971.

Since then, 4 such sections have become operational, which means that the newly established team having accepted responsibilities in promoting interregional activities and setting up services of general interest to Members, particularly relating to documentation, information and publication, can now concentrate its efforts towards reaching these objectives.

Governing Board as from 1977

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1) CILB = Commission Internationale de Lutte Biologique.

Membership Fees for 1978

As a Member of IOBC (global), you will receive the scientific journal « Entomophaga », periodically issued « Newsletters » and other relevant documents.

Membership fee : Swiss fr 65 or US $ 30.

Alternatively, you can become an IOBC (global) Member without receiving « Entomophaga » but the abstracts of the papers it contains and the Newsletters.

Membership fee : Swiss fr 24 or US $ 11.

Secretary-General IOBC
G. MATHYS

New from the IOBC Sections [1]

Western Hemisphere Regional Section (WHRS)

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Increase in Membership

	1976	1977	Increase
Members without Entomophaga	108	117	9
Members with Entomophaga	77	96	19
Institutional Members	7	9	2

Major Achievements in 1976

Meetings

— Symposium on the « Principles and Potential of Viruses as Control Agents of Insect Pests » (at the occasion of the Brazilian Congress of Entomology).
— Symposium on *Diatraea saccharalis*, also in the frame of the Brazilian Congress.
— The Brazilian WHRS Members have decided to hold a symposium each year under WHRS sponsorship with 2-3 US scientists participating.

Other Achievements in 1976 and 1977

— They have been concerned with solidifying the membership. In order to increase the Section's outreach, direct contacts have been established in each Central and South American Country.
— A Brazilian Group has been established during the course of the recent Brazilian Congress.

Plans for 1978

— These include an emphasis on the re-establishment of regional organizations in the US and South American Countries which meet simultaneously with the Entomological Society of America Branch (regional) organizations or national meetings, such as in Brazil.
— A WHRS Section meeting on biological control is planned in the frame of the annual national ESA meetings starting in 1978.

West Palaearctic Regional Section (WPRS)

Governing Board (as from October, 1977)

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C. PELERENTS — Faculté des Sciences Agronomiques de l'Université, Coupure Links 533, *BE-9000 Gand* (Belgium)

Membership

36 Institutional Members representing 21 countries.

The General Assembly of the Section, which takes place every 3rd year, was organized in Athens (Greece) during the week of 3-8 October, 1977. On this occasion, the Governing Board was renewed and progress made by the 26 Commissions and Working Parties was studied.

The recommendations established by the General Assembly referred essentially to the need for developing integrated production systems which should be derived from integrated crop protection patterns. A publication prepared by the Working Party for Integrated Control in Orchards showing the potentials of this approach had been distributed beforehand [2].

The General Assembly also stressed the need for production, availability and use of biological and biotechnical agents and recommended that a close international cooperation for the study of safety aspects of insect pathogens be secured.

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1) Information on the East Palaearctic Regional Section will be supplied in the next Newsletter.
2) STEINER, H. *et al.* (1977). An Approach towards Integrated Agricultural Production through Integrated Plant Protection. WPRS Bulletin 4 : 163 pp.

Finally, the General Assembly recommended that efficient methods for evaluating the relative resistance of existing and newly introduced crop plant varieties to phytophagous arthropods be developed and applied in addition to methods to test resistance to plant pathogens.

South and East Asian Regional Section (SEARS)

Governing Board

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Secretary-Treasurer

A.J. MOHYUDDIN — Commonwealth Institute of Biological Control, Murree Road, P.O. Box 8, *Rawalpindi* (Pakistan)

Professor MOHYUDDIN has provided the IOBC Secretariat with an extensive list of researchers interested in biological control in several countries of this region. There are now good potentials for strengthening co-operation and establishing groups, but financial questions remain a considerable hindrance. It would be appreciated if a list of readily available natural enemies could be periodically issued by the IOBC Secretariat. Furthermore, there is a need for literature on biological control and means should be sought to make such literature available on request.

OILB/WPRS Integrated Control of Soil Pests Working Group, Zurich, Switzerland, 15-16 September, 1977

A meeting of the Working Group was held in Zurich at the Entomologisches Institut of the Eidg. Technische Hochschule (ETH).

Results of the collaborative experiment on pests of sugar-beet seedlings in Ireland, England, Switzerland, Federal Republic of Germany and the Netherlands were presented. In general, it was found that there were more micro-arthropods in the sugar-beet rows than between them; more in the herbicide-treated plots than the untreated and, usually, more in the untreated than insecticide-treated plots (although there were a few significant increases of individual groups due to pesticides). Data on surface macro-arthropods activity (pitfall trapping) was interesting in that the insecticides significantly decreased activity of some small carabids, but increased that of others. In particular, aldrin considerably decreased populations of Collembola, Acarina and spiders. All workers of the group agreed to more standardization of extraction and other methods and stressed the need for identification.

In experiments to control seedling pests of sugar-beet with the entomophilic nematode *Neoaplectana*, the effects of a low dose (2,500/m) and a high dose (250,000/m) on *Onychiurus*, *Atomaria*, symphylids, millipedes and other arthropods were assessed by comparison with untreated plots. Results were variable, and further work seems to be necessary to establish doses and soil conditions for effective use of this nematode as a control agent against sugar-beet seedling pests.

A subgroup is just beginning collaborative work on the role of organic matter in control of pests and diseases. Initial studies have shown that liquid manure treatments caused larger increases in numbers of mites and Collembola than sewage sludge which, in turn, increased populations more than mineral fertilizers.

A collaborative experiment on the establishment of sugar-beet seedlings in relation to soil pests would be continued for at least one further year.

Regarding interrelationships of nematodes with arthropods and other organisms, 2 activities were proposed for 1978:

a) *Neoaplectana* experiments (with particular reference to *Onychiurus* and *Atomaria*) and
b) biotic factors limiting nematode populations.

The group proposed to continue and extend its exploratory work on the role of organic matter in pest and disease problems in agriculture.

In a final plenary session, a proposal for a collaborative experiment on assessing the importance of parasites and predators, associated with the soil, in controlling pests of cereals was outlined.

In 1978, the problem of identification will be tackled by organizing a small workshop at which the fauna of all experimental sites will be identified with the assistance of local experts. This will be held at Rothamsted Experimental Station, England, in mid-September 1978.

7th Session of the FAO Panel of Experts on Integrated Pest Control and Resistance Breeding, Rome, 21-28 April, 1977

This Panel advises and supports the Director-General of FAO on the establishment and implementation of integrated control programs; it is composed of 36 individually elected members.

The studies were centered on the global program on integrated control which is directed jointly by FAO and UNEP 1) and benefits from financial support arising from bilateral agreements as well as other resources. The programs should allow the particularly difficult problems existing in certain crops in the Third World to be resolved. Programs are conceived by the project co-ordinator of UNEP in such a way that they encompass an extensive biogeographical region. The FAO Panel is required to judge the appropriateness of operations envisaged.

The Sahel project is nearing practical implementation; it concerns the following countries: Senegal Mauritania, Cape Verde Islands, Gambia, Upper-Volta, Niger and Chad, notably to improve protection measures against pests of sorghum and millet. With the return in 1974, of normal rainfall, after periods of drought, the losses due to locusts and other insects have attained enormous proportions. In 1974, USAID 2) undertook a far-reaching program, which should continue for a number of years, with the collaboration of the following organizations: FAO, UNDP 3), OCLALAV 4), OICMA 5), CIDA 6) and COPR 7). A deci-

1) UNEP : United Nations Environment Program.
2) USAID : United States Aid for International Development.
3) UNDP : United Nations Development Program.
4) OCLALAV : Joint Anti-Locust and Anti-Avarian Organization.
5) OICMA : International African Migratory Locust Organization.
6) CIDA : Canadian International Development Agency.
7) COPR : Centre for Overseas Pest Research.

sive meeting between the African countries and the international organizations and other donors took place in Rome in December 1976. It was then decided to establish, in each country concerned, a working party comprising experts in diverse disciplines, such as biologists specialized in integrated control, economists, sociologists, programmers. These working parties are entrusted with establishing systems of exploitation which facilitate yield optimization. In the context of all these efforts, special mention should be made of the fact that, during latter years, the need for an integrated control approach has been generally recognized.

The FAO Panel has approved the Sahel project which will, initially, give special attention to the evaluation of crop losses and to the establishment of critical economic thresholds for different pest populations.

A second project of the global program concerns cotton ; its implementation is planned in Syria, Turkey, Sudan and Egypt. Countries in South and Central America are also engaged in integrated programs.

Finally, in South-East Asia, considerable efforts are being made towards implementing integrated programs to control rice pests (Sri Lanka, Malaysia, Indonesia).

Regarding the new FAO program (IPHR 1)) to promote the selection of varieties having horizontal resistance, as opposed to vertical resistance, it appeared that the genetic mechanisms involved needed to be further studied before rejecting techniques for incorporating vertical resistance, which does have some advantages. It would be unwise, moreover, to believe that horizontal resistance would not break down. The Panel has, consequently, proposed that indepth studies of these problems be undertaken before pursuing this work.

In general, it appears that the Panel on integrated control plays a determinative role in giving advice on FAO programs.

Catalogue of Available Stocks of Beneficial Arthropods 2)

Fifty-nine entomologists, mainly members of IOBC, have been contacted in 55 countries excepting the USA, in order that a catalogue on available stocks of beneficial arthropods could be established. The data collected from the survey made in 1976 have been compiled by V. Delucchi of the Eidg. Technische Hochschule Zurich, Entomologisches Institut, Universitätstr. 2, CH-8006 Zurich, Switzerland. The catalogue lists institute addresses, parasitoid/predator. host/pray, and persons supplying the information.

World Biological Control Statistics

Up to 1976, for insect pests and weeds combined, there have been 385 successful attempts made in various parts of the world, with 327 of these being control of insect pests (102 complete, 144 substantial, 81 partial) and 57 being weeds (13 complete, 26 substantial and 18 partial). In terms of actual pest species involved, these examples represent 157 insects and 29 weeds, with 104 of the insect pests, and 24 of the weeds, being completely or substantially controlled.

UNDP/FAO 3) *Project on Control of Olive Pests and Diseases in Greece*

This project became operational in 1970 and has been extended to 1978. A particularly important event was the entry into operation of insectaria in Corfu and Likovrissi (Athens), the one at Khania having already functioned for 3 years. These facilities have been used to supply the parasites for olive fly population suppression by *Opius concolor* Szépl. Indepth studies have also been made on the olive moth and black scale. Although large-scale field trials have not yet been carried out, *Bacillus thuringiensis* Berliner shows considerable promise for moth control. Similarly, progress has been made in techniques for mass production of sterile flies able to compete with wild individuals, and in release and monitoring techniques.

UNDP/FAO 3) *Project on Control of the Coconut Palm Rhinoceros Beetle*

The field activities of this regional project, covering various methods of control, in the South Pacific, terminated in 1976. A number of introduced insect predators and parasites became established but did not significantly reduce beetle populations. However, considerable success was achieved with *Baculovirus oryctes* and the green muscardine fungus, *Metarhizium anisopliae* Sorok. Wild or mass reared beetles are infected by immersion in a virus suspension, obtained by blending virus-killed grubs in water. The released beetles carry the disease to remote places. Laboratory tests in France have, so far, not detected any possible pathogenic effects on man and other mammals. For *M. anisopliae*, only 50 g/m³ inoculum is required to treat heaps of decaying organic material in which spores remain infective to grubs for at least 2 years.

UNDP/FAO Project on Biological Control of Cereal Aphids in Chile

In Chile, the reported annual losses in cereal production in 1974 exceeded US $ 30 million. A parasite introduction program (from Europe, California, Israel) was initiated by UNDP in 1976 to control the 2 most important cereal aphid species, *Acyrthosiphon* (*Metopolophium*) *dirhodum* (Wlk.) and *Macrosiphum* (*Sitobion*) *avenae* (F.). On the whole, the average number of selective pesticide applications has been reduced to 2, and farmers now carefully survey fields for ladybirds and syrphids. A follow-up project was approved in March 1977, and biological control methods will be further investigated.

Natural Control Agents in Soybean

Polyphagous predators appear to be the most effective natural control agents of soybean pests in the southern USA. The annual row-crop ecosystem of soybean is characterized by a high degree of instability (when compared to many perennial crops) to which these non-specific predators are able to adapt. The large complex of hymenopterous and dipterous parasites attacking soybean pests appear to have less impact on populations than does the predator complex. However, the green cloverworm, *Plathypena scabra* (F.), is effectively controlled by *Apanteles marginiventris* (Cress.) and the Mexican bean beetle, *Epilachna varivestis* Muls., by *Pediobius foveolatus* (Crwf.). Small areas of early planted snap bean are used to attract and concentrate overwintered bean beetle adults. The parasite is released into heavily infes-

1) IPHR : International Program for Horizontal Resistance.
2) The list can be obtained from Prof. Delucchi.
3) UNDP : United Nations Development Program.
FAO : Food and Agriculture Organization of the United Nations.

ted areas and rapidly builds up and disperses to adjacent fields. Promising microbial pathogens of soybean pests include the entomopathogenic fungi, *Nomuraea rileyi* Farl. (syn. *Spicaria rileyi* Charles) and *Entomophthora gammae*, and the nuclear polyhedrosis viruses of soybean looper, alfalfa looper and velvet bean caterpillar. Application of aqueous spore suspensions of *Nomuraea rileyi* to initiate an epizootic earlier in the season than occurs naturally has been disappointing. This problem was overcome by culturing the fungus on tobacco budworm larvae (*Heliothis virescens* [F.], and distributing the dead, diseased, cut up larvae in fields plots. One of the most serious obstacles to the eventual use of viruses is the lack of satisfactory methodology for large-scale production, in addition to questions pertaining to human safety.

Biological Control in China

In Kwangtung, an interesting method involves the use of ducklings. Each day, 40-50 ducklings per ha were released into the rice paddy for 2 h. In 5 days, they reduced planthoppers by over 50 %, and also reduced weed control efforts by half. As planthoppers are virus vectors, rice diseases may also be reduced. The ducks are later sold for food. *Trichogramma* is used with success on the rice leaf-roller, *Cnaphalocrocis medinalis* (Gn.), and *Bacillus* on rice stem borers, leaf-rollers and skippers. These biocontrol agents are all produced at the commune level. *Trichogramma* is also used to reduce overwintering larvae of the pink bollworm. In Peking, lady beetles are used for controlling cotton aphid; the beetles are collected by hand from various hosts and then released in cotton fields. *B. thuringiensis* is used as a 1:500 spray for control of the hawkmoth, *Clanis bilineata* Walk., and tussock moth, *Dasychira loculpe*, in soybean crops.

The Systems Approach

Considerable progress has been made in California in developing general predator models in cotton, taking into consideration extensive data on species such as the green lacewing, *Chrysopa carnea* Steph., the minute pirate bug, *Orius tristicolor* (White), *Nabis americoferus* Carayon, and the big eyed bug, *Geocoris pallens* Stal. Similarly, plant, pest and pathogen models are being developed. The NSF/EPA 1) sponsored Integrated Pest Management Project, which was funded to the University of California and 18 co-operating universities, has already shown that models are of immense value in helping researchers organize their facts, in pointing to data gaps and in elaborating pest management programs.

Your attention is drawn to the joint EPPO/IOBC 2) Conference on Systems Modelling in Crop Protection, held in Paris, October 1976, the proceedings of which should be published shortly.

Developments in Biological Control in France

Research on biological control in France is largely carried out at 3 research stations: Antibes (Provence), La Minière (Versailles), and West Indies (Guadeloupe).

Much work has been devoted to the rearing of entomophagous insects, particularly with regard to finding suitable artificial media. For the scale predator, *Adonia 11 notata* and the endoparasitic Tachinid, *Phryxe caudata* Rond., complete development from egg to adult has been obtained on media whose content is based on the composition of the host haemolymph and on the biological and biochemical characteristics of the entomophagous larva.

In 1973, a project was initiated to prepare an inventory of species and races of *Trichogramma* existing both in France and throughout the world and to characterize these populations. The laboratory at Antibes presently disposes of 80 permanent populations of *Trichogramma*, including almost all the species and races so far described. *Ephestia kühniella* Zell. was chosen as a substitute host and daily production of this Lepidopteran now exceeds 400,000 eggs; this should be increased to 5 million eggs over the next few years. A cold and UV treatment of eggs ensures their long conservation. Research in Lyons (France) and the USA is now directed towards producing artificial eggs.

In 1974, the first field trial carried out in Alsace against the European corn borer proved successful; trials were extended in 1975 to the Paris Basin. Present experiments, in collaboration with other research stations and professional bodies, are attempting to define the quantities of *Trichogramma* to use per ha and the optimum time and place of release. Furthermore, the use of this parasite is being extended to control other pests: the cabbage white butterfly (Alsace and Hières), the codling moth on apple and plum (Versailles; Lot-et-Garonne), as well as the olive moth. Control is also envisaged of the rice borer and vine moths. The Antibes laboratory also has links with overseas research stations concerned with *Trichogramma* control of pests in cotton and sugar-cane.

In Citrus, for scale (*Lepidosaphes beckii* [Newm.]) control, *Metaphycus helvolus* (Comp.) has been successfully established in the Alpes-Maritimes and Corsica; much progress has been made with the introduction of *Aphytis lepidosaphes* Comp., and *Diversinervus elegans* Silv. shows promise for adaptation. Populations of *Aleurothrixus floccosus* (Mask.), a major white fly pest of Citrus, are maintained at low levels by the parasite *Cales noacki* How.

Since the successful acclimatization of *Rodolia* (*Novius*) *cardinalis* (Muls.) in the Côte d'Azur, in 1912, the Zoology Station at Antibes continues to distribute this Coccinellid. Another species also reared and distributed (since 1920) is *Cryptolaemus montrouzieri* Muls. for control of *Pseudococcus* in glasshouses. In 1966, on the request of the Mauritanian Government, and in collaboration with the Institut Français de Recherches Fruitières d'Outre-Mer, Antibes, researchers initiated a project to control the date-palm white scale, *Parlatoria blanchardi* (Targ.). By 1970, a considerable reduction in scale infestation had been obtained using *Chilocorus bipustulatus* L. var. *iranensis*. This means of control has been extended to other countries of the Sahel and priority is now being given to its use in the Maghreb countries.

For more than 10 years, research has been carried out on 7 principal aphidiphagous Coccinellids.

Research on entomopathogenic fungi (*Beauveria, Metarhizium, Nomuraea, Paecilomyces*) has been carried out over the last 12 years in various research stations and universities in France. Encouraging results have been obtained on limited experimental areas (for control of *Leptinotarsa decemlineata* Say and *Cydia* [*Carpocapsa*] *pomonella* [L.]), and justify further development of this technique, particularly regarding mass multiplication of spores, and selection of strains safe for beneficial arthropods and vertebrates.

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1) NSF : National Science Foundation.
EPA : Environmental Protection Agency.
2) EPPO : European and Mediterranean Plant Protection Organization.

Biological Control of the Cactus *Eriocereus martinii* in Queensland, Australia

By R.E. McFadyen, CIBC 1)

The cerambycid *Alcidion cereicola* from Argentina, introduced into Australia and first released in Queensland in November 1974, has established and is killing cactus over several hundred m². The mealybug *Hypogeococcus festerianus*, released in September 1975, has also established. *Cactoblastis* sp. from *Eriocereus* spp. in Argentina, and an undescribed cryptorhynchine weevil from *E. adscendens* in north-eastern Brazil were sent to Queensland in February 1976 and are being bred in quarantine in the Alan Fletcher Research Station, Brisbane.

The CIBC South-American Sub-Station in Tucuman closed when the *Eriocereus* project terminated in May 1976. All inquiries and correspondence should be sent to Dr F.D. Bennett at the CIBC, West Indian Station, Gordon Street, Curepe, Trinidad, W.I.

Insects attacking *Ambrosia* spp.

By R.E. McFadyen, CIBC

A survey of the insects attacking *Ambrosia* near Tucuman, Argentina, was undertaken from October 1975 to April 1976. *Euaresta toba* and *Contarinia* sp. attack the flowers; an indet. curculionid (?Bariinae), a cerambycid and an agromyzid bore in the stems; a thrips *?Liothrips* causes deformation and scarring to stems and buds; 2 species of tingids attack the leaves and a rare pseudococcid attacks the roots.

Program for the Study of Biological Control Agents of *Solidago* spp.

A program for the study of biological control agents of *Solidago* spp. has been prepared by Dr A.J. Wapshere of the CSIRO 2) Biological Control Unit, Montpellier, France, and is now under study by the Plant Protection Services of EPPO 3) Member Countries.

The proposed program comprises 2 phases : determination of the effectiveness of the various organisms attacking *Solidago* spp. in their native habitat in north-eastern America (in regions ecologically analagous to Europe), followed by determination of the safety (specificity) of the most effective organisms. The first phase would involve at least 2 years' observations. The latter phase would include tests against a group of plants. This group would be selected to : a) determine whether testing is worthwhile, i.e. critical test plant (s) (in this case, sunflower, *Helianthus annuus*), b) demonstrate the host range of the prospective biocontrol agent, and c) expose all cultivated or economically important plants which might be at risk from the particular agent.

A sequence of test plants is outlined. The chrysomelid *Trirhabda canadensis* (Kby.) has already been partially tested but not sufficiently to ensure its safety.

The detailed program outline can be obtained from EPPO Headquarters, 1, rue Le Nôtre, FR-75016 Paris, quoting document no. 3099.

Survey in Africa for Insects for the Biological Control of *Hydrilla verticillata* Casp.

by R.W. Pemberton, Biological Control of Weeds Laboratory, USDA, ARS, Albany, California

Hydrilla verticillata Casp. (Hydrocharitaceae) is a submerged aquatic plant, native to the warmer regions of the Old World. *H. verticillata* was first recorded in the United States, growing in a canal, in Miami, Florida, around 1960. Since then, it has spread throughout the southeastern USA, has overwintered as far north as Iowa and was recently found in a lake in Marysville, California. In addition, *H. verticillata* is recorded as a pest in India and Panama.

H. verticillata is a problem primarily because of the thickness of its growth, which becomes so dense that it not only precludes use of the infested waterways by man, but it also becomes disruptive ecologically, significantly altering the flora and fauna. Control, by mechanical and chemical means, is difficult and expensive. The state of Florida alone spent $ 10,000,000 in 1976 in direct control efforts, and this effort was directed against less than 10 % of the acreage infested with this weed. Biological control seems to offer the greatest potential for providing an effective and economical solution to the *H. verticillata* problem.

The Commonwealth Institute of Biological Control has conducted a survey and biological studies of natural enemies of *H. verticillata* in Pakistan. The natural enemies they found in Pakistan, however, do not appear to have the desired host specificity, nor do they seem to damage *H. verticillata* enough to offer good control possibilities.

The white amur (Chinese grass carp) is currently being studied to determine the safety of its introduction and its ability to reduce *H. verticillata*. The white amur, however, is swimming in a sea of controversy concerning its proposed use, and this may ultimately prevent or severely limit its use as a biological control agent of *H. verticillata*, at least in the USA.

The author recently (autumn 1976) conducted a survey for natural enemies of *H. verticillata* in East Africa, under the support of the Agricultural Research Service, US Department of Agriculture. This region was selected because it is rich in hydrocharitaceous plants, and may well be the place of origin of the family and of *H. verticillata*. The most interesting situation encountered on the survey was the widespread occurrence of severely damaged *H. verticillata* plants in Lake Tanganyika. The apical meristems of some 70 % (average) of the shoots (per plant) were eaten away. A chironomid midge belonging to the genus *Polypedium* was often associated with this damage--a dramatic stunting--and was probably responsible for it. These plants were usually no more than 0.6 m in height and rarely reached the surface of the water. Growth of this nature does not present the problem seen in Florida.

In addition, a stem boring mayfly (as yet unidentified) and a cichlid fish (also unidentified) were found damaging *H. verticillata*. The midge and the other natural enemies will be further investigated in Central Africa by the USDA 4), during the next several years. While an effective and economical control of *H. verticillata* is not yet a reality, there is now some hope for success.

Success With Aquatic Weed Control by *Tilapia zillii* (Gervais)

By E.F. Legner, Univ. Calif.

The herbivorous fish, *Tilapia zillii* (Gervais), has demonstrated a capability for keeping irrigation canals free of

1) CIBC : Commonwealth Institute of Biological Control.
2) CSIRO : Commonwealth Scientific and Industrial Research Organization.
3) EPPO : European and Mediterranean Plant Protection Organization.
4) USDA : United States Department of Agriculture.

aquatic weeds in southern California. The particular strain, originally secured from the Sea of Galilee, must be stocked annually at rates of ca. 2,500 75 mm long fish per surface ha after water temperatures reach 20° C. Low water temperatures during winter reduce the population over 95 %, an event that may enhance the effectiveness of *T. zillii* by practically eliminating intraspecific competition often expressed as male dominance in 1-year old fish. Weed species that have been effectively controlled are *Potamogeton pectinatus* L., *Najas guadalupensis* Morong, *N. marina* L., *Chara* spp., and, to a lesser extent, *Myriophyllum spicatum*. It is anticipated that most water in the southern California deserts, including recreational lakes, could be treated at savings of 1/2 to 1/3 over current techniques, a saving of over US $ 500,000 to irrigation districts in direct costs alone. In addition, water can be delivered to users more efficiently, and loss in weed-trapped water greatly reduced. A serious obstacle to effective implementation of *T. zillii* is the absence of trained biologists in irrigation districts, which results in the stocking of weakened cultures and the breakdown of effective communication with wildlife authorities.

First Scientific Working Group on Biological Control of Insect Vectors of Diseases, Geneva, 5-9 September, 1977

WHO 1) activities in the field of biological control of vectors were initiated in the early 1960s. The Organization now has a network of collaborating centres serving for the isolation, characterization and safety and efficacy testing of biological control agents. The above-mentioned Working Group has been set up in the frame of the jointly sponsored WHO/UNDP 2) Special Program for Research and Training in Tropical Diseases, whose objective is the use, in the interruption of vector-borne diseases, of microbial agents which affect mosquitoes, blackflies and snails, which serve as vectors or intermediate hosts of malaria, schistosomiasis, filariosis, including onchocerciasis, trypanosomiasis, leprosy and leishmaniasis (useful background information on these diseases is given in the booklet 'Tropical Diseases' issued by WHO (1977), price US $ 1).

Reference was made to the annotated bibliography (to be published shortly), covering the period 1964-1974, on the biological agents affecting vectors, viz. microsporidia, viruses, bacteria, nematodes and fungi. Updating of this inventory is facilitated by use of a field collection kit, provided free to persons throughout the world for the dispatch of microbial specimens for examination. Details of the kit were presented. A further working paper dealt with the computerized information system, Agent Biologique Ecologie (ABE), developed by Ohio State University for the WHO Collaborating Centre for the Biological Control of Vectors of Human Diseases. Data for the program are based upon the afore-mentioned inventories. The fields of ABE for the data items include: the accession number, the genus and, preferably, host species, the host's development form and stage, collection site (with details on latitude, longitude, water conditions, country, seasonal meteorological conditions, abundance of host in the habitat), the genus and, preferably, species of the biological agent, and date of collection. Fields are available which cite published or unpublished references to the host/biological agent. The Centre continues to invite and to receive host/parasite reference material, and reference specimens provided for the detection, isolation and identification of biological agents, thereby, increasing the store of available information.

Other working papers presented at the meeting included: an approach to mammalian safety tests for entomopathogenic organisms, pathogenicity of 3 strains of *Bacillus sphaericus*, and industrial development of microbial agents. In the latter, attention was drawn to the need for standardization and establishment of international standard units. For instance, dead cells (treated with chloroform) of *B. sphaericus* are as biologically active as viable cells; therefore, in what terms should activity be expressed. The establishment of an 'international unit' is suggested, defined in terms of the mg amounts of the standard powder necessary to give a specific biological activity against *Culex* (and/or *Anopheles*). Another problem is that of methods for accurately identifying and characterizing biological agents, but, the most important future problems relate to formulation and delivery systems.

Outlines of 41 proposed research projects on vector control had been received from scientists throughout the world. The majority of proposals related to mosquitoes, while some concerned Dipteran and snail control, and others were more general in nature.

National Biological Control Research Centre of Thailand (NBCRC)

Excerpt from Research and Development Activities at Kasetsart University, *Kasetsart Univ. Res. Comm.*, 1976

Through the achievement of the National Research Council of Thailand and Kasetsart University and with the endorsement and approval of the Department of Technical and Economic Co-operation (DTEC) and the National Economic and Social Planning Council of Thailand, the National Biological Control Research Centre was established in 1973 to handle all works related to biological control of pests of agricultural as well as public health importance. During its formative stages, substantial technical assistance will be provided by the British government through the Commonwealth Agricultural Bureaux, and an operating budget allocated by the government of Thailand.

NBCRC itself was initially organized and operated as a sub-committee comprising representatives from various institutional collaborators. The co-operating agencies, other than the National Research Council and Kasetsart University, include the Department of Agriculture, Department of Fisheries, the Royal Forest Department of the Ministry of Agriculture and Co-operatives, Ministry of Public Health, and Universities, in particular Mahidol University, Chiangmai University, Khonkaen University and Prince of Songkla University.

Eventually, Kasetsart University will be solely responsible for the operation and organization of NBCRC, collaborating closely with co-operating agencies. The national headquarters was planned at Kampangsaen with regional subcentres, representing the various geographical areas of Thailand, in Bangkok, Chiangmai, Khonkaen and Hardyai.

During 1975, at least 21 research projects on different aspects of biological control were initiated and financially supported by the centre. These research projects ranged from classical or conventional biological control to advanced biological control practices envisioned by experts and specialists in this area of plant protection. Important projects include surveys of endemic natural enemies, introduction of parasites and predators, evaluation of natural enemies, life table and life system investigation, biological control of both terrestrial and aquatic weeds, and biological

1) WHO : World Health Organization.
2) UNDP : United Nations Development Program.

control agents as an integrated part of modern pest management practice.

NBCRC is also engaged in co-operative projects with other institutions outside the country, such as biological control of aquatic weeds with BIOTROP, Indonesia, exploration of natural enemies with the State of Hawaii, Department of Agriculture and Division of Forestry, exploration of natural enemies of gypsy moth and allied species with the US Department of Agriculture. Co-operation is also being sought with other international agencies such as the Commonwealth Institute of Biological Control (CIBC), International Organization for Biological Control (IOBC) and other interested agencies.

North American Egg Parasite Successfully Controls a Different Host Genus in South America : an Unorthodox Control of a Forest Insect

A North American egg parasite, *Telenomus alsophilae* Vier. (DROOZ, A.T. *et al.* [1977]. *Science* **197** [4301] : 3901), has been shown to successfully control a different host genus (*Oxydia trychiata*) in South America. The classical approach in biological control of exotic insect pests has involved importing known natural enemies. However, since parasite/host systems evolve towards homeostasis, and since introducing parasites of the same species into the new area does not alter the parasite/host relationship, effective control is limited because parasites will seldom increase sufficiently to suppress the same host in a new area. In contrast, if the association between host and parasite is new, as reported above, host suppression is often more complete. Although compatibility with the pest's environment is stressed as a criterion for selecting parasites to introduce, *T. alsophilae* readily adapted from the North American to the Andean terrain, despite considerable climatic differences between locales. The authors concluded that biological control specialists should look in the direction of matching parasites from one host to a host in a nearby taxon.

Control of the Coconut Leaf Moth (*Levuana iridescens* Baker) in Fiji

By R.W. Plaine

It is now 50 years since this moth was controlled by the introduction of the tachinid *Bessa remota* (Ald.) from Malaya, and 100 years since it was first recorded as a coconut pest in Fiji. In 1956, *L. iridescens* was still evident locally on coconuts in inland Vitilevu but, in recent years (lastly in February 1977), searches for it have failed. There is the possibility that this Zygaenid moth is now extinct ; but, as the first record of it as a pest of coconuts was in 1877, and it has not yet been discovered outside Fiji, it may still exist in Fiji on some non-economic, 'original' food plants to which its much reduced population is now again confined. In support of this view is the occurrence of the closely related Zygaenid, *Leptozygaena gracilis* Jordan, on *Musa* sp. (nr. *maclayi*), in the Western Solomons, and on an upland species of *Pandanus* in mainland New Guinea. There is no record of *L. gracilis* on coconut palms anywhere in Melanesia where it is controlled by a complex of parasites. It remains to be seen whether, 1) *L. iridescens* is now extinct ; 2) if not extinct, on what it now feeds in Fiji, and 3) whether it may yet be found to occur outside Fiji (e.g. in New Hebrides).

Congratulations

Prof. K. Yasumatsu

Professor Keizo Yasumatsu (Kyushu University, Fukuoka, Japan), who is now in Thailand on assignment with the Japanese Colombo Plan, was awarded the honorary degree of Doctor of Agricultural Sciences by Kasetsart University, Bangkok, Thailand. The award was bestowed upon him for his contribution to the promotion of biological control in Thailand.

Dr F.J. Simmonds

Dr F.J. Simmonds retired from the Directorship of the Commonwealth Institute of Biological Control on 30 September, 1976. He joined the Organization in 1938 to work on codling moth parasites in southern France. The Second World War interrupted this work and Dr Simmonds was reappointed in September 1941 and posted in Canada. He moved to Trinidad in 1946 and organized the West Indian Station of CIBC. He became the Director of CIBC in 1958. During this period, CIBC greatly expanded its activities and geographical coverage, with regional stations in practically all the continents.

We are glad to know that Dr Simmonds' retirement does not mean that he will no longer be connected with biological control work. He will continue to work as a Consultant or in other capacity on one or more new biological control projects in different parts of the world.

Dr F.D. Bennett

Our congratulations and best wishes to Dr F.D. Bennett who has taken over as the new Director of CIBC, effective from 1st October, 1976. Dr Bennett joined the CIBC West Indian Station, Trinidad, in 1951 and became the Entomologist-in-charge there in 1958. Like his predecessor in office, Dr Bennett is well-known internationally, particularly to members of IOBC.

Relevant Books

A Review of Biological Control in Western and Southern Europe

Editor : D.J. Greathead.
Contributors : K.P. Carl, O. Eichhorn, D.J. Greathead, H. Pschorn-Walcher, D. Schroder, D.J. Girling.
Contains a review of biological control work in the European part of the IOBC/WPRS.
Published by the CAB (1976), 182 pp (32 pp of references) ISBN 0-85198-369-3. Price £ 5 (UK), £ 6 (Overseas).

Biological Pest Control, 2nd ed.

By J.M. Franz and A. Krieg (BBA, DE).
Verlag Paul Parey (1976), 222 pp (8 pp of references) ISBN 3-489-66626-7. Price DM 29.
A textbook on biological control.

Technical Bulletin No. 17 of the Commonwealth Institute of Biological Control

Published by the CAB, 173 pp. Price £ 1.50 (U.K.), £ 1.80 (Overseas).

Review

Biological Control of Forest Insects

By H. Pschorn-Walcher (1977). *Annual Review of Entomology* **22** : 1-22 (125 references).

A review dealing with the strategy and principles of the biological control of forest insect pests introduced from one continent into another by means of importation of their natural enemies from their home countries.

Editors and organizers of this issue : G. MATHYS and Elizabeth A. BAKER (EPPO).