

# IOBC NEWSLETTER 3

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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)

## DRIVE FOR MEMBERSHIPS

Membership in the International Organization for Biological Control offers to individuals and to organizations the opportunity to make a contribution towards one of the most important problems of our time - the development of rational methods of pest control. A stronger, vital IOBC is essential in this development; IOBC needs the support of all those who would sponsor this development.

## ENTOMOPHAGA

To meet the increasing demand for publication in *Entomophaga*, the Editorial Board and the Publisher have decided to admit free of charge only those articles not exceeding 10 printed pages. For any additional pages authors will be required to pay page charges of 100 SF per page (about US\$35/page). If the printing costs of the article are entirely supported by individuals or institutions, the article will receive priority for early publication.

## IOBC DOCUMENTS

Several IOBC documents of interest have been produced:

- A **brochure** on the aims, structures and activities of IOBC. Copies available from the Secretary - General of the Organization;
- The **report of the 6th General Assembly** of IOBC, held in Canberra (Australia) in 1972. Copies available from the Secretary-General of the Organization;
- A **report on the second Council meeting** of WPRS in Brussels, November 21-22, 1972. Copies obtainable from Dr. L. Brader, Wageningen;
- WHRS - **Entomophagous species under culture** - December 1972, available from Dr. J. S. Kelleher, Ottawa.

## NEW WORKING GROUP

The informal worldwide working group on biological control of weeds voted in Montpellier to accept the invitation of IOBC to become a Working Group of IOBC. Dr. Peter Harris, Canada Department of Agriculture, Regina, Saskatchewan, Canada is the group leader.

## THIRD INTERNATIONAL SYMPOSIUM ON BIOLOGICAL CONTROL OF WEEDS

The symposium was hosted by A. J. Wapshere and the CSIRO biological control unit at Montpellier, 10-14 Septembre, 1973. Two basic approaches were evident in the rapidly increasing expertise in the biological control of aquatic weeds. J. C. J. Van Zon rejected the use of monophagous agents for the control of weeds in Dutch irrigation canals (as the control of one species leads to its replacement by another) in favour of the highly polyphagous fish, the white amur. This fish is also being used in the United States but is regarded as undesirable in the many areas where aquatic weeds are an essential resource for wild life. Thus the emphasis (N.R. Spencer) was on the use

of monophagous agents to control particular noxious species such as alligator weeds and water hyacinth. For this purpose extensive surveys are being made in South America (B. D. Perkins) and on *Hydrilla* in Pakistan (G. M. Baloch). Striking control of alligator weed has already been obtained in the United States, although in part it has been replaced by water hyacinth.

The use of pathogens has been sparked by the spectacular control of *Chondrilla* in Australia with *Puccinia chondrillina* (J. M. Cullen). One of the difficulties was finding a strain of the rust virulent against the strain of the weed involved. As *Chondrilla* is apomictic a single genotype comprised most of the infestation in Australia which may have made it a particularly suitable subject for control by a pathogen. However, it should soon be known whether pathogens are effective against polygenic weeds as the search for species suitable for the control of other Australian weeds has been extended to Iran (S. Hasan) and studies have been started on their use against aquatic weeds in the United States (T. E. Freeman). J. J. Lipa reported on the massive Polish survey of cruciferous feeding insects. Cruciferous weeds are difficult biological control subjects as the family contains many economic plants and there is a dearth of insects restricted to single species or genera; however, the survey has revealed some prospects. Another weed supporting surprisingly few monophagous insects was *Sonchus* (D. Schröder). This was in marked contrast to *Lantana* which has 10 agents already released against it in Australia and more are expected to be found in Brazil (K. L. S. Harley). The Japanese program has been largely concerned with developing host testing procedures to satisfy their Plant Protection authorities. For this purpose indigenous chrysomelids from *Rumex* were employed (M. Miyazaki). W. B. Ennis presented an overview of the current United States program. A. J. Wapshere reviewed the procedures employed in biological control of weeds and emphasized the necessity of moving from a rather ad hoc to a more scientific basis. This was also the concern of P. Harris in the selection of agents likely to provide effective biological control.

## TRICHOGRAMMA CULTURES AVAILABLE

CIBC Indian Station, Bangalore, has over the past 5 years been studying a number of species of *Trichogramma*, and has obtained a large number of populations originating from different parts of the world and occurring on different hosts. Cultures of most of these and of hybrids have been established. Stocks are still available and will probably be maintained for another year or so. Since many lepidopterous pest species appear to be suitable targets for biological control using *Trichogramma*, it might be worthwhile for interested persons to take advantage of the present availability of these cultures. Reasonably large numbers for direct field release could be supplied at relatively short notice and at low cost. In addition to several *Trichogramma* species, a few interspecific hybrids (including one thelytokous population) are also available. Hosts against which these *Trichogramma* species might well be tried include: *Heliothis*, *Spodoptera*, *Achaea*, *Papilio*, codling moth, sugarcane borers (including *Chilo* and *Diatraea* spp.), *Hypsipyla* etc. and a certain amount of information could be supplied

as to natural hosts, and ecological preferences of some of the species. If you think you might be interested in this material over the next year or so, please write to Dr. T. Sankaran, Entomologist-in-charge, CIBC, Indian Station, P.O. Box 603, Bangalore 560006, India, giving particulars of the pest (s) which you wish to control, so that he may advise on the species which appear most suitable and the costs involved. **Once these stocks are discontinued it may well be impossible to obtain a number of these species from a single source.**

## NEWS AND REPORTS FROM THE REGIONAL SECTIONS

### Pacific Regional Sections (PRS)

(a) Biological control of *Oryctes rhinoceros* on coconuts continues in Samoa, Wallis Island, Fiji, Tonga and New Britain, with the *Rhabdovirus oryctes*.

(b) The introduction to American Samoa (Pago Pago) of *Brontispa longissima* (Coleoptera, Hispinae) from Tahiti was followed by a survey (requested by the American Samoa government through the South Pacific Commission, Noumea and conducted by P. Cochereau) and the introduction and mass rearing in Pago Pago (I. Swan) of *Tetrastichus brontispae*. The work is now in promising progress. *T. brontispae* was used in Tahiti, New Caledonia, Solomon Islands and New Hebrides against *Brontispa longissima* with good results. The strain for Pago Pago was collected in Santo (New Hebrides).

(c) *Achatina fulica* (the Giant Africa Snail) is spreading in Tahiti, New Caledonia and New Hebrides (Vate Island). Biological control with predator snails (introduced in Hawaii by C. E. Davis and others) is planned.

(d) Work on the population ecology of fruit sucking moths and citrus scale insects (*Lepidosaphes beckii*) continues in New Caledonia.

### Western Hemisphere Regional Section (WHRS)

#### (a) Governing Board of WHRS for 1973 and 1974

The Governing Board consists of the Executive and three members-at-large. For 1973 and 1974 these are:

Past President	F.D. Bennett	Trinidad
President	O. Beingolea G.	Peru
President-elect	C.M. Ignoffo	USA
Vice-Presidents	C.H.W. Flechtmann	Brazil
	P.S. Messenger	USA
Secretary-Treasurer	W.H. Whitcomb	USA
Corresponding Secretary	J.S. Kelleher	Canada
Members-at-large	R.I. Saller	USA
	R. van den Bosch	USA

#### (b) Voucher specimens from biological control investigations

Dr. Paul Oman (WHRS Newsletter No. 3) has commented on the need for a better documentation of experimental work by the deposition of voucher specimens in institutional collections where they will be available for future study. The value of this has been supported by Dr. Henry Townes (WHRS Newsletter No. 4) who has also pointed out the importance of keeping proper records of the releases and follow-up studies when attempts are made to introduce parasites and predators. Dr. Townes has sugge-

sted further, that government agencies who issue permits allowing the importation of biological control organisms should ensure that voucher specimens are kept and properly curated, and that IOBC could take the initiative in seeing that this is done.

#### (c) Entomophagous species under culture

A preliminary list of entomophagous species under culture in WHRS was prepared in December 1972. This consisted of 164 species held by 50 cooperators. An addenda giving 29 additional species was issued with WHRS Newsletter No. 5 in June 1973. These lists are available from: J.S. Kelleher, Research Program Services, Research Branch, Agriculture Canada, Ottawa, Ontario, Canada K1A 0C6.

#### (d) IBP Project on pest management

The International Biological Program (IBP) has initiated a project on which \$14 million may be expended over a 5-year period. Dr. C. B. Huffaker of the International Center for Biological Control, University of California is the director of this project which has been funded through the Center by the National Science Foundation, units of the U. S. Department of Agriculture, and the Environmental Protection Agency. The activity embraces complete integrated pest management studies on pests of alfalfa, deciduous fruits, citrus, cotton, soybean and pines (bark beetles). Systems analysis, importation and improved use of natural enemies (including pathogens), crop breeding for resistance, studies on economic thresholds, ways to obtain pesticide selectivity, use of cultural methods, pheromones, hormones, etc. are included. The project is designed to develop a better system of pest management on a national basis but the advancement in pest control will be a worldwide benefit. Scientists in various agricultural disciplines from 18 U.S. universities and various USDA units are participating.

#### (e) Working Groups in WHRS

The WHRS Governing Board has set up a number of committees to identify areas where international cooperation and coordination are needed. The chairmen of these committees are:

Citrus pests	— C.W. McCoy
<i>Diatraea</i> borers	— F.D. Bennett
Integrated control	— R.L. Ridgway
Forest insects	— A.T. Drooz
Microbial control	— J. McB. Cameron
Soybean pests	— L.D. Newsom
Weeds	— P. Harris

#### (f) New USDA beneficial insects laboratory

The Louis A. Stearns Laboratory, University of Delaware, Newark, Delaware, was officially dedicated on October 30, 1973. It was built by the University and leased to USDA as a Beneficial Insects Laboratory, staffed by personnel formerly stationed at Moorestown, New Jersey. The assignable area is 6404 square feet and it is equipped with quarantine facilities, controlled environmental rooms and other laboratory features to carry out the functions of importing, culturing and research in biological control. A Symposium was also held on the occasion with the following speakers: D.F. Bray, W.H. Day, G. Guyer, R.I. Saller and R. van den Bosch.

#### (g) Proposed study on biological control of intermediate snail hosts of fascioliasis

The Puerto Rico Nuclear Center has responded to an invitation by the Pan American Health Organization by proposing a pilot study on biological control of the intermediate snail hosts of fascioliasis and related snail-borne diseases in Puerto Rico

by use of sciomyzid flies. Fascioliasis is a problem not only in Puerto Rico but in the Andean Zone of Colombia, Ecuador, Peru, Bolivia and Northern Argentina. There are no effective drugs for the disease and molluscicides are useful only in limited circumstances; drainage is effective but often too costly.

The Sciomyzidae have been selected for use in this project because this is one of the most thoroughly studied groups of natural enemies of snails. But there is still a need for basic studies on biology and dispersal which will be done first on endemic species and later on imported species. At the same time mass rearing techniques must be developed. The evaluation of the effect of the flies on the snail population will be done by sampling and comparison with untreated areas. Techniques for the evaluation of the animal infection level with *F. hepatica* and the rate at which animals are infected have already been worked out.

### West Palaearctic Regional Section (WPRS)

Dr. L. Brader reports the following general developments:

#### (a) Integrated Control in Brassica crops - Working Group.

The first session at Wageningen discussed types and importance of Brassica crops grown in the different countries represented, the relative importance of the pest species attacking them and current research on these pests. The conclusion was drawn that currently all Brassica pests are controlled with insecticidal treatments applied specifically to control the individual species, mainly without consideration of the full insect complex attacking the crop, a necessary prerequisite in an integrated control programme designed to utilise the natural enemies of the pest complex.

The following suggestions were made regarding Brassica research:

(i) Short-term research: Investigation of insecticides suitable to control Brassica insects; determination of their intrinsic selectivity or ways that they may be used to make them more selective to avoid interference with natural enemies; and studies to enable control treatments to be applied at the correct time and to remain effective over the period of growth of the crop most susceptible to damaging attacks.

(ii) Long-term research - based on work already in progress:

**Cultural** - Effect of cultural practices and cropping diversity on pest incidence; determination of what environmental factors influence this situation.

**Ecological** - Population dynamics, multiplication factors, adult dispersal and flight range.

**Host plant resistance and insect pathogens** - Work is continuing.

#### (b) Genetic control of *Hylemya* - Working Group

A meeting was held in combination with that of the Brassica working group. The main topics discussed were: Rearing of *Hylemya antiqua* and *H. brassicae*. The former can be reared on a semi-industrial scale, but plant material is still necessary for successful rearing of *H. brassicae*. *H. antiqua* can be sterilized 100% at a dose of 3 krad; for *H. brassicae* it is difficult to obtain more than 99.5% sterility with 4.5 krad without notable effects on the competitiveness of the flies.



Marking of the flies can be well done with fluorescent powders and also with radioisotopes (P 32 and Zn 65). For migration studies flight-interception traps are used for *H. antiqua* and yellow traps for *H. brassicae*. Dispersal of *H. antiqua* only takes place over rather short distances. For the different countries represented at the meeting the following general outlines concerning genetic control of these insects could be drawn:

**Federal Republic of Germany** -many doubts about the feasibility of genetic control;  
**Belgium** -attempts to build genetic control into a programme of integrated control are being made; **United Kingdom** -high population densities and dispersion of host plants reduce the possibilities of the application of such integrated control methods;  
**Netherlands** -genetic control of *H. antiqua* can probably reduce the populations below the economic injury levels; and **Switzerland** -no plans for any application in the near future.

#### (c) Integrated control in orchards -Working Group

(i) The object of the meeting held in Bologna was to discuss the possibilities of a more rational approach to the control of fungus diseases in orchards, by limiting the use of fungicides, and closer attention to the possible side-effects of fungicides. The following subjects were considered:

**Apple scab:** One possible way of reducing the number of treatments against scab is to spray curatively, using Mills' tables to ascertain if infection has occurred. But in respect to integrated control programmes autumn applications of fungicides or urea, to kill the perithecia or to prevent their development, were found to be much more promising than the curative method of scab control. The 3rd way of reducing the application of fungicides is to breed for resistance. Resistant varieties from the USA and East Malling are available and are being tested for productivity, etc. at Wädenswil, East Malling and in France.

**Apple powdery mildew:** A normal spraying scheme seems to increase the susceptibility of trees to mildew; there is some evidence that herbicides stimulate mildew infestation on black currants; nitrogen fertilization intensifies mildew attack; development of mildew is impeded by practices that stimulate fast maturation of newly-formed leaves.

**Storing diseases (Gloeosporium, Nectria):** Cultural practices and treatment of the fruit can be adjusted to reduce the risk of storage diseases.

**Side-effects of fungicides:** The 2 main points discussed were influence on the physiology of the tree and on development of spider mites; and persistence of systemic fungicides in the soil and the influence on soil processes.

(ii) Another meeting was held at Montfavet (Avignon) to discuss problems created by the increasing resistance of spider mites to acaricides and to analyse the possibilities of the introduction of integrated control, especially in situations where *Carpocapsa* is dominating. Research on biological control has furnished promising results. Different *Typhlodromus* species were used (*T. potentillae*, *T. pyri* and *T. finlandicus*). Introduction of these predatory mites can be envisaged in conditions where selective methods are used for the control of other pests. Close observation on the development of the populations of *Carpocapsa* permits a better timing of control measures and as

such a considerable reduction in the use of pesticides. More details of this meeting are published in the 1972 Activity Reports obtainable from the Secretary of the WPRS.

#### (d) Biological control of olive pests -Working Group

A meeting was held at Portici (Italy). The results have not as yet been received by IOBC.

(e) **General meeting with industry**  
Recently an informal meeting with industry was held in Paris where the following main topics were discussed and conclusions drawn. The industries considered primarily are those producing pesticides, although it seems impossible to be too restrictive. For the application of integrated control there is a need for the development of physiologically selective chemicals. Close cooperation between WPRS and industry might furnish a better understanding of these needs and give better information about the marketing possibilities of a product. A detailed market survey is necessary. Official research has on several occasions developed programs for the introduction of biological control means, but there has been a failure to contact industry to ascertain their practical implementation. For industry the development of biological control agents of the form of pathogens is hazardous, since difficulties of official registration may arise on toxicological grounds. The assistance of WPRS (and IOBC globally) could help to allay these difficulties and uncertainties. For the application of integrated control a close collaboration between research extension services and industry will be necessary.

The Agro-Allied Industries have recently published a booklet « Pesticides in the modern world » with a chapter on integrated control showing industry's interests here. WPRS is prepared to issue a leaflet reflecting the Organization's position on the relationship between official research and industry. This document will form a basis for further discussions between WPRS and industry. Industry is aware that the integrated control movement now includes a wide range of biologists, particularly ecologists, and many other scientists in academic and official research, and in administrative circles, including industry itself. The participants stressed the important role industry has to play in this framework. It is expected that further meeting of a joint WPRS/industry nature will open the way for a fruitful cooperation.

### CIBC ANNUAL REPORT 1972

This record of CIBC work during 1972 is now available from either the Director, CIBC or from the Pakistan Station, P.O. Box 8, Rawalpindi, Pakistan. During 1972 CIBC made 1285 shipments of 182 species totalling 4,558,000 insects to 44 countries.

The practical successes reported include:

(a) Successful establishment of *Teleonemia scrupulosa* against *Lantana* in two areas of Zambia with complete defoliation in some areas. It has also been successfully established in St. Helena, as has *Uroplata girardi*, and this last and *Octotoma scabripennis* introduced by the Forest Entomologist at Dehra Dun in India (this last not in CIBC report).

(b) *Siphona geniculata*, a tipulid parasite introduced from Europe into Canada in 1971 appears to be established.

(c) Biocontrol of potato tuber moth continues to be promising in several areas - notably in Zambia and St. Helena, but also in other areas; e.g. *Apanteles subandinus* is now established in Malagasy (A number of parasites are still available).

(d) *Trichogramma brasiliensis* released against cotton boll worms in the Karnal area (Haryana, India) is established and has given up to 90% egg-parasitism.

(e) The egg-parasite *Telenomus remus* sent to Barbados against *Spodoptera* spp. in 1971 is well-established and giving very high parasitism on a number of crops.

(f) *Apanteles plutellae* shipped from the Indian Station is well established in Barbados and in Zambia and has been recovered after releases in Guam.

(g) *Urophora affinis* introduced from Europe into Canada against knapweeds, *Centaurea* spp., appears to be well-established.

(h) The aquatic grasshopper *Paulinia acuminata*, introduced into Kariba Lake against the water-fern *Salvinia? auriculata* appears well-established and is beginning to cause appreciable damage.

**Harrisia cactus project:** A long-term project has just been undertaken for Queensland, Australia on the natural enemies of *Harrisia cactus*.

**Eriocactus martinii:** Investigations will be centred at Tucuman in northern Argentina, and it is hoped that areas in the range of *Eriocactus* spp. in surrounding countries will also be covered. Dr. R. E. Cruttwell will be carrying out this work, and preliminary surveys appear quite promising.

The new buildings to house CIBC headquarters and the West Indian Station in Trinidad should be ready for occupation at the end of 1973. This will be able to provide laboratory accommodation for entomologists visiting the area.

### SYMPOSIUM ON INTEGRATED CONTROL IN ORCHARDS

**Bolzano (Italy), September 3-7, 1974**  
The West Palaearctic Regional Section is organizing a symposium from 3 to 7 September 1974, to review the current situation in integrated control in orchards. Topics will include: application in different countries, methods, techniques with the dominant pest species, possibilities of diseases, new pesticides, genetic control and pheromones, economic aspects, environmental considerations, and future prospects. Further information can be obtained from the Secretariat, IOBC/WPRS: Dr. L. Brader, Instituut voor Plantenziektenkundig Onderzoek, Binnenhaven 12, Wageningen, Holland.

### DR. PAUL DEBACH

Dr. Paul DeBach, Professor of Biological Control at U.C. Riverside and Associate Director, International Center for Biological Control, was recently notified of his election as an Honorary Foreign Member of the Entomological Society of the Union of Soviet Socialist Republics. This recognition is known to have been accorded to two other U.S. Entomologists, the late Dr. E.A. Steinhilber, Professor of Pathobiology and Director, Center for Pathobiology at U.C. Irvine, and in 1973, Dr. Curtliss W. Sabrosky, Director, Systematic Entomology Laboratory, USDA, Washington, D.C.

## C.J. DAVIS RETIRES

Mr. C.J. Davis, State Entomologist for Hawaii, retired at the end of 1973. He served on the WHRS Policy Guidance Committee. Despite the geographical isolation of Hawaii, Mr. Davis has been a very active supporter of IOBC and a good correspondent. We regret that he has decided not to continue to serve on this Committee as he is moving from the island of Hawaii. His new address is P.O. Box 245, Volcano, Hawaii 96785. We wish him many happy years of retirement.

## WANTED

(a) **Candidate egg parasite for *Glena bisulca*** (A.T. Drooz, Forestry Sciences Laboratory, U.S. Forest Service, P.O. Box 12254, Research Triangle Park, N.C. 27709).

In cooperation with government authorities in Colombia, we have tried to establish *Telenomus alsophilae* and *Ooencyrtus clisio-campae* on eggs of the geometrid, *Glena bisulca*. *G. bisulca* defoliates *Cupressus lusitanica* in Colombia. Neither *O. clisio-campae* nor *T. alsophilae* developed properly in the eggs which they attacked. *T. alsophilae* adults lived only a few hours after emergence. We believe the host eggs were too small ( $0.52 \times 0.84$  mm) compared with the North American host, *Ennomos sub-signarius*, whose eggs measure  $0.72 \times 1.40$  mm. We would like to hear from anyone who has a candidate egg parasite for *Glena bisulca*. For details of the life history of *G. bisulca*, see *Journal of Economic Entomology* 65 (1): 89-93.

(b) **Request for parasites of Acrididae** N.E. Rees, Grasshopper Laboratory, USDA - ARS Western Region, Montana State University, Bozeman, Montana 59715, would like to obtain parasites of Acrididae from outside the North American continent to test on native grasshoppers in Montana. If anyone

can supply such parasites, they should contact him first, for permits and information related to shipping live insects into the USA.

(c) **Exchange of Hymenoptera specimens** A small reference collection of selected species of parasitic wasps (Hymenoptera) used in biological control programs is offered to overseas establishments in exchange for equivalent material of unmounted specimens (in 96% alcohol) of miscellaneous parasitic microhymenoptera (Proctotrupeoidea, Chalcidoidea, Braconidae). For further information please contact Dr. Lubomir Masner, Biosystematics Research Institute, Agriculture Canada, Ottawa, Ontario, Canada K1A 0C6.

## RECENT PUBLICATIONS OF INTEREST

### Strains of entomophagous micro-organisms

The West Palearctic Regional Section has compiled a list of entomophagous micro-organisms held at laboratories in several western European countries. These include bacteria, fungi, protozoa, rickettsia and viruses. Both the original host and country of origin are given for each strain listed. Copies of this WPRS Bulletin (1973/3) can be obtained from Dr. Brader, General Secretariat of IOBC/WPRS.

### Conference on the safety of biological agents for biological control

The proceedings of this conference held at the Center for Disease Control, Atlanta, Georgia 16-19 April 1973 has been published by World Health Organization (WHO/VBC/73.445). Papers are presented on the present status of biological control agents, regulatory aspects, possible hazards from bacteria, protozoa, fungi, nematodes, and larvivorous fish, and the requirements for future research.

## CIBC PUBLICATIONS

A Catalogue of Parasites and Predators of Terrestrial Arthropods.  
Section A, Host or Prey/Enemy, Vol. 1, Arachnida to Heteroptera (Price £ 4)  
Vol. II, Homoptera (Price £ 5)  
Section C, Bibliography Vols. 1 and 2 (Price £ 5 each)

A Review of the Biological Control of Insects and other Pests in South-east Asia and the Pacific Region.  
Technical Communication No. 6 (Price £ 3)

Studies on Predators of Adelges spp. in the Himalayas.  
Miscellaneous Publication No. 3 (Price £ 2)

Biology, Ecology and Behaviour of Principal Natural Enemies of major Insect Pests of Forest Trees in Pakistan.  
Miscellaneous Publication No. 4 (Price £ 2)

CIBC Technical Bulletin No. 15 (Price £ 1.50)

Copies of these publications may be ordered from C.A.B., Central Sales, Farnham House, Farnham Royal, Slough, SL2 3BN, England.

## APPEAL FOR NEWS

We may repeat the plea to members made in Newsletter No. 2 for items of information. The general response to the previous plea was virtually nil, and quite obviously Newsletters cannot continue without news. Until the present issue, WPRS and CIBC have provided the majority of items. It would appear to be up to members to redress this imbalance, as this issue does, in part.

April 1974.

INTERNATIONAL  
ORGANIZATION  
FOR BIOLOGICAL  
CONTROL

IOBC

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