Insect and Pest Control Newsletter

JOINT FAO/IAEA DIVISION OF NUCLEAR TECHNIQUES IN FOOD AND AGRICULTURE
AND FAO/IAEA AGRICULTURE AND BIOTECHNOLOGY LABORATORY, SEIBERSDORF
INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA, AUSTRIA

No. 51
June 1998

ISSN 1011-274X

CONTENTS

PLEASE SEE OUR INTERNET HOME PAGES:
http://www.iaea.or.at/programmes/rifa/d4/index.html
http://www.fao.org/WAICENT/Agricul.htm

A. TO THE READER

Letter from the Section Head

The last months have coincided with preparations for the FAO/IAEA International Conference on "Area-Wide Control of Insect Pests Integrating the Sterile Insect Technique and Related Nuclear and Other Techniques" to be held May 28- June 2 in Penang, Malaysia in conjunction with the Fifth International Symposium on Fruit Flies of Economic Importance (June 1-5) also in Penang. The response and interest in area-wide pest control has been very encouraging and alone for the conference we have registrations from nearly 300 persons from 82 countries and 5 international organisations. For those of you who will not be able to come to the conference we attach at the end of this newsletter the programme of oral presentations of the meeting, as well as a list of posters that will be presented.

The concept of Area-wide IPM, which is the main focus of this International Conference, implies more than just extending local strategies to large areas. Area-wide management has longer-term objectives, and intervention strategies are planned and implemented on a regional scale. Area-wide IPM requires coordination between farmers and addresses the management of the total population of a pest in an area or region. This involves a strategy very different from traditional IPM in that the large-scale spatial distribution of the pest species has to considered, both in cultivated as well as non-cultivated and urban areas. It also involves considering the temporal distribution of the pest to determine the periods when the pest is most susceptible to preventive, rather than reactive, interventions. When producers of a given area or region organize themselves to take area-wide integrated action and target all individuals of the pest population, much less inputs are required over the medium and long term and the control is usually more effective and sustainable. The area-wide IPM approach is central to the effective integration of the Sterile Insect Technique (SIT) with other pest control technologies. However, as will be described by several speakers in this Conference, it is also very effective when other pest management tools are integrated on an area-wide basis.

Dr. E. F. Knipling, the "Father of SIT" who has encouraged us to organize this Conference, wrote the following preface for the book of abstracts of the meeting:

"The organisation of this International Conference on the Area-wide Approach to the Control of Insect Pests is appropriate and timely. There is increasing interest in the holistic approach to dealing with major insect pest problems. This interest has been prompted by the steady progress scientists have made in the development of the sterile insect technique for eliminating the screwworm from North America, the melon fly from Okinawa, the elimination and containment of the medfly in various countries and the progress that scientists have made in eradicating tsetse fly populations from isolated areas. Increased interest has also been shown by agriculturalists because of the realisation that the farm-to-farm reactive method of insect control is only a temporary solution to problems and that pests continue to be about as numerous as ever from year-to-year. In the meantime, there is increasing public concern over the environmental hazards created by the use of broad-spectrum insecticides to deal with insect pest problems.

While there has been progress in the area-wide approach to insect control it has not advanced to the extent that it should have. There are many other important insects that would be good candidates for area-wide management. Our agricultural leaderships in both the public and private sectors and many pest management scientists do not fully appreciate the large economic and environmental benefits that can be realised by directing control efforts against total pest populations in a fully organised manner. The sterile insect technique provides a feasible way to manage total insect pest populations. However, other techniques and strategies appropriately integrated into management programs can increase the effectiveness and efficiency of area-wide management programs. These include the augmentation of mass-produced biological organisms and the use of semiochemicals such as the insect sex pheromones.

This conference will give pest management scientists from many countries the opportunity to exchange information on the area-wide approach to insect pest management - an approach that if fully developed can be highly effective, low in cost and at the same time make a major contribution to alleviating the environmental concerns associated with primary reliance on broad-spectrum insecticides for controlling insect pests."

Jorge Hendrichs

B. STAFF

The Sub-programme staff, consisting of those in the Joint FAO/IAEA Division located in the Vienna International Centre, and those in the FAO/IAEA Agricultural and Biotechnology Laboratory in Seibersdorf Laboratory, are listed below.

Insect & Pest Control Section
(fax = +43 1-20607; tel = +43 1-2060-21628)

Jorge Hendrichs e-mail: J.Hendrichs@iaea.org	Head
Udo Feldmann e-mail: U.Feldmann@iaea.org	Technical Officer (Tsetse)
Pat Gomes e-mail: P.Gomes@iaea.org	Eastern Mediterranean Region Expert (Fruit Flies)
Andrew Parker e-mail: A.Parker@iaea.org	African Region Expert (Tsetse)
Maria-Eugenia Guerra-Garduño e-mail: M.E.Guerra-Garduno@iaea.org	Secretary
Lucia Kruzic e-mail: L.Kruzic@iaea.org	Secretary

FAO/IAEA Agriculture and Biotechnology Laboratory, Entomology Unit, Seibersdorf Laboratory, A2444 Seibersdorf, Austria
(Tel: 43 1 2060+extension; Switchboard 43 1 2060+0; Fax: 43 1 2060 28 222)

Alan Robinson e-mail: A.Robinson@iaea.org	Unit Head
Gerald Franz e-mail: G.Franz@iaea.org	Medfly Genetics and Molecular Biology
Kingsley Fisher e-mail: K.Fisher@iaea.org	Medfly Rearing Technology
Elizabeth Opiyo e-mail: E.Opiyo@iaea.org	Tsetse Rearing Technology
Jean-Pierre Cayol e-mail: J.P.Cayol@iaea.org	Medfly Behaviour Studies

Field expert on project ETH/5/012 "Integrating SIT for Tsetse Eradication", Ethiopia:

Marc Vreysen
e-mail: estc@telecom.net.et

C. FORTHCOMING EVENTS

I. Research Co-ordination Meetings (RCM)

"Evaluation of Population Suppression by Irradiated Lepidoptera and their Progeny", 26 - 30 May 1998, Penang, Malaysia. 3rd and final RCM

"Improved Attractants for Enhancing the Efficiency of Tsetse Fly Suppression Operations and Barrier Systems used in Tsetse Control/Eradication Campaigns", 26 - 30 May 1998, Penang, Malaysia. 2nd RCM

"Development of Medfly Attractant Systems for Trapping and Sterility Assessment", 26 - 30 May 1998, Penang, Malaysia. 3rd and final RCM

"Enhancement of the Sterile Male Technique Through Genetic Trans-formation Using Nuclear Techniques", June 1998, Penang, Malaysia. 2nd RCM

“Automation in Tsetse Mass-rearing for Use in Sterile Insect Technique Programmes”, 12-16 April 1999,Vienna, Austria, 3rd RCM.

"Molecular and Genetic Approach to Develop Sexing Strains for Field Applications in Fruit Fly Sterile Insect Technique Programmes", April/May 1999, location to be confirmed, 3rd RCM.

"Medfly Mating Behaviour Studies Under Field Cage Conditions", 1-5 July, 1997, Guatemala City, Guatemala. 4th and final RCM

"Genetics Application to Improve the SIT for Tsetse Control/Eradication including Population Genetics", 6-10 September 1999,Nairobi, Kenya. 2nd RCM.

II. Consultants Meetings

“Programme on African Animal Trypano-somosis”, 25-27 November 1998, Vienna, Austria.

“Standardisation of Quality Control in Fruit Fly Mass Rearing”, 25-27 May, 1998, Penang, Malaysia.

III. FAO/IAEA Training Courses

National Training Course on "Integrated Area-wide Control of Fruit Flies", 8-12 June 1998, Patum Thanee, Thailand.

2nd National Workshop organised by SENASA/PROCEM in conjunction with the IAEA on "Advances in Research Support for the National Fruit Fly Programme", Buenos Aires, Argentina, August, 1998.

Group training course on “Plant Quarantine Procedures against Fruit Flies for Quarantine Inspectors and Supervisors”, 17 - 21 August 1998, location to be announced. (Chile/ Peru)

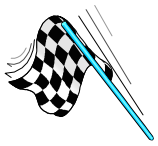
Group training course on “Integrated Control of Fruit Flies, with Emphasis in the Sterile Insect Technique”, 9 - 13 November 1998, location to be announced (Chile/ Peru).

NOTE:
The Interregional Training Course on the "Use of the Sterile Insect and Related Techniques for the Area-Wide Management of Insect Pests", planned for

Gainesville, Florida, in October 1998 had to be postponed.
Subject to approval and availability of required funding, the course will now be held in Gainesville, Florida in May/June 1999. The course is planned to run for six weeks, and will emphasise the area-wide concept of integrated pest management, the principals, economics, practical application and management of SIT, F-1 sterility and other genetic control programmes, new developments in the field of pest control, review of ongoing area-wide programmes, insect population dynamics and modelling, post-harvest treatments, quarantines, pest-free zones and international sanitary and phytosanitary standards. The course will cater for about 22 participants, who must have a BSc or equivalent, and preferably a few years experience in applied pest control, plant protection or post-graduate research.
The new details will be confirmed in our next newsletter.

IV. 5th International Symposium on Fruit Flies of Economic Importance, 1-5 June 1998 in Penang, Malaysia
***(see internet: http://www.bio.usm.my/bio/fruitfly*).**
At the time of going to press this Symposium is just about to start. The 1st (1982) and 2nd (1986) International Symposia were held in Europe and the 3rd (1990) in Latin America. The 4th International Symposium, held 1994 in Clearwater, Florida, was very successful, attracting ca. 300 fruit fly workers from over 45 countries. This 5th symposium will be the first International Fruit Fly Symposium to be held in Asia. Penang is a centre of academic, research and control activities for fruit flies in Malaysia and therefore provides an excellent background for the meeting. The symposium will be held at the Penang Park Royal Hotel of Batu Ferringhi Beach on the Straits of Malacca. This hotel is large enough to facilitate communications and interactions of the participants as has been the tradition in the past.

V. FAO/IAEA International Conference on "Area-Wide Control of Insect Pests, Integrating the Sterile Insect Technique and Related Nuclear and Other Techniques" to be held from **28 May - June 2** in Penang Malaysia
At the time of going to press this conference is just about to start. The conference will address the area wide management of insect pests in general, as well as new developments and techniques in the fields of SIT, F-1 sterility, genetics, biotechnology, mass rearing, ecology and behaviour, augmentative biological control, quarantine, etc. The International Conference will be held in conjunction with the above International Fruit Fly Symposium (28 May - 2 June at the same location and site) to strengthen the attendance to both international meetings.
For further information and a full agenda see Section G. Highlights of the Conference will be posted on our web site at http://www.iaea.or.at/programmes/rifa/news/index.html



D. PAST EVENTS (1997-1998)

I. Research Co-ordination Meetings (RCM)

"Development of Female Medfly Attractant Systems for Trapping and Sterility Assessment", 20-24 January 1997, Madeira, Portugal. 2nd RCM.

"Automation in Tsetse Mass-rearing for Use in Sterile Insect Technique

Programmes", 27 February- 4 March 1997, Tanga, Tanzania. 2nd RCM.

"Genetic Applications to Improve the Sterile Insect Technique for Tsetse Control/Eradication Including Genetic Sexing", 10-14 February 1997, Addis Ababa, Ethiopia. 1st RCM.

"Molecular and Genetic Approach to Develop Sexing Strains for Field Applications in Fruit Fly Sterile Insect Technique Programmes", July, 1997, Guatemala City, Guatemala. 2nd RCM.

"Medfly Mating Behaviour Studies Under Field Cage Conditions", September, 1997, Tel Aviv, Israel. 3rd RCM

Proceedings are available on request at the Insect & Pest Control Section's Office.

II. Consultants Meetings

"Use of Nuclear Techniques in Biological Control: Managing Pests, Facilitating Trade and Protecting the Environment". April 14-18, 1997, Vienna, Austria.

"International Standardisation of Quality Control Procedures and Parameters for Mass Reared and Released Fruit Flies", 5-9 May, 1997, Vienna, Austria.

Proceedings are available on request at the Insect & Pest Control Section's Office.

III. FAO/IAEA Training Courses

National Training Course on "Methyl Bromide Fumigation Technology for Quarantine Treatments Against Fruit Flies", Concordia, Entre Rios, Argentina, February, 1997.

National Workshop organised by SENASA/PROCEM in conjunction with the IAEA on "Advances in Research Support for the National Fruit Fly Programme", Buenos Aires, Argentina, 27-29 May, 1997.

National Training Course on "Basic Training on Integrated New World Screwworm (NWS) Control/Eradication with Emphasis on the Sterile Insect Technique (SIT)", Kingston, Jamaica, 6-27 August, 1997.

Bi-National Chile-Peru Training Course on "Quarantine Procedures and Treatments in Support of the Mediterranean Fruit Fly Eradication Campaign in Tacna and Moquegua, Peru", Lima, Peru, 24-26 September, 1997.

Regional Training Course on the "Use of SIT in Support of Integrated Area-wide Methods to Combat Tsetse and Trypanosomosis", Tanga and Zanzibar, Tanzania, Africa - November-December, 1997.

Regional Latin American Training Course on the "Use of the Sterile Insect Technique in Support of Area-Wide Integrated Fruit Fly Control/Eradication Programmes", Tapachula, Mexico and Guatemala City, Guatemala, October, 1997.

Regional Training Course on "Use of SIT and Related Methods for the integrated Area-wide Fruit Fly Control/Eradication in the Near East and the Mediterranean Basin", Madeira, Portugal, November, 1997.

Workshop in conjunction with SENASA on "Area-Wide Integrated Control of Fruit Flies in the Littoral Citrus Region", Concordia, Entre Rios, Argentina, 23-25 June 1997.

Seminar held in conjunction with INFRUITEC on “Feasibility Assessment for Fruitfly Eradication using SIT,

Stellenbosch, Western Cape, Republic of South Africa, 28-29 April 1998.

E. TECHNICAL CO-OPERATION PROJECTS

Over the last four years, the Section has had technical responsibility for over 35 technical co-operation projects. They fall under four major areas, namely:

- Tsetse
- Fruit Flies
- F-1 Sterility for the Control of Lepidopteran Pests
- Screwworm and Others

Current 0perational Projects are:

ARG/5/005 Fruit Fly Eradication in the South Region
ETH/5/012 Integrating SIT for Tsetse Eradication
GRE/5/01 Control of the Mediterranean Fruit Fly in Crete
*GUA/5/013 Genetic Sexing to Control the Medfly
IRQ/5/014 Field Monitoring and Laboratory Rearing of Old World Screwworm
ISR/5/009 Feasibility Study of SIT for Medfly Eradication
JAM/5/006 Eradication of the New World Screwworm: Preparatory Phase
JOR/5/007 Feasibility of Area-wide Control of Medfly by SIT
*KEN/5/020 Control of Tsetse Fly & Trypanosomiasis in Lambwe Valley
LEB/5/013 Feasibility of Integrated Control of Medfly Using SIT
MAR/5/009 Control of Diamondback Moth by Sterile Insect Technique
*MLI/5/012 Integrated Tsetse Control
**PAN/5/012 Control of Fruit Fly in the Chiriqui Province Using SIT
PHI/5/026 Integrated Control of Oriental Fruit Fly on Guimaras Island
POR/5/005 Mediterranean Fruit Fly Programme on Madeira
RAF/5/040 SIT for Tsetse and Trypanosomiasis Management in Africa
RLA/5/039 Binational Project Chile-Peru: Eradication of the Fruit Fly
SAF/5/002 Feasibility Assessment for Fruit Fly Eradication Using SIT
SYR/5/016 Preparation for Codling Moth Management Using SIT
THA/5/044 Extension of Areas Under Integrated Fruit Fly Control
UGA/5/018 Integrated Tsetse Control in Buvuma Island on Lake Victoria
*URT/5/016 Tsetse Fly Eradication on Zanzibar Island
URT/5/018 Entomological and Veterinary Monitoring on Zanzibar
*ZIM/5/007 SIT for Tsetse Control Programmes

*Projects in process of being phased-out or terminated
**Projects awaiting funding from extra budgetary sources

In keeping with our policy to highlight a few of our Technical Co-operation projects in each Newsletter the following projects are discussed in this issue.

<u>Opening of New Medfly Emergence Facility in Israel (TC Project ISR/5/009)</u>

On 12 February 1998, the Israeli Ministry of Agriculture and the Arava Regional Council held inauguration ceremonies for the opening of their new Medfly Emergence Facility located at Sapir Centre in the Arava Valley. His Excellency Rafael Eitan, Israeli Minister of Agriculture and the Environment, presided over the ceremonies that included an open house at the new facility and a ribbon cutting event at the Ein Yahav airstrip to highlight the first official aerial releases of sterile Medflies. The Arava Medfly Eradication Project (AMEP) Director, Ezra Ravins,

provided an overview of the project using aerial photographs and maps to show where project activities occur. Yaakov Bagg, Facility Director, gave a guided tour through the facility. Sterile Medflies were displayed in Plexiglas cages for viewing by the general public and the press. Minister Eitan and Mr. Bagg flew together in the contract aircraft over the nearby settlement at Ein Yahav to release sterile Medflies. A chilled insect release machine provided by the IAEA and fabricated by the US Department of Agriculture was used to disperse the adults from the aeroplane. Minister Eitan was favourably impressed and issued instructions to plan for expansion of the use of SIT to include the rest of the country.

A number of dignitaries and key contributors to the AMEP also were present for the ceremonies. This included representatives from the Arava Regional Council, Jewish Fund, Citrus Marketing Board of Israel, Israel Cohen Institute for Biological Control, Flower Board of Israel, and Vegetable Board of Israel. Patrick Gomes represented the International Atomic Energy Agency and the Food and Agriculture Organization. Attending the ceremonies on behalf of the Jordanian government were: General Mansour Abu-Rashed, Ministry of Defence, who is responsible to King Hussein for co-ordination of activities along the Jordan-Israel border; Captain Raed Aussayli, Liaison Unit, Ministry of Defence; Eng. Yousef Moula, Director, Plant Protection Department (PPD), Ministry of Agriculture (MOA); and Eng. Mary Bahdousheh, Head, Plant Quarantine Section, PPD/MOA. Members of the press included national and local television crews, national and local newspapers and several radio reporters.

Jordanian-Israeli Co-operation to Control the Medfly in the Lower Jordan Rift Valley

On 1998 February 19, the 1st Technical Meeting between Jordanian and Israeli project counterparts was held at the Dead Sea Resort Hotel in Jordan. The meeting lasted for approximately 3 hours. Both parties agreed to emerge Medfly adults at the new facility located at Sapir Centre for release in Jordan. Both parties agreed to use the same commercial aircraft under contract to the Israeli project to fly over Jordanian territory to disperse the sterile flies. This aircraft has been modified to carry a chilled insect release machine. Using the same aeroplane and release equipment for both projects represents a major cost-savings and brings about more effective use of project resources.

Releases in Jordan would be concentrated over the city of Aqaba located in the southern part of the Lower Jordan Rift Valley and the agricultural areas of Ghor Safi and Mazra'a situated in the northern part of the Valley near the Dead Sea. As a result of this agreement, Medfly will be controlled using sterile insect technique throughout the entire Lower Jordan Rift Valley. Approvals from the appropriate authorities would be requested by the project managers on both sides of the border. Joint co-operation on other plant protection matters also were discussed during the meeting.

On 29 March 1998, the 2nd Technical Meeting between Jordanian and Israeli project counterparts took place at Sapir Centre in Israel. The Royal Jordanian Air Force granted permission to the Israeli pilot and aircraft to over fly Jordanian territory along the border in order to disperse sterile Medflies for control purposes. Participants toured the sterile Medfly release centre. This was followed by brief updates on monitoring and control activities conducted in Israel and Jordan respectively. Jordan completed installation of traps in Aqaba and other locations along

the Wadi Araba. Training planned for April was discussed. The Israelis proposed that training of Jordanian personnel at the Sapir release centre in quality control, fruit sampling, marked fly identification, pre-release handling of pupa and aerial release of sterile flies would be possible, but would required co-ordination and assistance from the IAEA and FAO. Co-operative research on methyl bromide also was discussed during the meeting.

AMEP in Israel loaned a small quantity of trimedlure attractant to the Jordanian Ministry of Agriculture so that trapping activities can proceed without delay. The Jordanian Ministry of Agriculture exchanged some of the traps and attractant that they use in the Upper Jordan Rift Valley for purposes of comparison.

Training Course for Jordanian Personnel (JOR/5/007)

A total of 14 persons in the Ministry of Agriculture received training on Medfly trapping and fruit sampling at Ghor Safi. A total of 120 traps baited with 3-component lure to attract Medfly females were installed in the city of Aqaba with an additional 40 traps installed in the 6 agricultural villages located along the Lower Jordan Rift Valley extending from the Red Sea in the south and the Dead Sea in the north. Mr. James Rudig, a US expert on area-wide pest control and eradication programs, provided a workshop in Ministry of Agriculture Extension Services Office located in Beq'a. Mr. Rudig provided a demonstration on how to properly calibrate and apply bait sprays for Medfly population suppression. A total of 14 personnel from the Ministry of Agriculture attended the workshop. An assessment of current control practices was made in the Upper Jordan Valley. Site visits were made to South Shuna and Deir Alla to meet with farmers affected by the Medfly. Some farmers have not treated their orchards for the past 2-3 years in order to control citrus leafminer with parasitoids. As a result, farmers reported that the level of Medfly infestation reached 65 to 90% last year. The concern by the Ministry of Agriculture is that farmers will return to conventional cover sprays on a calendar basis once again using dimethoate and dursban. Protein bait sprays applied on an area-wide basis could serve as an effective interim measure to suppress Medfly populations in the north part of the country until sterile release activities can be expanded northward from the Lower Jordan Rift Valley.

Formal Funding Proposal Requested Under MERC Program

A preproposal for control of the Mediterranean Fruit Fly was submitted last December by the Plant Protection Services of Israel, Jordan and the Territories Under the Jurisdiction of the Palestinian Authority to the US Agency for International Development in Washington, DC. Under the Middle East Regional Co-operation (MERC) Program, USAID could provide financial assistance of up to 3 million dollars over a period of 3 years. Notification was received recently from Dr. David O'Brien, Director of the MERC Program, that the preproposal was accepted and he has requested submission of a formal proposal by the three entities on or before 1 September 1998. There is no guarantee that funding will be provided as the final award is determined on a competitive basis. Funds would be used to initiate monitoring activities, train personnel and release sterile Medflies for control purposes across the three entities involved.

Fruitfly Control in Costa Rica.

The TC project COS/5/012 to assist Costa Rica to establish a Medfly Research Laboratory was successfully completed in May 1994. Since then Costa Rica has gone on to develop a successful Integrated Fruit

Fly Management Programme (IFFMP) in Acosta County, San José Province.

There has been a considerable increase in the area planted to the hosts of the various fruit flies in the last ten years. Oranges now occupy 25,000 ha, coffee 30,000 ha and mangoes 9000 ha. The IFFMP for Medfly control in Acosta Country utilises releases of the pupal parasitoid *Pachycrepoideus vindenmiae* (Hymenoptera: Pteromalidae) to reduce fly densities, followed by sterile fly releases. The programme started by releasing 6000 parasitoids per hectare followed by an equal number of sterile Medflies. In the second and subsequent years releases were reduced to 3000 per hectare. Losses of oranges were reduced from 35% to 0.5% in two years.

Much of the work has been carried out by the orange grove owners themselves. They were trained in the strategies of the IFFMP, and pay for both of the biological materials and assisted with their distribution and release. Most of the owners continue to purchase and release parasitoids.

Integrated Oriental Fruit Fly Management Based on MAT and SIT in Guimaras Island, Philippines (PHI/5/026)

Integrated fruit fly management based on male annihilation and the sterile insect release method has been conducted in the island of Guimaras since 1992.

The initial phase of the project included basic ecological studies which involved determination of host fruits, degree of fruit infestation, population dynamics and fruit fly dispersal. Information campaigns through press releases and meetings were launched to inform growers, government officials and the private sector of the objectives and mechanics of the sterile insect technique.

Based on mark-release-recapture studies, the estimates of fruit fly population showed that more insects were present in natural vegetation as compared to mixed plantation and only a low population was recorded in commercial orchards.

Male annihilation efforts started in February 1997, using impregnated fibre board squares. The application rate in orchards and residential areas was 4 FBS per hectare by ground application, and 2 FBS per hectare in forested areas by aerial application. The effectiveness of male annihilation efforts was continuously checked by traps and fruit examination in 93 barangays. Generally, results showed that island-wide application of the male annihilation technique at regular intervals reduced the male fly population by over 95% in the island and that sterile fly releases could be started. Sterile insect releases were initiated in November 1997 and by April 1998 47 million sterile flies had been released. Releases are by air, supplemented by ground releases where high wild populations are identified, or infested fruit is found. Although the ratio of sterile to wild males is still low (3:1 in February 1998) the wild population is continuing to decline.

Integrated Control of *Plutella xylostella*, including SIT in Mauritius.

The specific objective of the project is to develop and implement an integrated pest management programme, including F-1 sterility, to control the diamondback moth (DBM). Cruciferous vegetables (cabbage, cauliflower, chinese cabbage and water cress) occupy an important part in the dietary requirements of Mauritians. Crucifers are grown in many areas of the world and DBM is considered the most serious pest in most production areas. DBM was first reported in Mauritius in 1945 and although from time to time was reported to cause moderate to severe

damage it was generally well controlled with synthetic insecticides until the 80's.

By 1985, farmers were suffering heavy losses and most available insecticides were ineffective even when 20 applications were made on a crop during a 60 day period. Research was initiated to develop a more sustainable approach to manage this pest and two species of parasites were introduced in 1992. IAEA and FAO have been providing support since 1995. A facility for rearing DBM and the parasite species, *Cotesia plutellae* on an artificial diet has been constructed and is operational. Current effort is focused on establishing production colonies of DBM and *C. plutellae* on the artificial diet production system, on conducting population studies and demonstration-education field tests utilising augmentative releases of *C. plutellae* to lower DBM populations prior to the release of irradiated DBM adults. Following these small tests, area-wide programmes will be initiated. Field tests will be conducted to evaluate the competitiveness of irradiated DBM with native moths prior to the initiation of field evaluations of combination releases of parasites and F-1 sterile DBM. Following the completion of a country-wide release programme a study will be carried out to assess the impact and benefits.

The introduction of *C. plutellae* has significantly reduced the overall population of DBM with many growers reducing their applications of insecticides by 50%. Prior to the implementation of the IPM programme for DBM, the cost of insecticide applications was over $75/acre and provided a harvest of only 80% of the crop. The estimated cost of the IPM programme should be no more than $25/acre, thus a saving of $50/acre and the crop should be nearly 100% harvestable.

Integrating SIT and autosterilisation lethality to eradicate *G. fuscipes fuscipes* in Buvuma Islands, Uganda.
(UGA/5/018)

The control of the tsetse species *G. fuscipes fuscipes* on Buvuma Island, Lake Victoria, Uganda, is of great importance as it is an important vector of both human sleeping sickness and animal trypanosomosis. The presence of active sleeping sickness on the Island and adjacent mainland prompted the Ugandan government to seek assistance from the Agency, and project UGA/5/018 was set up in 1995.

Recent mark - release - recapture experiments have shown that 70% of the flies are to be found along the shoreline of the island. Trapping activities are therefore concentrated around the shore. However trapping alone is not reducing the fly population fast enough. In addition traditional trapping methods have the disadvantage that once sterile fly releases start, the traps will also be killing the released flies.

The project is therefore investigating the potential of autosterilisation using the insect growth regulator triflumuron with treatment devices (TD) mounted on conventional traps. Flies entering the trap pass up into the TD as if it were the trap cage, where they pick up a dose of the triflumuron. The top of the TD is open, so the flies then escape. Triflumuron acts by disrupting the enzyme chitinase, so preventing the formation of new exoskeleton. As a result insects are unable to form new exoskeleton at the time of moulting, and either fail to moult at all or the newly emerged stage dies. When a female tsetse is dosed with triflumuron the IGR is passed on to the developing larva *in utero* and the larva then dies at the next moult. One dosing with triflumuron can render a female unable to produce viable

pupae for life, and a dosed male can pass sufficient IGR to a female at mating to prevent pupal production for several cycles. Released sterile males are unharmed by the dosing, so the use of TDs does not interfere but rather integrates ideally with SIT.

Trials are now underway to compare the effects of conventional insecticide treated traps with TD traps. Four peninsulas on Buvuma have been selected, each being protected by a barrier of insecticide treated traps. One area has insecticide treated traps, one traps with TDs dosed with triflumuron, one traps with untreated TDs, and an untreated control area. If the results are encouraging the use of TDs will be extended to the whole coastline of Buvuma in preparation for sterile male releases.

II. MODEL PROJECTS:

Medfly Control in South America

Good progress is continuing to be made with Medfly control in South America with Chile signing a second binational agreement, this time with Argentina.

The Chilean Medfly programme (CHI/5/015) declared eradication in Arica Province in December 1995. Since then Chile has been concerned with the risk of re-invasion from both Argentina and Peru Binational project Chile-Peru RLA/5/039). Argentina started control operations in Mendoza and San Juan Provinces in 1990, and in Patagonia Province in 1996. The new agreement between Argentina and Chile, signed in 1997, is on co-operation towards eventually incorporating the Argentinean control areas into a larger fly free zone together with all of Chile. Under the agreement Chile is to supply 15 to 20 million sterile flies per week to the San Juan programme. The agreement also covers joint work on SIT with genetic sexing strains, integrated pest management strategies, border quarantine controls, quarantine treatment of fruits, research, and an emergency response programme.

In Patagonia where more than 60,000 ha of temperate fruit production is located, the Medfly does not cause significant damage in commercial fruit growing areas, but is present in some urban areas of northern Patagonia. The control programme is aimed at declaring the fruit growing areas free of Medfly to open fruit exports to countries that have imposed a ban on fruit from Medfly endemic areas. The project currently receives sterile flies from the Mendoza Mass Rearing Facility, and has been treating 12,000 ha since August 1997. The coverage will be expanded to include all of the fruit growing valleys in northern Patagonia this year, increasing the sterile release area to about 20,000 ha. In support of the sterile insect release, around 2,200 traps are serviced weekly, 500 fruit samples are examined each week, and an intensive public relations campaign and training programme is being conducted.

Under the Binational Project Chile-Peru (RLA/5/039) the IAEA and FAO have been providing economic and technical support to both countries and Chile is supplying 20 million sterile flies per week for ground releases in Tacna, Peru. The flies will be released by air for the first time in mid-1998 over the Tacna valley.

Eradication of the New World Screwworm From Jamaica (JAM/5/006)

An eradication programme for the screwworm, *Cochliomyia hominivorax* (Coquerel), is being organised jointly by the Government of Jamaica and the IAEA. The livestock producers of Jamaica have sought an eradication programme for Jamaica for over 30 years but until now have been unable to get a programme organised. However, the situation has now changed and a programme is a foregone

conclusion for the very near future. The programme will cost about 9 million US dollars and these funds have already been obtained and are available for the eradication. Most of these funds came from Jamaica (89%), and the IAEA has also made a significant monetary contribution (11%) as well as providing training, organisational and technological expertise. The USDA and Mexico are providing contributions in kind.

The plans are to release about 15 million sterile flies per week from the Mexico-US facility in Tuxla Gutierrez, Mexico, and the first flies are expected to be released as early as January 1999. This will be about 3,000 sterile flies per square mile and it is estimated that releases will have to made for up to 2 years. The release of the sterile flies will be supported by prevention, control and quarantine procedures that will reduce the natural population as well as put the mechanisms in place to prevent reintroduction after eradication. A recent cost benefit study has determined that the annual losses to the livestock industry of Jamaica range from 5.5 to 7.7 million US dollars per year. Using either of these estimates, the programme will realise net saving at some point in the second year after eradication. The National Director has received training at the FAO/IAEA interregional training course in Gainesville, Florida, and four Jamaican scientists have received and completed fellowships for training with the Mexico-United States Screwworm Rearing Factory in Mexico and the Nicaragua- United States Eradication Programme in Nicaragua. At this time the personnel, administrative procedures, equipment and laboratory facilities necessary to support the eradication programme are being put in place in Jamaica. The readers of this Newsletter may expect updates of the project often over the next 3 years.

At the same time that the eradication is being organised plans are being made with FAO for the pest's eradication from the entire Caribbean. Cuba, Haiti and the Dominican Republic are infested in addition to Jamaica,. The only other Caribbean islands infested are Trinidad and Tobago but eradication from these two islands is not possible at this time because of the close proximity of South America. Successful programmes on these islands would conclude the eradication of screwworm from half the Western Hemisphere.

Tsetse Eradication on Zanzibar (URT/5/016)

On 31 October 1997, the expert group convened by the IAEA to assess the outcome of the tsetse eradication project on Zanzibar reported that "The existing information strongly suggests that the tsetse fly *Glossina austeni* has been eradicated on Zanzibar". Eradication was declared jointly by the Government of Tanzania and the IAEA in December, and the project was terminated at the end of 1997. Fly monitoring on Zanzibar will continue for one year and veterinary monitoring for two years under a new reserve fund project. Initial results from this monitoring have revealed no flies and no transmission.

Meanwhile the Tsetse and Trypanosomiasis Research Institute, Tanga will be contracted to maintain a reserve colony of *G. austeni* for the next twelve months in case sterile males are needed again. The facilities at Tanga will also be further upgraded to assist with the rearing of *G. pallidipes* for the Ethiopia project, and a proposal to initiate work on *G. swynnertoni* on mainland Tanzania is currently being appraised.

The success of the Zanzibar project has elicited considerable interest, and not just

in Africa. There have been 115 press reports in 15 countries in national daily and weekly newspapers and magazines, 12 television reports in four countries and on international satellite channels (including CNN), and 23 radio broadcasts in 10 countries and in international services so far.

During a recent visit to Addis Ababa, Mr Qian, DDG-TC, was able to brief the Secretary General of the OAU, Dr Salim Ahmed Salim, on the success of the project, and on the prospects that this achievement opened with regard to livestock development. Details were provided on the five-year programme launched by the Zanzibar Government in 1998 to meet the national goal for self-sufficiency in milk and meat products by the year 2003. This programme will concentrate on improving productivity without increasing herd size, by using artificial insemination to introduce more productive crossbred animals, and improving nutrition through improved fodder crops and developing urea/ molasses/mineral supplement blocks. The Secretary General expressed personal interest in the SIT technique and promised that the issue will be considered by the OAU Secretariat in consultation with other partners. He reiterated the support of the OAU, as long as the IAEA-led efforts aiming at bringing lasting benefits to African peoples and economies, make a significant contribution to sustainable development.

In a letter to the Director General of the IAEA, Ambassador Ahmed Haggag, Assistant Secretary-General of the OAU, also congratulated the Agency on the success of the Zanzibar project, and assured him of the OAU's support to similar Agency projects in Africa.

Tsetse Project in Ethiopia (ETH/5/012)

Preparations for the tsetse project in Ethiopia are now under way. The project was approved by the Ethiopian government in June 1997, and government officials expressed their strong determination and commitment to the implementation of the Tsetse Eradication programme in the Southern Rift Valley (25,000 km^2).

The National co-ordinator, Dr Assefa Mebrate, and the Regional co-ordinator, Dr Minutet Mengeta were appointed late last year. Marc Vreysen, our tsetse field expert, has moved from Zanzibar to Addis Ababa to assist with the baseline data collection.

Five field teams have been established, and training has now started in all aspects of the work. A recent workshop in Sodo was attended by the 5 team leaders and their technicians. The following subjects were covered:

- topographical map projections, orientation on maps, use of compass and GPS.
- vegetation classification and different soil types.
- techniques for sampling plant specimen.
- how to take notes during field trips.
- tsetse morphology, male and female reproduction, dissection techniques, physiological ageing of flies, wing fray, species determination etc.

A manual was prepared and distributed to the different teams, which can serve as a basic guide during their field work.

A practical session was also held during which the team members had to locate several grids in the vicinity of Sodo and specific locations within a grid using topographical maps, compass and GPS. In addition how to classify the vegetation and the soil was demonstrated.

A meeting was held from 21 to 24 April between various project staff, researchers from Addis Ababa University and national research institutes, a GIS expert and a

cost/benefit analysis expert from the UK, an epidemiologist from ILRI and two staff from the FAO/IAEA Joint Division. The purpose of the meeting was to establish the baseline data that must be collected, or extracted from existing sources, for effective planning and implementation of the eradication programme and post eradication land use. All the data collected will be integrated in a geographical information system, which will be constructed in such a way as to facilitate day to day decision making and periodic report preparation, as well as providing a model to assess the suitability of the area-wide intervention campaign integrated with SIT in specific circumstances. It was agreed that the data to be collected will include:

- tsetse species
- seasonal tsetse density and trypanosome infection rate
- livestock distribution
- trypanosomosis prevalence and trypanosome species distribution
- agricultural activities
- agricultural potential
- direct and indirect cost of trypanosomosis
- environmental impact of trypanosomosis and tsetse eradication operations

and any other data that is required.

F. EXISTING AND PLANNED CO-ORDINATED RESEARCH PROJECTS

Enhancement of the Sterile Insect Technique (SIT) through Genetic Transformation Using Nuclear Techniques (D4. 10.12)

Objective: To support and encourage research to discover and develop efficient genetic transformation systems for major insect pests, and make the sterile insect method more reliable, more suitable and less costly.

Expected duration: 5 years (1995-99)

Contract Holders (1) from Greece

Agreement Holders (6) from Australia, United Kingdom, United States (2) and Italy (2).

A Molecular and Genetic Approach to Develop Sexing Strains for Field Application in Fruit Fly SIT Programmes (D4.10.15)

Objectives: (1) To optimise existing medfly strains in their genetic composition, productivity and application; (2) to advance the development of third generation strains using nuclear and molecular methods, and (3) to initiate the development of sexing systems in other fruit flies. The first objective will address the economic and operational consideration of large-scale use of the best strains available, the optimal procedures to maximise their productivity and efficiency, the potential for deploying them under different field conditions and geographical locations, and the isolation and evaluation of improved sexing genes. The second objective will incorporate molecular and biotechnology approaches into the development of genetic sexing strains. Current sexing strains are based entirely on classical genetic principles, and are, therefore, much more limited in their possibilities for manipulating the insect genome. The third objective will address the considerable interest generated in developing similar genetic sexing systems for other important fruit fly pests, particularly *Anastrepha* species in Latin America, and *Bactrocera* species in Southeast Asia. At present, genetic, cytogenetic and molecular information on these other species lags considerably behind that of the medfly.

Expected duration: 5 years (1994-99)

Contract Holders (6) from Argentina, Bangladesh, Brazil, Greece, Guatemala, Philippines and United States of America.

Agreement Holders (3) from Australia, Italy and the United States.

Automation in Tsetse Fly Mass-rearing for Use in Sterile Insect Technique Programmes (D4.20.06)

Objective: To improve and up-grade tsetse mass-rearing by the development and utilisation of automation and other methods. Emphasis will be placed on automation of moving materials, such as the blood used to feed tsetse flies, the pupae produced by tsetse flies and the male tsetse flies which are introduced into cages with females and then removed when mating has been completed. In addition, the automation of separating male from female tsetse flies may be possible, provided one of more methods of determining the sex of tsetse fly pupae can be developed.

Expected duration: 5 years (1995-00)

Contract Holders: (5) from Austria (2), Czech Republic, Burkina Faso, Tanzania and Nigeria.

Improved Attractants for Enhancing the Efficiency of Tsetse Fly Suppression Operations and Barrier Systems Used in Tsetse Control/Eradication Campaigns (D4.20.08)

Objective: To improve the efficiency of pre-SIT-release fly population suppression operations and entomological monitoring of the target tsetse fly species by developing better visual and odour attractants. This will reduce the time and amount of materials required to suppress a tsetse population to densities that permit the initiation of the SIT. Currently, pre-release population suppression of *G. austeni* involves more than 80 insecticide-impregnated targets per km^2 for more than 18 months, whereas good attractants available for other tsetse species require only 4 to 8 targets per km^2 for a period of 3 to 6 months. Moreover, reliable entomological data can be collected with less labour and investment. Thus, it will be possible to assess the progress of vector control or eradication operations, including the SIT, more easily and more accurately.

Expected duration: 5 years (1994-99)

Contract Holders (5) from Mali, Burkina Faso, Kenya and Hungary.

Agreement Holders (3) from the United Kingdom, the United States and Switzerland.

Evaluation of Population Suppression by Irradiated Lepidoptera and their Progeny (D4.10.11)

Objective: To carry out field releases of moths given sub-sterilising doses of radiation and to assess their impact in suppressing target pests in combination of augmentative releases of natural enemies. This requires baseline data on field populations. Special attention has been paid to field behaviour of released moths, as well as the development of techniques to assess the impact of the released moths and their progeny in suppressing the native population.

Expected duration: 5 years (1992-98)

Contact Holders: (20) from Bangladesh, Brazil, Bulgaria, People's Republic of China (2), Cuba, Czech Republic, India, Indonesia, Iran, Malaysia, Mauritius, Pakistan, Philippines, Romania, Russian Federation, Syria, Tunisia, and Vietnam (2).

Agreement Holders (1) from the United States of America

This CRP will be concluded in June 1998. Dr F. Marec will edit the final proceedings which will be available as a priced publication from the IAEA

Development of Female Medfly Attractant Systems for Trapping and Sterility Assessment (D4.10.13).

Objective: To develop a trapping system for female medflies which will be used in practical SIT programmes using a genetic sexing strain, i.e. where only sterile males are released.

A second objective is to develop a female trap from which eggs of wild females can be obtained to estimate sterility which has been induced into the wild medfly population.

Expected duration: 5 years (1993-98)

Contract Holders (13) from Argentina, Costa Rica, Greece, Guatemala, Honduras, Mauritius, Mexico, Morocco, South Africa, Spain, Turkey, United States and Portugal.

Agreement Holders (1) from the United Kingdom

This CRP will be concluded in mid 1998. Dr M. Heath will edit the final proceedings which will be available as a priced publication from the IAEA.

Medfly Mating Behaviour Studies under Field Cage Conditions (D4.10.14)

Objective: To conduct research to develop standard reproducible tests of medfly mating behaviour under field cage conditions. Once developed, the validity of these tests will be confirmed by a series of specifically designed tests to be conducted at different locations under different conditions. Once the test has been standardised and confirmed, it is anticipated that it will be incorporated into the standard medfly quality control tests currently being used throughout the world. The field test will be backed up by detailed video recording of medfly courtship mating behaviours, and the subsequent analysis of the observations utilising computer software. Thus, when completed, the test will be fairly simple and straightforward to utilise and the results can be quantified.

Expected duration: 5 years (1993 - 98)

Contract Holders (8) from Argentina, Costa Rica, Greece, Guatemala, Israel, Mexico, Reunion and Kenya.

Agreement Holders (1) from the United States.

Genetic Applications to Improve the SIT for Tsetse Control/Eradication Including Genetic Sexing (D4.20.06)

Objectives: To obtain information for a better understanding of the phylogenetic relationships between different tsetse species, subspecies and strains, and of heritable traits that can be subjected to selection pressure. This knowledge is of particular importance during the planning and the operational stages of area-wide control/eradication campaigns. Data on genetic variation within a target population and information on the gene flow between neighbouring tsetse fly populations will have implications for planning and implementation of control campaigns. The possible development of resistance (physiological or behavioural), based on the selection of particular genotypes, will interact with and influence the type of control measure chosen and its mode of application. A second objective is to acquire knowledge on all factors, genetic and microbial, which modulate tsetse-trypanosome interaction. Knowledge of these factors could enable trypanosome refractoriness to be introduced into a target population or a mass-reared tsetse strain. A third objective is to develop tsetse strains that are more suitable for mass-rearing and release in tsetse control/eradication campaigns. Particular emphasis is laid on the development of an automated sexing method for immature fly stages (genetic sexing), and on other genetic or related techniques that foster an efficient large-scale application of the SIT. This also includes research directed at a trans-taxon use of laboratory-reared sterile flies for tsetse and trypanosomosis control or eradication activities.

Expected duration: 5 years (1997-02)

Contract Holders (3) from Greece, Kenya and Italy.

Agreement Holders (5) from Greece, Kenya and Belgium, Canada, United States, Italy

The following Co-ordinated Research Programmes are scheduled to be initiated in 1999 subject to approval and availability of funding and we encourage applications for participation:

Evaluating the Use of Nuclear Techniques for the Colonisation and Production of Natural Enemies

Objective: The proposed CRP has the objective of evaluating the use of nuclear techniques in improving the production, shipping and deployment of biological control agents to manage pests, facilitate trade and protect the environment. Considerable technological advances have been made in mass-rearing of parasitoids and predators for augmentative biological control. This large scale availability of natural enemies of key insect pests opens the way for totally biological systems of pest control, where mass releases of natural enemies can suppress pest densities in the field and so act synergistically with sterile fly releases to control wild fly populations within the context of area-wide integrated pest management programmes. Nuclear techniques can also play an important role in the production of natural enemies, as recent research has shown that parasitization rates are increased in irradiated host larvae. They also can avoid the escape of prey or unparasitized adult pest insects and artificial diets for mass-rearing of natural enemies can be decontaminated using irradiation. (See one page summary of Consultants Report in this Newsletter as a guide for preparation of research proposals).

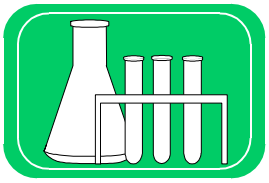
Expected duration: 5 years (1999 - 04)

There has been a good response to this initiative and a number of proposals are under consideration. Further submissions are still welcome.

Quality Assurance of Mass Produced and Released Fruit Flies

Objective: To improve and standardise internationally quality control procedures for mass produced fruit flies. There are now over ten fruit fly mass rearing facilities in the world that produce sterile flies for SIT programmes. With international trade in sterile insects becoming a reality, it is important that producers and users apply standard international quality control procedures. A CRP involving all parties involved, will allow fine-tuning and updating internationally accepted standards and procedures. A Consultants Group Meeting on the International Standardisation of Quality Control Procedures for Mass Reared and Released Fruit Flies was held in May 1997 in Vienna. It produced an international manual of standard QC procedures and recommended implementing this CRP to address those technical issues that require fine-tuning and those that could not be resolved and therefore require a co-ordinated R&D approach.

Expected duration: 5 years (1999-04)



G. DEVELOPMENTS AT THE ENTOMOLOGY UNIT, SEIBERSDORF

MEDFLY

Use of Genetic Sexing Strains in Operational Programmes

Medfly genetic sexing strains (GSS) have now been introduced into five out of eight international medfly facilities. In order to control genetic recombination in these strains a recombinant filter rearing system has been developed in Seibersdorf and has now been extensively tested in two of these facilities. The results are very encouraging and large SIT programmes in Guatemala and Argentina now rely on the filter to maintain the genetic integrity of the GSS to guarantee the release of only males. Recently Chile has decided to replace its bisexual strain with a GSS based on pupal colour.

New GSS :VIENNA 7-97 and AUSTRIA 6-97

VIENNA 7-97 was developed in 1997 and extensively tested at Seibersdorf during 1998. The translocation breakpoint in this temperature sensitive lethal strain is very close to the pupal colour mutation. The strain was reared for 11 generations and a production of more than 40 million pupae. Stability was excellent and there was no build up of recombinants. Quality control data on emergence and flight ability gave very satisfactory results as did the results of temperature treatment of eggs to kill females. All these factors have encouraged the proposal to use this strain in any future transfer of a GSS to an operational facility. It is also possible that this strain will replace some of the GSS being already mass produced.

To understand some important aspects of QC details of GSS, a strain, AUSTRIA 6-97 was synthesised which contained an extra marker, yellow body. The inclusion of this marker enabled specific individuals to be followed during the mass rearing process. These specific individuals whilst not impacting negatively on programme efficiency do compound the interpretation of quality control data specifically the emergence of flies from pupae. In normal GSS these individuals are not recognisable and their impact on QC cannot be accurately measured. Using AUSTRIA 6-97 it was shown that the low emergence rate in many GSS is due the survival of these specific individuals to the pupal stage but they do not emerge into flies.

Genetic Transformation

For the first time at Seibersdorf transgenic medflies have been produced in conjunction with Dr Al Handler following the use of a vector named *piggy back* and the use of an eye colour gene to select out the transformants. Many transgenic lines were produced and are now being characterised. Success in this field will enable the laboratory to investigate relevant aspects of transgenic lines including that of stability.

Mating Behaviour

As part of a project to examine the world-wide mating behavioural compatibility of medfly populations a series of studies on field-caged host trees has been carried out at Seibersdorf and in several Member States. For the tests in Seibersdorf, pupae collected in the field are shipped to the laboratory and the emerging flies are used in mating compatibility studies. Flies from five continents have now been assayed and no cases of behavioural incompatibility have yet been detected. This is an important finding

indicating that for the eradication of an outbreak sterile flies from any source can be used. It has also been shown that males from a particular GSS can successfully mate with flies from many geographical locations. This means that it should not be necessary in the future to synthesise a new GSS for each location that requests them.

TSETSE

Tsetse Mass Rearing

A highly mechanised prototype machine for holding and feeding tsetse flies and for the collection of pupae was evaluated. Several new principles were shown to be effective but overall it was not possible to maintain a self sustaining colony of tsetse on the machine. This was mainly due to high adult fly mortality in the cages. The design of the machine did not permit modifications of the cage design to be carried out.

Based on the lessons learnt a second system has now been designed and constructed and is under evaluation using *G. austeni*. This system is simple, robust and can be constructed under African conditions. A hand operated trolley enables 70 cages to be brought to feeding simultaneously and a pupal collection device will harvest pupae to a central point. It is felt that the principles used to develop this system will be those used for the facility to be constructed in Ethiopia.

New Operational Procedures

It was demonstrated using *G. austeni* that a difference in the eclosion time of males and females could be used to allow flies to emerge directly into cages in the right number and sex ratio. This removes a very time consuming process of the handling of young flies. Cages that we stocked in this way were compared to cages stocked in the normal way and it was shown that pupal production was unaffected. This system is now being adapted for *G. pallidipes*. This procedure can also be used at the end of the production process to separate males for sterilisation and release.

For the large future programme in Ethiopia's Southern Rift Valley it will be essential to develop new procedures for the release of sterilised male flies from aircraft. A necessary component of this will be the requirement to chill flies for some time after radiation. It was shown that chilling of flies at 4°C for periods of up to 24 hours was not detrimental either to fly survival or mating efficiency of the males. It appears that the adaptation for tsetse of the chilled adult release system which is routinely used for screwworm, medfly and various moths will not be compromised by temperature effects on the flies.

Freeze Dried Blood

The supply of a blood diet to adult tsetse is the key component of tsetse fly rearing. At present, blood is stored and transported to the rearing facility as fresh frozen irradiated product. Experiments have been carried out to confirm that freeze dried blood could also be used as a diet source for adult tsetse which would greatly simplify the logistics of blood transport. Using both *G. pallidipes* and *G. austeni* it was confirmed that freeze dried blood is a good source of nutrition for adult tsetse. Freeze dried blood could also be used that was irradiated before reconstitution, this greatly simplifies the logistics of blood irradiation. A large experiment has now been set up to examine the long term effects of feeding freeze dried blood to tsetse.

G. pallidipes *from Ethiopia*

A colony of *G. pallidipes* from Arba Minch in the Southern Rift Valley has been successfully colonised at Seibersdorf. From August 1996 until July 1997, 9334 pupae were received of which 46% emerged at a sex ratio of 1:1. A very high mortality was observed in the

emerging adults within 24 hours such that only 631 females survived to start the colony. The productivity and survival of these females has been excellent and the colony is growing as expected. In order to provide flies for experiments and to generate a colony for transfer to Ethiopia it is essential that the supply of material from Arba Minch be restarted with much higher numbers of pupae being shipped.

H. SPECIAL NEWS AND REPORTS

International Symposium on the Evolution of Fruit Fly Behaviour, at the Instituto de Ecologia, A.C. Xalapa, Veracruz, Mexico, February 16-21 1998.

The Symposium was attended by 35 scientists from 12 countries and aimed to compile information available on the behaviour of fruit flies (Diptera: Tephritidae) and their taxonomy for a better understanding of the phylogeny within the group. According to the organisers (Allen Norrbom and Martin Aluja) the book which should be published before the end of 1998 by CRC Press will serve as a blueprint for basic and applied behavioural research on fruit flies and other organisms for the next decade.

Update on NWSW eradication in the Americas

When an agreement was signed on August 28, 1972, to form the Mexico-United States Commission for the Eradication of New World Screwworm the objective was to free northern Mexico from screwworm and to create a barrier at the Isthmus of Tehuantepec in Mexico. This objective was achieved in 1984, but the sterile fly barrier divided the country, with livestock producers to the south claiming the Mexican government was showing favouritism to producers north of the barrier. Further studies showed that there was a much better site for a permanent biological barrier in Panama. This location extending from the Panama Canal to the border with Colombia would require only 40 million sterile flies per week, compared to 150 million per week at the Isthmus of Tehuantepec. Following indications of interest in screwworm eradication from all Central American countries and Panama, a plan was developed in 1985 to extend the Screwworm Eradication Program through Central America and establish a permanent biological barrier in the eastern half of Panama.

Progress since then in this SIT programme has been enormous. Mexico was declared Screwworm-Free on February 25,1991, Guatemala May 20, 1994, Belize May 22, 1994, El Salvador June 19, 1995, Honduras August 6, 1996. Nicaragua is now also free of screwworm and expected to be declared so in 1998. Screwworms are well controlled in Costa Rica and an eradication program has begun in Panama. All of Central America is expected to be free by the end of the year 2000.

Andrew G. Parker Joins Staff

Andrew joined the section in April 1998 and is backstopping SIT projects in Africa. He comes to the section with considerable experience of mass rearing tsetse having work in Tanga with the colony throughout the Zanzibar project. He has also worked for the section in Nigeria on the BICOT project.

His previous experience was in an operation control programme for mosquitoes in the Caribbean, and an aerial spraying programme for tsetse control in Somalia.

Andrew's strengths, apart from his formal training and experience in entomology and parasitology, lie in maintenance engineering and computing.

FAO/IAEA INTERNATIONAL CONFERENCE ON AREA-WIDE CONTROL OF INSECT PESTS INTEGRATNG THE STERILE INSECT AND RELATED NUCLEAR AND OTHER TECHNIQUES

Penang, Malaysia
28 May - 2 June, 1998

PROGRAMME

Wednesday, May 27

14:00 - 22:00 **REGISTRATION**
Poster Set-up for Period May 28-31st

Thursday, May 28

09:00 - 09:30 **OPENING CEREMONY**

Addresses:
- Tan Sri Dr. Koh Tsu Koon, Chief Minister of Penang, Malaysia
- Dr. Manase Peter Salema, Deputy Director, Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture, Vienna, Austria

09:30 - 10:00 **Break**

SESSION A: Area-Wide Approach: Concepts and Economics

10:00 - 10:30	Pest Management Strategies: Area-Wide and Conventional	**Lindquist**	Vienna, Austria
10:30 - 11:00	Area-Wide Approaches to Insect Pest Interventions: History and Lessons	**Klassen**	University of Florida, USA
11:00 - 11:30	Economics of Area-Wide Pest Control	**Mumford**	Imperial College, Silwood Park, UK
11:30 -12:00	Trade Issues and Area-Wide Pest Management	**Griffin**	FAO, Rome, Italy

12:00 - 12:30 **Discussion of Presentations**

Moderator : Hendrichs
FAO/IAEA, Vienna, Austria

Rapporteur:
Robinson
FAO/IAEA
Seibersdorf, Austria

12:30 - 13:30 **LUNCH**

SESSION B: Tsetse and Screwworm Programmes

13:30 - 13:50	Success in Zanzibar: Eradication of Tsetse	**Msangi** et al.	TTRI, Tanzania
13:50 - 14:10	Integrating the Sterile Insect Technique to Eradicate Tsetse from the Southern Rift Valley in Ethiopia	**Assefa** & Feldmann	ESTC, Ethiopia

14:10 - 14:30	Current Tsetse Control Operations in Botswana and Prospects for the Future	Allsopp & **Philemon-Motsu**	Tsetse Control Division, Min. of Agriculture, Maun, Botswana
14:30 - 14:50	Potential for Area-Wide Control or Eradication of Tsetse in Africa	**Kabayo** & Feldmann	Makerere University, Uganda
14:50 - 15:20	**Discussion of Presentations**		
	Moderator : Opiyo FAO/IAEA, Seiberdorf, Austria	Rapporteur: Feldmann	FAO/IAEA, Vienna, Austria
15:20 - 15:40	**Break**		
15:40 - 16:10	**Viewing of Posters of Session B**		
16:10 - 16:40	Screwworm Eradication in the Americas - Overview	**Wyss**	USDA-APHIS, Panama
16:40 - 17:00	A Screwworm Eradication Programme for Jamaica and other Caribbean Nations	**Grant** et al.	Veterinary Services, Jamaica
17:00 - 17:20	Insurance Against an Old World Screwworm Fly Invasion	**Tweddle**	DPIE, Australia
17:20 - 17:40	Incidence of Old World Screwworm Fly *Chrysomya bezziana* in Iraq	**Al Taweel,** et al.	Min. of Agriculture, Iraq
17:40 - 18:10	**Discussion of Presentations and Posters of Session B**		
	Moderator : Wyss USDA-APHIS, Panama, CA	Rapporteur: Kabayo	Makerere University Kampala, Uganda
18:30	**Cocktail Party**		

Friday, May 29

SESSION C: Applications of the Area-Wide Concepts

SESSION C-1: Medical and Veterinary Pests

07:00 - 08:00	**BREAKFAST IN POSTER AREA**		
08:00-08:20	Vector Control Operations in the Onchocerciasis Control Programme in West Africa	**Hougard,** et al.	WHO, Burkina Faso
08:20 - 08:40	Genetic Control of the Australian Sheep Blow Fly, *Lucilia cuprina*	**Mahon**	CSIRO, Australia
08:40 - 09:00	Progress in the Eradication of *Amblyomma variegatum* from the Caribbean	**Pegram**, et al.	USDA/FAO, Bridgetown, Barbados, W. I.
09:00 - 09:20	Area-Wide Control of Chagas Disease Vectors in Latin America	**Schofield**	ECLAT, London, UK
09:20 - 09:40	Prospects for Large Scale Mosquito-Vector Control	**Curtis** & Andreasen	London School of Hygiene & Tropical Medicine, UK
09:40 - 10:10	**Discussion of Presentations and Posters of Session C-1**		
	Moderator : Klassen Univ. Florida, Homestead, FL, USA	Rapporteur: Opiyo	FAO/IAEA, Seibersdorf, Austria
10:10 - 10:40	**Break**		

SESSION C-2: Plant Pests

10: 40 - 11:10	Eradication of the Cotton Boll Weevil in the United States: A Successful Multi-Regional Approach	**Cunningham** & Grefenstette	USDA-APHIS, Riverdale, MD, USA
11:10 - 11:30	Corn Rootworm Area-Wide Management in the United States	**Chandler**, et al.	USDA-ARS, Brookings, SD, USA
11:30 - 11:50	Area-Wide Pest Management of Locusts & Grasshoppers: The Striking Similarities of Problems and Solutions in Africa and the United States	**Lockwood**	
11:50 - 12:10	The Sterile Insect Technique for Commercial Control of the Onion Fly	**Loosjes**	De Groene Vlieg, Niewe Tonge, Netherlands
12:10 - 12:30	The Sterile Insect Technique in the Integrated Pest Management of White Fly Species in Greenhouses	**Calvitti** & Cirio	ENEA, Rome, Italy
12:30 - 13:00	**Discussion of Presentations and Posters of Session C-1**		
	Moderator : Lindquist Vienna, Austria	Rapporteur: Cayol	FAO/IAEA, Seibersdorf, Austria
13:00 -14:00	**LUNCH**		

SESSION D: Lepidoptera and Augmentative Biological Control

14:00 - 14:30	Area-Wide Integration of Lepidopteran F_1 Sterility and Augmentative Biological Control	**Carpenter**	USDA-ARS, Tifton, GE, USA
14:30 - 14:50	Computer Simulation of Population Suppression by Irradiated and Mutant Lepidoptera Pests	**Anisimov**	All Russian Institute of Plant Protection, St. Petersburg, Russia
14:50 - 15:10	Pink Boll Worm Integrated Management Using Sterile Insects Under Field Trial Conditions	**Walters**, et al.	USDA-APHIS, Phoenix, AZ, USA
15:10 - 15:30	SIT for Codling Moth Eradication in British Columbia, Canada	**K. Bloem**	Okanagan-Kootenay SIR Program, Canada
15:30 - 16:00	**Discussion of Presentations**		
	Moderator : Ocampo Univ. of the Philippines, Los Baños Laguna, Philippines	Rapporteur: Robinson	FAO/IAEA, Seibersdorf, Austria
16:00 - 16:30	**Break**		
16:30 - 16:50	Area-Wide Population Supression of Codling Moth	**Calkins**, et al.	USDA/ARS, Wappato, WA, USA
16:50 - 17:10	Uses of Nuclear Techniques in Biological Control	Greany & **Carpenter**	USDA-ARS, Tifton, GE, USA
17:10 - 17:40	**Viewing of Posters of Session D**		
17:40 - 18:10	**Discussion of Presentations and Posters of Session D**		
	Moderator : Cunningham USDA-APHIS, Riverdale MD, USA	Rapporteur: Gomes	FAO/IAEA, Vienna, Austria

Saturday, May 30

SESSION E:	**Molecular Biology and Genetics in Relation to Area-Wide Insect Control**		
07:00 - 08:00	**BREAKFAST IN POSTER AREA**		
08:00 - 08:30	Genetic Techniques in Insect Pest Control: An Overview	**Marec**	Czech Academy of Sciences, Czech Republic
08:30 - 09:00	Arriving at the Age of Pest Insect Transgenesis	**Atkinson** & O'Brochta	University of California, CA, USA
09:00 - 09:30	*Drosophila* as a Model for the Study of Sex Determination in Other Dipteran Species	**Lucchesi** & Pannuti	Emory University, Atlanta, GE, USA
09:30 - 10:00	Molecular Approaches to the Modification of Insect Pest Populations	**Crampton,** et al.	Liverpool School of Tropical Medicine, UK
10:00 - 10:30	**Discussion of Presentations and Posters of Session E**		
	Moderator : O'Brochta Univ. Maryland, College Park, MD,USA	Rapporteur: Franz	FAO/IAEA, Seibersdorf, Austria
10:30-11:00	**Break**		
SESSION F:	**Supportive Technologies for Area-Wide Control**		
11:00 - 11:30	The Use of Semiochemical Based Devices and Formulations in Area-Wide Programmes - A Commercial Perspective	**Jones** & Casagrande	Agrisense, Cardiff, UK
11:30 - 11:50	Environmentally Safe Pest Control Using Novel Bio-Electrostatic Techniques: Initial Results and Prospects for Area-Wide Usage	**Howse**	University of Southampton, UK
11:50 - 12:10	Analogues of Insect Attractants as Promising Alternatives to Natural Semiochemicals	**Ujvary**, et al.	Plant Protection Institute, Hungary
12:10 - 12:30	Integration of SIT and Autosterilization/Lethality in Eradication of *Glossina fuscipes fuscipes* Newst. (Diptera, Glossssinidae) in Buvuma Islands in Lake Victoria, Uganda	**Oloo,** et al.	Ministry of Agriculture Veterinary Department Kabete, Nairobi Kenya
12:30 - 13:00	**Discussion of Presentations**		
	Moderator : Heath USDA-ARS, Gainesville, FL, USA	Rapporteur: Guerin	Univ. of Neuchatel Neuchatel, Switzerland
13:00 - 14:00	**LUNCH**		
14:00 - 14:30	Cold Storage of Insects: Using Cryopreservation and Dormancy as an Aid to Mass Rearing	**Leopold**	USDA-ARS, Fargo, ND, USA
14:30 - 15:00	Mass Rearing the Old World Screwworm, *Chrysomya bezziana*	**Mahon** & Ahmad	Kluang, Malaysia; CSIRO, Australia

15:00 - 15:20	Incorporation of Diapause into Codling Moth Mass Rearing: Production Advantages and Insect Quality Issues	S. Bloem, **K. Bloem** & Calkins	Okanagan-Kootenay, SIR Program, Canada
15:20 - 15:50	**Break**		
15:50 - 16:10	New Systems for the Large Scale Production of Male Tsetse Flies	**Opiyo** et al.	FAO/IAEA, Seibersdorf, Austria
16:10 - 16:30	Development and Use of Novel Insecticide Formulations such as Photoactive Dyes in Fruit Fly Adult Suppression Systems	**Mangan** & Moreno	USDA-ARS, Weslaco, Texas, USA
16:30 - 16:50	Awareness, Flight Guidance and Reliability: Impact of Technology Upon Sterile Insect Technique	**Slagell**	K & K Aircraft, Inc., Bridgewater, VA, USA
16:50 - 17:20	**Viewing of Posters of Session F**		
17:20 - 18:00	**Discussion of Presentations and Posters Session F**		
	Moderator : Calkins USDA-ARS, Wapato, WA, USA	Rapporteur: Fisher	FAO/IAEA, Seibersdorf, Austria

Sunday, May 31

11:00 - 14:00	Removal of Posters for Period May 28-31st
14:00 - 22:00	Registration for International Fruit Fly Symposium
	Poster Set-up for Period June 1-3rd

Monday, June 1

09:00 - 09:30 **OPENING CEREMONY**
International Symposium on Fruit Flies of Economic Importance

Addresses:
- Dato' Prof. Ishak Tambi Kechik, Chairman, Local Organizing Committee, Universiti Sains Malaysia
- Patrick Gomes, Chairman, International Fruit Fly Steering Committee, FAO/IAEA, Vienna, Austria
- Datuk Amar Dr. Sulaiman bin Haji Daud, Minister of Agriculture of Malaysia

09:40 - 10:00 **Break**

SESSION I: Area-Wide Fruit Fly Action Programmes

10:00 - 10:20	Eradication of Medfly from Chile/Joint Programme in Southern Peru	Lobos & **Machuca**	SAG, Arica, Chile
10:20 - 10:40	Use of Strain SEIB 6-96 for Massive SIT to Control Medfly in Mendoza, Argentina	De Longo, Colombo, & **Gomez-Riera**	ISCAMEN, Mendoza City, Mendoza Argentina
10:40 - 11:00	Current Progress in the Medfly Program Mexico-Guatemala	Villaseñor, Carrillo, **Zavala,** et al.	Programa Moscamed, Tapachula, Chiss. Mexico
11:00 - 11:20	Area Wide Control of the Mediterranean Fruit Fly in the Lower Jordan Rift Valley	**Gomes**, et al.	FAO/IAEA, Vienna, Austria
11:20 - 11:40	Mediterranean Fruit Fly Preventive Release Programme in Southern California	**Dowell**, et al.	California Dept. of Food & Agriculture, Sacramento, CA, USA
11:40 - 12:00	Mexican Fruit Fly Eradication Programme	**Reyes**, et al.	SAGAR-CONASAG, Mexico-City, Mexico

12:00 - 12:30 **Viewing of Posters of Session I and II**

12:30 - 13:00 **Discussion of Presentations and Posters Session I**

Moderator : Kakinohana Okinawa Prefectural Agric. Experiment Station, Okinawa, Japan	Rapporteur: Rendon	USDA-APHIS-PPQ, Guatemala City, Guatemala, CA

13:00-14:00 **LUNCH**

14:00 - 14:20	Eradicating *Bactrocera papayae,* Drew and Hancock from North Queensland	Broughton, Gleeson, **Hancock,** et al.	Dept. of Primary Industries, Cairns, Queensland, Australia
14:20 - 14:40	Eradication of an Exotic Fruit Fly from Mauritius	**Seewooruthun,** et al.	Ministry of Agriculture, Fisheries & Co-operatives, Reduit, Mauritius

14:40 - 15:00	Regional Programme for the Eradication of the Carambola Fruit Fly in South America	**Malavasi**, et al.	IICA Office, Paramaribo, Surinam
15:00 - 15:20	Status Report on Integrated Fruit Fly Management Based on the Sterile Insect Technique in Guimaras Island, Philippines	Manoto, **Covacha**, et al.	National Mango R&D Centre, Guimaras, Philippines
15:20 - 16:00	**Discussion of Presentations and Posters Session II**		
	Moderator : Koyama Mizuhodai, Izumiku, Sendai, Japan	Rapporteur: Tan	Universiti Sains Malaysia, Penang, Malaysia
16:00-16:30	**Break**		
SESSION II:	**Area-Wide Approaches To Fruit Fly Management**		
16:30 - 16:50	Madeira Med Programme, Sterile Insect Technique Against Mediterranean Fruit Fly in Madeira, Portugal	**Pereira,** et al.	Programa Madeira-Med, Funchal, Portugal
16:50 - 17:10	Regional Approach to Management of Fruit Flies in the Pacific Island Countries and Territories	**Allwood**	FAO/AusAID/UNDP /SPC Secretariat of Pacific Community, Suva, Fiji
17:10 - 17:30	Feasibility of Eradicating *Ceratitis* spp. Fruit Flies from the Western Cape of South Africa by the Sterile Insect Technique	**Barnes** & Eyles	ARC-Fruit, Wine & Wine Research Institute, Stellenbosch South Africa
17:30 - 17:50	Use of Sterile Insect Technique in Mediterranean Fruit Fly Eradication and Caribbean Fruit Fly Control Programs in Florida	**Steck**	Florida Dept. of Agriculture & Consumer Services, Gainesville, FL, USA
17:50 - 18:30	**Discussion on Needs of Industry and Action Agencies**		
	Moderator : Malavasi IICA Office, Paramaribo, Surinam	Rapporteur: Batkin	Citrus Research Board; Visalia, CA, USA

Tuesday, June 2

SESSION III:	**Quarantine and Postharvest Treatments**		
07:00	**BREAKFAST IN POSTER AREA**		
08:00 - 08:30	An Overview of Quarantine for Fruit Flies	**Frampton**	Ministry of Agriculture & Forestry, Lincoln, New Zealand
08:30 - 09:00	Integrated Use of Pre- and Post Harvest Technology to Meet Quarantine Standards against Fruit Flies	**Mangan** & Shellie	USDA-ARS, Weslaco, TX, USA
09:00 - 09:30	**Viewing of Posters of Session III**		
09:30 - 10:00	**Discussion of Presentations and Posters**		
	Moderator : Vijaysegaran MARDI, Kuala Lumpur, Malaysia	Rapporteur: Hallman	USDA-ARS Weslaco, TX, USA
09:30-10:00	**Break**		
SESSION IV:	**Biotechnology, Genetics and Molecular Biology**		
10:30 - 11:00	Population Genetics and Cryptic Species	**McPheron**	Penn State University, PA, USA
11:00 - 11:30	Sex Determination in Medfly: A Molecular Approach	**Polito**, et al.	Universtita Federico II di Napoli, Italy
11:30 - 12:00	**Viewing of Posters of Session IV**		
12:00 - 12:30	**Discussion of Presentations and Posters**		
	Moderator : Haymer Univ Hawaii, Honolulu, HI, USA	Rapporteur: Steck	Florida Dept. of Agriculture and Consumer Services Gainesville, FL, USA
12:30 - 13:30	**LUNCH**		
SESSION V:	**Genetic Sexing and the Sterile Insect Technique**		
13:30 - 14:00	Modifications of Genetic Sexing Strains Based on the Experience Gained in the Mass Rearing of Such Strains	**Franz,** et al.	FAO/IAEA, Seibersdorf, Austria
14:00 - 14:30	Comparison of Medfly Male-Only and Bisex Releases in Large Scale Field Trials	**Rendon**, et al.	USDA-APHIS-PPQ, Guatemala City, Guatemala, CA
14:30 - 15:30	**Viewing of Posters of Session V**		
15:30 - 16:00	**Discussion of Presentations and Posters**		
	Moderator : McInnis USDA-ARS, Honolulu, HI, USA	Rapporteur: Robinson	FAO/IAEA, Seibersdorf, Austria
15:30-16:00	**Break**		

SESSION VI:	**Rearing, Quality Control and Nutrition**		
16:00 - 16:20	A Filter Rearing System for Mass Reared Medfly	**Fisher** et al.	FAO/IAEA, Vienna, Austria
16:20 - 16:40	Mass Rearing of the Medfly Temperature Sensitive Lethal Genetic Sexing Strain	**Caceres**, et al.	Programa Moscamed, El Pino, Guatemala
16:40 - 17:00	Mass Rearing of Melon Fly in Okinawa, Japan: Special Reference to Quality Control	**Yamagishi** & Kakinohana	Okinawa Prefectural Agric. Experiment Station, Okinawa, Japan
17:00 - 17:30	**Viewing of Posters of Session VI**		
17:30 - 18:00	**Discussion of Presentations and Posters of Session VI**		
	Moderator : Zavala Programa Moscamed, Tapachula, Chiapas, Mexico	Rapporteur: Opp	California State Univ. Hayward, CA, USA
	End of International Area-Wide Conference		
	The International Symposium on Fruit Flies of Economic Importance continues until June 5		

Wednesday, June 3

	Various Special Group Discussions
	Organised Scientific Tours
11:00 - 14:00	Removal of Posters for Period June 1-2
14:00 - 18:00	Poster Set-up for Period June 4-5
20:30 -	Formal Dinner of International Fruit Fly Symposium

POSTERS SESSION B: Tsetse and Screwworm Programmes

B-01 D.N. Lumamba, J. Mubanga, J. S. Hopkins, C. Mweempwa, E. Leroy and T. Robinson : Control of Tsetse, *Glossina morsitans morsitans* and *G. pallidipes* (Dipt. Glossinidae) Using Odour-Baited Insecticide-Impregnated Targets in Lusitu, Southern Zambia.

B-02 J. Mubanga, T.Robinson, J. S. Hopkins, E. Leroy and D. N. Lumamba : Control of Tsetse Flies Using Odour-Baited Insecticide-Impregnated Black Screens in Chiawa, Lusaka Province of Zambia.

B-03 M. J. B. Vreysen, K.M. Saleh, K. G. Juma and V. A. Dyck : The Use of the Sterile Insect Technique (SIT) for the Eradication of the Tsetse Fly, *Glossina austeni* (Diptera: Glossinidae) on the Island of Unguja (Zanzibar).

B-05 D.A. Adabie-Gomez, A. Dokurugu and Ch. Annoh : Tsetse Sterile Insect Technique Programme in Ghana: Status and Future Prospects.

B-06 S.A. Ajayi, J. D. Ogedengbe, G. I. Dogo, M. E. Ogedengbe and D. Bayei : Monitoring of Tsetse and Trypanosomosis Control Programme in Central Nigeria Using Ag-ELISA and Related Techniques.

B-07 D.A. Carlson, B. D. Sutton and U. R. Bernier : Cuticular Hydrocarbons of *G. austeni* and *G. pallidipes*: Activity as Sex Pheromones and Differences Between Populations.

B-08 D. J. Nadel : Tsetse Fly Rearing and Release at "Biovillage".

B-09 A. Djiteye and B. Diakite : Comparison of the efficacy of different odours and odour mixtures to attract *Glossina morsitans submorsitans, G. palpalis gambiensis* and *G. tachinoides* in Mali.

B-10 I. Kabore and B. Bauer : 20 Years of Autonomous Large-Scale Rearing of 3 *Glossina spp* on an *in vitro* System.

B-11 W. van Dyck, K. Fuerst, J. Hohl and D. Schmidradler : Automated Sex Determination of Tsetse Flies with Machine Vision Sensors, Illumination and Handling.

B-12 T. T. Vo : Economic Impact of Eradicating the New World Screwworm, *Cochliomyia hominivorax* from Jamaica.

B-13 A.R. Khattat : Patterns of Temporal and Spatial Occurrence of the Old World Screwworm (Diptera: Calliphoridae) in Iraq.

B-14 M. A. J. Al-Izzi, A. A. Al-Taweel and F. A. Jassim : Epidemiology and Rearing of Old World Screwworm, *Chrysomya bezziana* in Iraq.

B-15 A. S. Robinson : Preliminary Analysis of *Glossina austeni* and *G. pallidipes* populations using RAPD DNA Analysis.

POSTERS SESSION C: Medical, Veterinary and Plant Pests

C-01 J. M. Crampton. S. Stowell, M. Karras and R. E. Sinden : Expressing Immunogenic Parasite Proteins in Mosquitoes and *Drosophila*: Model Systems to Evaluate the Use of Haematophagous Insects to Deliver Protective Vaccines.

C-02 J. B. Rayaisse, I. Kabore and B. Bauer : Comparison of Efficacy of Four Different Traps Against Tabanids.

C-03 H. Morris, N. N. Yee, N. Maung and S. S. Lwin : Area-Wide Insect Pest Control Programmes in Myanmar.

C-04 B. Zhang and Z. Li : The Review on Plant Quarantine Treatment Techniques and Prospects for the Application of Irradiation Treatment Technology as a Quarantine Treatment Method in China.

C-05 S. Nacro, J. P. Nenon, J. Le Lannic and D. Dakouo : The African Rice Gall Midge and its Parasitoids in Burkina Faso.

C-06 A. Cokl, N. Stritih and M. Virant-Doberlet : The Role of Host Plants in Premating Behaviour of the Pest Species, *Nezara viridula* L. (Heteroptera, Pentatomidae).

C-07 S. D. Dyby and R. I. Sailer : Impact of Low-Level Radiation on Fertility and Fecundity of *Nezara viridula* (Hemiptera: Pentatomidae).

C-08 Ch. Razafindrakoto : Biological Control against *Heteronychus* sp.(Coleoptera, Dynastidae, Oryctinae), a Polyphagous Soil Pest in Madagascar.

POSTERS SESSION D: Lepidoptera and Augmentative Biological Control

D-01 D. Abeeluck and Ch. Dunhawoor : Integrated Control of the Diamondback Moth, *Plutella xylostella* (L.) in Mauritius.

D-02 R. Yang, D. Xia, W. Gu and Y. Zhang : A Study on Control of the Diamondback Moth in the Field by Irradiated Sterility.

D-03 N. Maung and H. Morris : Control of Cabbage Diamondback Moth by Using the Sterile Insect Technique in Myanmar.

D-04 M. Esmaili, E. Bagheri Zonooz, P. A. Fard, H. Zolfaghrieh and N. Ghaemi : The Possibilities for Area-Wide Control of Rice Stem Borer, *Chilo suppressalis* Walk (Lep. Pyralidae) Integrating F-1 Sterility Techniques with Other Control Measures for its Population Management in Iran.

D-05 M. A. J. Al-Izzi, H. A. W. Hassoon and M. Z. Khalaf : Radiosensitivity and Population Suppression of Pomegranate Fruit Moth, *Ectomyelois ceratoniae* Zell. by Releasing of Irradiated Insects and the Parasitoid *Apanteles angaleti.*

D-06 I. Rosca and A. Barbulescu : Control of European Corn Borer, *Ostrinia nubilalis* Hb. by Inherited Sterility in Romania (Field Research).

D-07 R.K. Seth, V. Baweja and A. Dhar : Ascertaining the Bioinfectivity Potential of Entomogenous Nematodes on F-1 Progeny of Irradiated *Spodoptera litura.*

D-09 B. Suarez, O. Cabello, L. M. Garcia, C. Berenguer, E. O. Masso Villalon, R. Fernandez, T. Mateo, J. C. Garcia and J. Cortiñas : Method of Chrysales Classification of *Diatraea saccharalis* for the Use of the Sterile Insect Technique and F-1 Sterility.

D-10 A. Barbulescu and I. Rosca : Pheromones: An Important Factor for Control of Lepidopterous Pest Species (Case Study: European Corn Borer, *Ostrinia nubilalis* Hb. in Romania.

D-11 D. Lu, J. Hu, E. Wang, Q. He and Y. Li : Rearing and Irradiation Effect of Cotton Bollworm, *Helicoverpa armigera.*

D-12 H.A. Sallam, S. S. El-Shall, A. M. Rashad, and H. F. Mohamad : Inherited Sterility in Progeny of Gamma Irradiated Male Spiny Bollworm, *Earias insulana* Boisd.

D-13 C. Berenguer, L. Garcia, B. Suarez, T. Mateo and R. Fernandez : Diet Labelled to Differentiate Irradiated Adult *Diatraea saccharalis* (Fab.).

D-14 V. R. Ocampo, J. B. de Leon, P. P. Ocampo and A. A. Barrion : Radiation-Induced Effects in the Male Reproductive Organ of *Helicoverpa armigera* (Hubner) Noctuidae, Lepidoptera.

D-15 T. Maimun and M. Mahani : Dietary and Age Effects on Reproductive Performance of *Plutella xylostella* L.

D-16 R.K. Seth, V. .P. Sharma and D. K. Rao : Assessment of Sperm Transfer and its Viability in F-1 Sterility Technique as a Control Measure for *Spodoptera litura* (Fabr.).

D-17 G. Saour and H. Makee : Effect of Gamma Irradiation on Sperm Utilisation in Twice-mated Female of Potato Tuber Moth, *Phthorimaea operculella* (Lep., Gelechiidae).

D-18 M. Mansour : Recovery of Fertility in Codling Moth, *Cydia pomonella* L. Males Exposed to 25 and 35 Krad of Gamma Radiation.

D-19 L. M. Garcia, E.O. Masso Villalon and B. Suarez : Sub-Sterilizing Dose of 100 Gy in Sugar Cane Borer (*Diatraea saccharalis* (Fab.).

D-20 V. Arthur, F. M. Wiendl, J. T. de Faria, T. A. Wiendl and J. A. Duarte Aguilar : The Use of Gamma Radiation as a Control Method Against 3 Selected Species of Lepidoptera.

D-21 M.H. Dhouibi : Biological Integrated Control in Oasis and in Date Packing Houses.

D-22 J. Michalik, E. Szolajska and J. Chroboczek : Application of Baculovirus for Control of Pest Population.

D-23 M. Baizhanov : Biological Safe Methods of Struggle Against Pest Invertebrates in Kazakhstan.

D-24 H. M. Saleh, F. A. Fattah and H. M. Aboud : Biological Control of the White Fly, *Bemisia tabaci.*

D-25 E. M. Hegazi, A. El-Minshawy, W. E. Khafagi and N. El-Singaby : Studies on the Mature Teratocytes in the Body Cavity of *Spodoptera littoralis* (Boisd.) Attacked by *Microplitis rufiventris* Kok.

POSTERS SESSION E: Molecular Biology and Genetics in Relation to Area-Wide Control

E-02 H. Cui and S. Guo : Construction of Plant Expression Vectors Harboring Two Insecticidal Genes and their Expression in Tabacco.

E-03 A. Zambetaki, N. Pasteur and Mavragani-Tsipidou : Cytogenetic Analysis of Malpighian Tubule Polytene Chromosomes of *Culex pipiens* (Diptera: Culicidae).

E-04 A. Pannuti, T. Kocacitak and J.C. Lucchesi : Genetic Sexing Strategy for Anopheline and Aedine Mosquitoes.

E-05 A. Gariou-Papalexiou, G. Yannopoulos and A. Zacharopoulou : Polytene Chromosome Maps of the Tsetse Fly, *Glossina austeni.*

POSTERS SESSION F: Supportive Technologies for Area-Wide Control

F-01 M. Hasan : Potential of Ionizing Radiation for the Control of Uzi-Fly *Exorista sorbillans* (Wied.), an Endoparasite of Silkworm, *Bombyx mori* L.

F-02 C. H. Bui, M. H. Nguyen, Q. V. Pham, P. T. Dinh and D. L. Nguyen : Research and Development of

Radiation to Control Stored Product Insect Pests in Vietnam

F-03 D. A. Lupa and S. Ignatowics : Melanization Process in Irradiated Larvae of Moths and Beetles, Pests of Stored Products

F-05 C. H. Bui : Effect of Gamma Radiation and Bag Packaging Materials on the Development of *Dermestes maculatus* DeGeer (Coleoptera: Dermestidae) in Sword Fish.

F-06 J. T. de Faria, V. Arthur, T. A. Wiendl and F. Wiendl : The Use of Gamma Radiation as a Quarantine Control Method Against the 'Orange Fruit Borer' *Ecdytolopha aurantiana.*

F-07 N. Kaupert : Irradiation Application as Quarantine Treatment of Apples and Pears in Argentina.

F-08 D. A. Lupa and S. Ignatowics : Detection Methods for Irradiated Insects.

POSTERS SESSION I : Area Wide Fruit Fly Action Programmes

I-01 Steven L. Peck : Theoretical Population Biology, Evolutionary Ecology, Chaos and other Ignored Considerations in Fruit Fly Action Programs.

I-02 Grant T. McQuate and Steven L. Peck : Mortality of Mediterranean Fruit Flies Following Feeding on Phloxine B - Protein Baits, with and without Uranine, and Subsequent Exposure to a Range of Different Light Intensities.

I-03 Robert V. Dowell : When does Zero Mean Zero -- Fruit Fly Trapping in California.

I-04 Jorge Escobar, Juan Bianchi and Fernando Murual : Advances of the Fruit Fly Control and Eradication Program in San Juan – Argentina.

I-05 R.A. Sanchez : Advances in the Program for the Eradication of the Mediterranean Fruit Fly (*Ceratitis capitata*, Wied.), in the Patagonia Region, Argentina.

I-06 Bill Woods : Eradication of Medfly from the Kimberley Region of Western Australia.

I-07 E. Cosenzo, E. D'Angelcola and M. Spineta : National Fruit Fly Control and Eradication Program in Argentina.

I-08 R. Ocampo, C. Lobos and J. Machuca : Seven Years of Operation of the Chile-Peru / IICA-IAEA Binational Programme Against Flies in their Border Areas.

I-09 C. Lobos, E. Cosenzo and J. Machuca : Agreement between Chile and the Argentina Governments : A Joint Work for the Establishment and Recognition of Fruit Fly Free Zones in both Countries.

I-10 L. Salmeron, J. L. Zavala and A. Villaseñor : Mediterranean Fruit Fly Eradication in Pest Free Areas of Mexico.

I-11 Wang Huasong, Hu JianGuo, Lu Daguang, Kang Wen and Li Yuanying : Area Wide Control of Chinese Citrus Fly, *Bactrocera (Tetradacus) minax*, and Studies on Mating Characteristics.

I-12 H. Camacho : Using Sterile Insects and Parasitoids in the Integrated Fruit Flies ManagementProject in Costa Rica.

POSTERS SESSION II : Area Wide Approaches to Fly Management

II-01 Joseph L. Knapp, S.E. Simpson and H. N. Nigg : Medfly Eradication

in Urban and Wetland Environs, Tampa Florida – 1997.

II-02 David K. Eyles, Niël Du Plessis and Brian N. Barnes : Effect of DifferentInsecticide Bait Attractant Combinations for *Ceratitis* spp. Bait Sprays in South African Fruit Orchards.

II-03 Aruna Manrakhan, John Stonehouse, Simon Fowler, Nigel Price and John Mumford : Evaluation of the "Eradicate and Buffer" Concept for Fruit Fly Control.

II-04 Susan Opp, Katherine Reynolds, Carolyn Pickel and William Olson : Monitoring Guidelines Improve Control of Walnut Husk Fly in California.

II-05 Steven L. Peck, Grant T. McQuate, Roy T. Cunningham and Nicanor J. Liquido : Field Tests of the Effectiveness of Xanthene Dye Bait Sprays in the Control of Two Species of Tephritid Fruit Flies.

II-06 Steven L. Peck and Grant T. McQuate : Suppression of Mediterranean Fruit Fly Populations over Mountainous Areas through Aerial Phloxine B - Protein Bait Sprays: Regional Medfly Program in Guatemala.

II-07 J. P. Ros, I. Escobar, F.J. Farcia Tapia and G. Aranda : Pilot Experiment to Control Medfly (*Ceratitis capitata* Wied.) Using Mass Trapping Technique in a Custard Apple (*Anona cerimolia* Mill) Orchard.

II-08 S. Md. Jalaluddin, K. Natarajan & S. Sadakathulla : Enhancement of Guava Resistance to the Fruit Fly.

II-09 S. Md. Jalaluddin, K. Natarajan and S. Sadakathulla : Relative Resistance of Guava Germplasm to Guava Fruit Fly *Bactrocera correcta* (Bezzi).

II-10 Misra, D.S. and Manju Bala Pandey : Current Status of *Bactrocera cucurbitae* (Coq.) Management in India.

II-11 Permalloo, S., Seewooruthun, S.I., Soonnoo, A. R. and Gungah, B. : Fruit Fly Control in Mauritius.

II-12 Harnaivo Rasamimanana, Aruna Manrakhan, Simon Fowler, Nigel Price and John Mumford : The Cost-Benefit Analysis of Wide-Area Backyard Fruit Fly Control.

II-13 Luis L. Vazquez, Isabel Perez, Aurelia Navarro and Juan Carlos Casin : Occurrence and Management of Fruit Flies in Cuba.

II-14 A.P. Economopoulos, B. Papadopoulos, N. Mantzos and P. Mavrikakis : Control of the Medfly by Sterile Male Releases Combined with Lure and Kill Initial Wild Male Reduction and Barrier-Zone Protection of Treated Area.

II-15 Herbert N. Nigg, Samuel E. Simpson and Joseph L. Knapp : An Alternative Approach to Fruit Fly Control.

II-16 A. Larcher Carvalho, J. Mumford, W. Enkerlin, J. F. Pereira and C. Soares : Preliminary Economic Analysis of Mediterranean Fruit Fly Management in Portugal.

II-17 Nguyen Ngoc Thuy : Fruit Fly Problem In South Vietnam.

II-18 Antonio Belcari, Patrizia Sacchetti, Massimiliano Mancini : Control of the Olive Fly, *Bactrocera oleae* (Gmel.) by U.L.V. Spot Sprays in an Olive Grove of Central Italy.

II-19 Nancy Boscan and Freddy Godoy : Levels of Infestation of the Papaya Fuit Fly *Toxotrypana curvicauda* Gerst. in Canoabo and Bejuma, Venezuela.

POSTERS SESSION III : Quarantine and Post Harvest

III-01 Peter Bailey and Nick Perepelicia : Fifty Years Managing Fruit Fly Incursions into South Australia.

III-02 Gina Bonne, Will Dogley and Steve Dupuis : Plant Quarantine in Seychelles.

III-03 C.P.F. De Lima : Disinfestation of Plums against Mediterranean Fruit Fly Using Methyl Bromide, Cold and Controlled Atmosphere Treatments.

III-04 Wendy A. Odgers, Jocelyn W. Eskdale and Marion J. Healy : Management of Fruit Fly Area Freedom in Australia to Ensure Quarantine Security of Host Products.

III-05 Khalil Abdul-Halim, Mohamad Assaed, Ahmad Murhidg and Mohamad Maihoob : The Occurrence of Fruit Fly *Ceratitis capitata* in Syria.

III-06 John W. Armstrong and Thomas W. Phillips : Quarantine Cold Treatment for Litchi (A Tale of Strange Results).

III-07 T. Grove, W. P. Steyn and M.S. De Beer : The Effect of Hot Water Treatment on Mango Fruit Quality.

III-08 Andrew J. Jessup and Isla F. Carswell : Disinfestation of Fruits and Vegetables from Insects by a Combination of Cold or Heat and Modified Atmospheres.

III-09 Abdullah Joomaye, John Stonehouse, Robert Black, Simon Fowler, Nigel Price, Steve Dupuis and John Mumford : Fruit Fly Quarantine Research in the Islands of the Indian Ocean.

III-10 S. Dupuis, E. Jeuffrault and S. Quilici : Quarantine Co-ordination within the Regional Research Program on Fruit Flies in Indian Ocean.

III-11 Jose Tadeu de Faria, Valter Artur and Federico Maxililiano Wiendl : The Use of Gamma Radiation as a Quarantine Treatment against *Ceratitis capitata* (Wied. 1824) Infecting Papayas, Sunrise Solo.

III-12 B.C. Waddell, R.J. Petry and G.K. Clare : High-Temperature Treatment of Export Cook Island Papaya to Disinfest Fruit of Tephritid Fruit Flies.

POSTERS SESSION IV : Biotechnology, Genetics and Molecular Biology

IV-01 G. Christophides, C. Savakis, A. Mintzas and K. Komitopoulou : Structure and Function of Genes Encoding for Male Specific Serum Proteins in the Medfly, *Ceratitis capitata*..

IV-02 David S. Haymer and Mei He : Analysis of Molecular Variation Within and Between Species in the *Bactrocera dorsalis* Complex.

IV-03 Lim Choon-Leng, Tan Keng-Hong and Tan Sai-Tee : Cytogenetic Analysis of Mitotic and Salivary Gland Chromosomes in *Bactrocera papayae.*

IV-04 Susan D. McCombs, Jingwei Xiao, Jinsheng Yang and Stephen H. Saul : Molecular Characterization of the White Eye Gene in the Oriental Fruit Fly, *Bactrocera dorsalis* (Hendel).

IV-05 M. Rosetto, T. De Filippis. A.G.O. Manetti, G. Petteruti, D. Marchini and R. Dallai : Female-Specific Genes in the Medfly *Ceratitis capitata* (Diptera: Tephritidae).

IV-06 C. Torti, L.M. Gomulski, A.R. Malacrida, P. Capy and G. Gasperi : Transposable Elements in Ceratitis capitata (Medley) Populations.

IV-07 M.E. Gagou, M.A. Rodriguez-Gabriel, J.P.G. Ballesta and S. Kouyanou-Koutsoukou : Studies of the Genes Encoding for the Ribosomal Phosphoproteins P1, P2 and P0 in *Ceratitis capitata.*

IV-08 Zambetaki, A., Scouras, Z.G. and Mavragani-Tripidou, P. : The Genome of the Olive Fruit Fly *Bactocera oleae* : Localization of Molecular Markers by *in situ* Hybridization to Salivary Gland Polytene Chromosomes.

IV-09 J.C. Lucchesi and A. Pannuti : *Drosophila* as a Model for the Study of Sex Determination in other Dipteran Species. **IV-10** Aurelio Reyes and Maria Dolores Ochando : Mitochondrial DNA Differentiation in Spanish Populations of *Ceratitis capitata* (Dipetera: Tephritidae).

IV-10 Aurelio Reyes and Maria Dolores Ochando : Mitochondrial DNA Differentiation in Spanish Populations of *Ceratitis capitata* (Diptera: Tephritidae).

IV-11 H. Yu, M. Frommer, B. Lillemets, M.K. Robson and J.A. Sved : DNA Micro-satellites for Analysis of the Population Structure of Australian Native Fruit Flies.

IV-12 J.T. Zhao, P. Maheswaran, J.A. Sved, A. Meats and M. Frommer : Genetic and Physical Chromosome Maps of the Queensland Fruit Fly, *Bactrocera tryoni*

IV-13 L. M. Gomulski, C. Torti, A.R. Malacrida, P. Capy and G. Gasperi : Diffusion of a *mariner* Element in Tephritid Flies and its Interaction with the Host Genomes.

IV-14 Masahiko Muraji, Shigehito Nakahara and Tamio Sugimoto : Variations in Nuclear and Mitochondrial DNA Sequences among *Bactrocera* Species (Diptera, Tephritidae).

IV-15 A.M.A. Zambri, M.F.F. Wajidi and Z. Jaal : Detection of Specific Expression of Glutathione S-Transferase from the Life Cycle of *Bactrocera papayae*.

POSTERS SESSION V : Genetic Sexing and Sterile Insect Technology

V-01 Susan D. McCombs, Alfred M. Handler, Malcolm J. Fraser and Stephen H. Saul : Germline Transformation in the Mediterranean Fruit Fly with the Lepidopteran Transposon Vector, *piggyBac*.

V-02 S. Barbosa, A. Mexia and R. Pereira : Dispersal and Survival of Sterile Male "TSL" Mediterranean Fruit Flies.

V-03 Carlos Caceres and Pedro Rendon : Mediterranean Fruit Fly Temperature Sensitive Lethal ("TSL") Genetic Sexing Strain Versus a Normal Bisexual Strain Under Mass Rearing Conditions.

V-04 D.O. McInnis, P. Rendon and D.R. Lance : Medfly S.I.T. : What Do Field Cage Tests Tell Us?

V-05 P. Gourzi, D. Gubb, Y. Livadaras, A. Mintzas, C. Savakis and A. Zacharopoulou : A Screen for the Isolation of Balancer Chromosomes in the Medfly *Ceratitis capitata.*

V-06 U. Cirio, M. Calvitti, G. Cecchini and M. Schwarz : First Results in the Use of Electron Irradiation for the Sterilization of *Ceratitis capitata* Wiedmann.

V-07 Lira C., Villasenor A., Stewart, J., A. Rodas R. and Carrillo L. : Eradication of Mediterranean Fruit Fly Populations over Mountainous

Coffee Areas of Rio Ocho in Huehuetenango, Guatemala.

V-08 Reza Md. Shajahan, Begum Gul Nahar, M.Z.R. Majumder, A.K. Shaha and Mahfuja Khan : Research Directed Towards the Development of a Genetic Sexing Strain and SIT in the Melon Fly, *Bactrocera cucurbitae.*

V-09 B. Chrysanthakopoulou, A.C. Mintzas and A. Zacharopoulou : Heat Shock Puffs and Genes in the Mediterranean Fruit Fly *Ceratitis capitata.*

V-10 M. Verras, M. Mavroidis, G. Kokolakis, A. Zacharopoulou and A.C. Mintzas :Cloning and Characterization of the Ecdysone Receptor of the Mediterranean Fruit Fly *Ceratitis capitata.*

POSTERS SESSION VI : Rearing, Quality Control and Nutrition

VI-01 Nazir Ahmad : Role of Egg Density in Mediterranean Fruit Fly Production on Recycled Diet.

VI-02 A. Barbosa, N. Silva and K. Fisher : Aspects of Mass Rearing and Quality Control in Madeira Medfly Facility.

VI-03 Carlos Caceres, Luis Andrade, Carolina Romero, Gordon Tween and John Stewart : Guatemala Modular Mass Rearing Facilities at "El Pino".

VI-04 Harvey T. Chan, Jr., Harry Ako, Ruth Y. Nino-Duponte, James R. Carpenter and Eric B. Jang : Composition of Mediterranean Fruit Fly Third Instar Larvae (Diptera: Tephritidae) and Diet: Material Balance Studies on Amino Acids, Minerals, and Nutrient Composition in Fresh and Spent Mass Rearing Diets.

VI-05 Andrew J. Jessup and Leanne Cruickshank : Improving the Quality of Insects for Sterile Insect Release by Improving Larval Rearing Conditions.

VI-06 A.G. Manoukas and E.N. Zografou : A Practical, Efficient and Low Cost Diet for Rearing Mediterranean Fruit Fly Larvae.

VI-07 H.H. Prasad : Studies on Rearing and Effect of Gamma Irradiation on the Life Processes, Sterilization and Mating Competiveness of Oriental Fruit Fly, *Bactrocera dorsalis.*

VI-08 Gustavo Taret and Pablo Gomez Riera : Mass Rearing of *Ceratitis capitata* (Wied.), Strain SEIB 60'96, at Bioplant Km8. Mendoza, Argentina.

VI-09 Gustavo Taret, Daniel Marengo, Gabriela Bonpland, Beatriz Turinetto and Mariel Vanin : Incidence of the Sorting Machine in the Production and Quality of Medfly Pupae (*Ceratitia capitata*, Wied.), Strain SEIB 60'96.

VI-10 Gustavo Taret, Gabriela Bonpland and Mariel Vanin : Use of Wheat Bran as Support of the Larvae Diet of *Ceratitis capitata* (Wied.), Strain SEIB 60'96.

VI-11 D. Orozco and M.L. Sosa : Role of Quality Control in Mass Rearing Fruit Flies.

VI-12 J.C. Dominguez, F. de M. Moreno, S. de la Torre and A. Martinez : Moscafrut Facility : Five years of Fruit Fly and Parasitoid Mass Production at Metapa, Chiapas, Mexico.

I. PUBLICATIONS

Special Items (1997-98)

Franz, G., Willhoeft, U., Kerremans, Ph., Hendrichs, J., Rendon, P. Development and application of genetic sexing systems for the Mediterranean fruit fly based on a temperature sensitive lethal mutation. In: Evaluation of genetically altered medflies for use in sterile insect technique programmes (Ed: IAEA) Proceedings of the final Research Co-ordination Meeting, Clearwater, Florida, 11-13 June, 1994, IAEA, 85-95. (1997)

Genetic engineering technology for the improvement of the sterile insect technique (IAEA TECDOC-993) (1997)

Control of the Mediterranean Fruit Fly in the Near East Region Using the Sterile Insect Technique. (STI/PUB/1020) (1997)

Publications in Scientific Journals and Conference Proceedings (1997-98)

Cayol, J.P., Buyckx, E.J., Loussaief, F., Zarai, M., Boukhari, M., Arfaoui, T., "Control of Mediterranean fruit fly with Vienna-43/44 *tsl* sterile males in Tunisian oases", in Proceedings of the 2nd International Open Meeting Lisbon, Instituto de Investigacão Cientifica Tropical, Organisation Internationale de Lutte Biologique, Lisbon. (1997)

Robinson, A.S., "The potential role of the International Atomic Energy Agency in the development of a sterile insect programme for mosquitoes", 2nd Global Meet on Parasitic Diseases, Hyderabad 1997 (abstract).

Dyck, V.A., Juma, K.G., Msangi, A.R., Saleh, K.M., Kiwia, N., Vreysen, M.J.B., Parker, A. G., Hendrichs, J., Feldmann, U., "Eradication of the tsetse fly Glossina austeni by the Sterile Insect Technique (SIT) in Zanzibar - could South Africa be next?" in Insects in African Economy and Environment. (Proceedings of the Joint Congress of the Entomological Society of Southern Africa (11th congress) and the African Association of Insect Scientists (12th congress)) Robertson, H.G. Ed. Entomological Society of Southern Africa, Pretoria, South Africa (1997) (abstract)

Bailey, S. Tsetse fly eliminated on Zanzibar. Nucl. News, 56-61 (January 1998)

Willhoeft, U., Müller-Navia, J., Franz, G., Analysis of the medfly sex chromosomes by microdissected DNA probes, Genome 41(1998) 74-78

P. Gomes, J. Hendrichs, W. Enkerlin "Can Area-Wide Control of the Mediterranean Fruit Fly Using Sterile Insects Lead to Establishing Pest Free Areas in the Near East?". Sixth Arab Congress of Plant Protection, October 27-31, 1997, Beirut, Lebanon

Mansour, M., Franz, G. Gamma radiation as a quarantine treatment for the medfly, Ceratitis capitata (Wied) (Diptera: Tephritidae). J. Econ. Entomol. 89(1997): 1175-1180

Willhoeft, U., Fluorescence *in situ* hybridization of ribosomal DNA to mitotic chromosomes of tsetse flies (Diptera: Glossinidae: Glossina), Chromosome Research 5(1997):262-267.

Hendrichs, M.A., Hendrichs, J Perfumed to be killed: Interception of Mediterranean Fruit Fly (Diptera: Tephritidae) sexual signaling by predatory foraging wasps (Hymenoptera: Vespidae). Ann. Entomol. Soc. Am. 91(1998): 228-234.

Insect and Pest Control Section
Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture
International Atomic Energy Agency
Wagramerstrasse 5, P.O. Box 100
A-1400 Vienna, Austria

Printed by the IAEA in Austria