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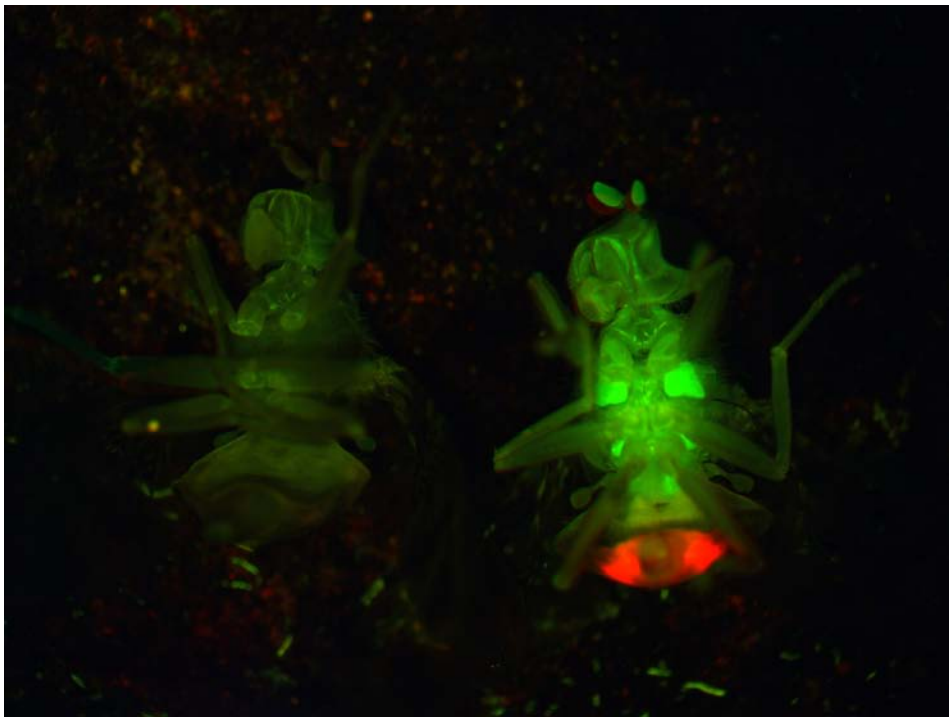


On the right a transgenic Mediterranean fruit fly male carrying two different types of molecular markers (overall EGFP *green and* Dsred *testes-specific colour) that become visible upon exposure to the appropriate fluorescent light. On the left a non-transgenic male is shown as control. Among various potential applications being assessed in the laboratory, molecular markers would allow to see sterile sperm in wild female spermatheca and eliminate the need for the fluorescent dye used to mark sterilized insects externally. Fluorscent dye affects the quality of the sterile insects and the sterile:fertile differentiation process is labour intensive and not 100% accurate (Source: Francesca Scolari und Marc Schetelig).*

To Our Readers

Mid-2006 will see the inauguration of three large mass rearing facilities in support of the increasing application of the sterile insect technique (SIT). In Juazeiro, State of Bahia, Brazil, a mass rearing facility will initiate operations that will be dedicated initially to the weekly production of ca. 100-150 million sterile Mediterranean fruit flies per week. The development of the facility has been supported among others by the IAEA technical cooperation project BRA/5/057 and will service the rapidly expanding commercial fruit production areas (mango, grapes, etc.) of the various irrigation districts around Rio San Francisco in the arid northeast of Brazil. Future expansions of the facility foresee also the production of some Anastrepha spp. fruit flies, as well as fruit fly parasitoid mass rearing. The potential of the project for area-wide control is enormous in view of the significant involvement of the commercial sector. The initial objective is to reduce insecticide applications by suppressing fruit flies in an environment-friendly way, with the ultimate goal to eliminate the costly post-harvest treatments by establishing officially-recognized low prevalence and fruit fly free areas.

IAEA International Atomic Energy Agency

In Spain, in the citrus-producing region of Valencia, another facility has been under construction with technical support provided under a Memorandum of Understanding between the Joint FAO/IAEA Programme and the agriculture authorities (Conselleria de Agricultura de la Generalitat Valenciana) of the Autonomous Province of Valencia. This region is considered among the most important regions in the world exporting fresh citrus. Within this context the fight against the Mediterranean fruit fly is of major importance for both producers and Valencia authorities. Even though the number of insecticide treatments used to control this pest throughout the fruiting season has increased, damage due to larvae in fruit continues to be substantial, hampering exports to high value export markets that discriminate against the presence of this insect pest. An important export market for clementines from Spain in the United States of America was endangered in 2001, when immature stages of this pest were detected in ships laden with clementines from Spain, and a temporary quarantine was imposed by the US phytosanitary authorities.

This incident triggered actions on behalf of the authorities of the Conselleria de Agricultura to try to find more effective and environment-friendly alternatives to deal with this pest. In 2002, it was decided to shift the control strategy from conventional large scale aerial insecticide spraying to an area-wide integrated approach. Pilot trials including the SIT have been conducted starting in 2003 in two different areas of the Valencia Community, importing on a weekly basis sterile flies from Mendoza in Argentina. Moreover, the Conselleria Valenciana initiated the planning and construction of a mass rearing and sterilization facility which is now nearing completion, with a production capacity of 400-500 million sterile flies per week, sufficient to cover the main production areas of the province, with further expansions required to cover other major citrus production areas in Spain. Since the fruit industry is committed and well organized, the Mediterranean fruit fly is the only fruit fly present in Spain, and the fly is at its northern distribution limit undergoing strong natural suppression during each winter, the potential for effective SIT implementation is large.

Another facility that has been under construction for several years now is the New World screwworm facility in Panama, which will be inaugurated on July 12, 2006. During the last three decades, the outstanding successes of the screwworm eradication programme relied on the mass rearing facility of the Mexico-USA Screwworm Commission based in Tuxtla Gutiérrez, State of Chiapas, Mexico. After the production plant in Mission, Texas closed in the mid-1970s, this large facility with a capacity of ca, 500 million sterile flies, has been providing the sterile flies for all eradication campaigns in Mexico, Central America and the Caribbean. During the last years its much reduced production has also been providing sterile flies to maintain the sterile fly barrier in eastern Panama and to the ongoing eradication programme in Jamaica.

The new screwworm facility in Felipillo near Panama City includes much more modern technologies than the Tuxtla Gutiérrez plant, although it is also located in a screwworm-free area and therefore also requires extensive security and quarantine measures. The new facility, with a weekly capacity of ca. 100 million sterile screwworm flies per week, will take over the production to maintain the continuous barrier along the border with Colombia, thereby considerably reducing sterile fly transport costs, and will have some spare capacity to address some smaller outbreaks or campaigns. However, it will not have the capacity to address large outbreaks in the screwworm-free countries in North and Central America, or to initiate eradication campaigns in the large Caribbean islands that are still screwworm infested, such as Cuba or Hispaniola (Dominican Republic and Haiti). It will therefore be relevant to find a mechanism to maintain the Tuxtla Gutiérrez facility in some state of operational readiness, ideally by selling sterile flies to screwworm campaigns in the Caribbean and to reduce the risk of reinfestation.

Important news not reported in the last newsletter is the announcement in December 2005 by the Animal Plant and Health Inspection Service (APHIS) of the United State of America of the official recognition, through publication in its Federal Register (Vol. 70, No. 235), all of Patagonia region in Argentina as a fruit fly free area. This major success culminates ten years of joint efforts of the Servicio Nacional de Sanidad y Calidad Agroalimentaria (SENASA), the Fundación Barrera Patagónica (FUNDAPA), the Provincial Governments, the fruit industry, with technical support from Instituto Nacional de Tecnología Agropecuaria (INTA) and IAEA and FAO in terms of the implementation of the sterile insect technique as part of an area-wide integrated pest management approach. This achievement will allow Patagonia to export fresh fruits and vegetables to the USA without any quarantine treatments. The elimination of these costly quarantine treatments also applies to most of the 3 million boxes of quality pears and apples that this region exports to many other regions in the world and also opens the possibilities of exporting other high-value fresh fruit crops such as cherries. The achievement follows similar successes in Argentina's Mendoza province and has stimulated approval of a new programme also involving SIT implementation over an area of 56,000 hectares comprising the main citrus producing provinces of Argentina (Entre Ríos and Corrientes) in the northeast of the country.

Another encouraging development is related to IAEA regional project RLA/5/045, assisting Central American countries to develop fruit fly free and low prevalence areas to facilitate fruit and vegetable exports from Central America to the USA. In Nicaragua, this effort has resulted in the investment in these areas of ca. US $100 million by the private sector for the production of bell pepper. The Director General of Plant and Animal Health

of Nicaragua, Denis J. Salgado Fonseca, informed us in March that the first load of bell peppers was shipped from Nicaragua to the USA. This event marks the culmination of almost six years of technology transfer. This is a very significant development for the region which breaks a very old vicious circle which has been limiting development in the region, where the horticulture industry is unable to develop due to the presence of fruit fly pests, and as long as there is no horticulture industry to protect, fruit fly control is unnecessary. The first load of bell peppers will be followed by many more with an estimated initial export volume of 31,000 metric tonnes per year which will generate substantial revenue, create jobs and contribute to poverty alleviation in one of the poorest regions in the Americas. Similar developments are in progress for export of tomatoes, papayas and other non-traditional fruits and vegetables from other areas in the region, and for which the export rule are also expected to be published by USDA in the coming months and years.

I would like to call the attention to two new coordinated research projects (CRP) that are scheduled to start in 2007. The first CRP on "Improving SIT for Tsetse Flies through Research on their Symbionts and Pathogens" was recommended by a Consultants Meeting and has now been approved for the period (2007-2011). It will focus on microbial associations, beneficial and pathogenic in nature that can influence the efficiency and implementation of area-wide integrated pest management programmes that integrate the SIT. It will include the development of methods to manage virus infections in tsetse colonies, assessment of natural incompatibilities related to the presence of Wolbachia, the development of improved population suppression methods using fungal pathogens and the development of tsetse strains refractory to infection by trypanosomes. The second new CRP on "Field Biology of Male Mosquitoes in Relation to Genetic Control Programmes" also follows a Consultants Meeting and has also been approved for the period (2007-2011). It will focus on key gaps in knowledge on adult male mosquito biology, and particularly those factors that affect the ability of males to attract, court, and inseminate females in the field. The ultimate goal of the CRP is to establish the specific biological and behavioural determinants that contribute to male mosquito sexual competitiveness. We are encouraging relevant applications to these new CRPs.

A number of collaborators have been enquiring about the status of the proceedings of the Second FAO/IAEA International Conference on "Area-Wide Control of Insect Pests: Integrating the Sterile Insect and Related Nuclear and Other Techniques" that was held last year in May in Vienna. I would therefore like to inform you that the book will be published by Springer in early 2007. With the exception of very few papers, all manuscripts have been received and peer reviewed anonymously by at least two reviewers. The revised manuscripts have likewise gone through an English editing process. These papers are now being edited internally and we anticipate that this final editing process will be completed by July 2006. Then the papers will have to be formatted as the contract with the publisher Springer demands a camera-ready copy. We anticipate that this will take another four months. We are therefore confident that we can submit the book to the publisher before the end of this year. The book will not appear as proceedings in the "strict sense" of the word, but as a text book. The title of the book will be: Area-Wide Control of Insect Pests: From Research to Field Implementation. 2007. M.J.B. Vreysen, A.S. Robinson and J. Hendrichs (eds.). Springer, Dordrecht, The Netherlands. We thank all authors for your contributions and collaboration in this process and appreciate the understanding that in addition to all our other duties, the process of peer-review, editing and formatting takes considerable time.

Jorge Hendrichs
Head,
Insect Pest Control Section

Staff

The Insect Pest Control Subprogramme staff, consisting of those in the Section located in the Vienna International Centre, those at the FAO/IAEA Agricultural and Biotechnology Laboratory in Seibersdorf and field experts, is listed below.

Insect Pest Control Section, Joint FAO/IAEA Division, P.O. Box 100, A-1400 Vienna, Austria
Tel.: (+) 43 1 2600 12628; Fax: (+) 43 1 26007 21632

Entomology Unit, FAO/IAEA Agriculture and Biotechnology Laboratory
A-2444 Seibersdorf, Austria
Tel.: (+) 43 1 2600 28402; Fax: (+) 43 1 26007 2874

Name	Title	E-mail	Extension	Location
Jorge Hendrichs	Entomologist (Section Head)	J.Hendrichs@iaea.org	21628	Vienna
Udo Feldmann	Entomologist (Tsetse/Screwworms)	U.Feldmann@iaea.org	21629	Vienna
Walther Enkerlin	Entomologist (Fruit Flies)	W.Enkerlin@iaea.org	26077	Vienna
Marc Vreysen	Entomologist (Moths/Tsetse/Screwworms)	M.Vreysen@iaea.org	26062	Vienna
Arnold Dyck	Entomologist (Tsetse) Consultant	A.Dyck@iaea.org	26164	Vienna
Magali Evrard	Senior Secretary	M.Evrard@iaea.org	21633	Vienna
Maiko Binder	Secretary	M.Binder@iaea.org	21632	Vienna
Alan Robinson	Geneticist (Unit Head)	A.Robinson@iaea.org	28402	Seibersdorf
Gerald Franz	Molecular Geneticist (Fruit Flies)	G. Franz@iaea.org	28419	Seibersdorf
Andrew Parker	Entomologist (Tsetse Rearing Technology)	A.Parker@iaea.org	28408	Seibersdorf
Carlos Caceres	Entomologist (Fruit Fly Rearing)	C.Caceres@iaea.org	28413	Seibersdorf
Herve Bossin	Molecular Biologist (Mosquitoes)	H.Bossin@iaea.org	28407	Seibersdorf
Bart Knols	Medical Entomologist (Mosquito Rearing)	B.Knols@iaea.org	28426	Seibersdorf
Janis Thailayil	Consultant (Mosquito Genetic Sexing)	J.Thailayil@iaea.org	28425	Seibersdorf
Adly Abd Alla	Consultant (Virologist Tsetse)	A.Abdalla@iaea.org	28428	Seibersdorf
Michelle Helinski	Consultant (Mosquitoes)	M.Helinski@iaea.org	28429	Seibersdorf
Idrissa Kabore	Consultant (Tsetse Blood Diet)	I.Kabore@iaea.org	28411	Seibersdorf
Jesus Reyes	Entomologist (Establishing Pilot Fruit Fly-Free and Low Prevalence Areas in Central America and Panama, RLA/5/045)	J.Reyes@medflygt.com	Tel.: (+) 502 23672087	Guatemala

Forthcoming Events

I. Research Coordination Meetings (RCMs)

Coordinated Research Project (CRP) on Improving Sterile Male Performance in Fruit Fly SIT Programmes. 4-8 September 2006, Salvador, Bahia, Brazil. Second RCM.

CRP on Development of Mass Rearing for New World (*Anastrepha*) and Asian (*Bactrocera*) Fruit Fly Pest in Support of SIT. 4-8 September 2006, Salvador, Bahia, Brazil. Second RCM.

CRP on Enabling Technologies for the Expansion of SIT for Old and New Screwworm. Canberra, Australia. 27 November to 1 December 2006. Fourth RCM.

CRP on Molecular Technologies to Improve the Effectiveness of the Sterile Insect Technique. Bangkok, Thailand. 2-6 November 2006. Third RCM.

II. Consultants and Other Planning Meetings

Workshop on Design of Tsetse Fly Mass-Rearing Facility. 17-19 July 2006, Vienna, Austria.

Workshop on Standardized Sampling and Processing of Tsetse Flies for Population Genetic Assessment. 16-24 October 2006, Uganda.

Workshop on Standardizing Sampling and Processing of Tsetse Flies for Population Genetic Assesment. Late 2006, Burkina Faso.

III. Other Meetings/Events

International Fruit Fly Course. 21 August to 8 September 2006. Metapa de Dominguez, Chiapas, Mexico.

Third meeting of the Fruit Fly Technical Panel of the International Plant Protection Convention (IPPC). 4-8 September 2006, Salvador, Bahia, Brazil.

Seventh International Symposium on Fruit Flies of Economic Importance and Sixth Meeting of the Working Group on Fruit Flies of the Western Hemisphere, 10-15 September 2006, Salvador, Bahia, Brazil.

Past Events (second half 2005/2006)

I. Research Coordination Meetings (RCMs)

CRP on Improvement of Codling Moth SIT to Facilitate Expansion of Field Application. 16-20 September 2005, Mendoza, Argentina. Second RCM.

CRP on Development of Standardised Mass Rearing Systems for Male Mosquitoes. 5–9 December, 2005, Vienna, Austria. First RCM.

II. Consultants and Other Planning Meetings

Consultants Meeting To Prepare Harmonized Guidelines for Transport, Packing and Release of Sterile Fruit Flies, 22-26 August, 2005, Vienna, Austria.

Consultants Meeting to Refine Manual on Entomological Baseline Data Collection for Tsetse Control Programmes with Special Attention to GIS, Population Genetics and Database Management, 10-14 October 2005, Vienna, Austria.

Consultants Meeting on Role of Symbionts and Pathogens in Tsetse SIT. Vienna, Austria, 6-10 March 2006.

Consultants Meeting on Assessing the Minimum Size Area for Application of an Area-wide SIT Programme Against Selected Insect Pests. Vienna, Austria, 3-7 April 2006.

III. Other Meetings/Events

Second Meeting of the Fruit Fly Technical Panel of the International Plant Protection Convention (IPPC). 19-23 September 2005, San Jose, Costa Rica.

Roundtable on Codling Moth Control in Conjunction with the Sixth Argentinean Congress of Entomology. 12-14 September 2005, Tucuman, Argentina.

Workshop on Pest and Weed Control in Sustainable Fruit Production, organized by the Research Institute of Pomology and Floriculture. 1-3 September 2005, Skierniewice, Poland.

Eleventh Meeting of the Advisory Group of the Programme Against African Trypanosomiasis (PAAT). 21-22 September 2005, Addis Ababa, Ethiopia.

Thirtieth Meeting of the Executive Committee of the International Scientific Council for Trypanosomosis Research and Control (ISCTRC). 25 September 2005, Addis Ababa, Ethiopia.

Twenty-eighth Meeting of the ISCTRC. 26-30 September 2005, Addis Ababa, Ethiopia.

The Second Meeting of the International Organisation for Biological and Integrated Control of Noxious Animals and Plants West Palaearctic Regional Section Group on Integrated Protection of Olive Crops. Polo Scitifico of Sesto Fiorentino, 26-28 October, 2005, Florence, Italy.

FAO/IAEA Regional Training Course on Principles of Base-line Data Collection for Integrated Area-wide Tsetse and Trypanosomosis Inervention Projects with a Sterile Insect Technique Component, Nairobi, Kenya, 13 March to 7 April 2006.

Tenth Meeting of the Pan African Tsetse and Trypanosomosis Eradication Campaign (PAAT) Programme Committee. Istituto Agronomico per l'Oltremare (IAO), Florence, Italy, 26-27 April 2006.

FAO/IAEA Interregional Training Course on "The Use of the Sterile Insect and Related Techniques for the Integrated Area-wide Management of Insect Pests", University of Florida/USDA, Gainesville, Florida, USA, 10 May – 7 June 2006.

Note: Reports available upon request

Technical Cooperation Projects

The Subprogramme has currently technical responsibilities for the following technical cooperation projects that are managed by the IAEA Technical Cooperation Department. They fall under five major areas, namely:

- Tsetse
- Fruit flies
- Old and New World Screwworm
- F-1 Sterility for the Control of Lepidopteran Pests
- Mosquitoes.

Project Number	Title	Technical Officer
	Ongoing Projects That Started Before 2005	
ALG/5/019	Control of Date Moth Using the Sterile Insect Technique	Marc Vreysen
BOT/5/002	Support of Tsetse Eradication from Ngamiland	Udo Feldmann
EGY/5/025	Area-Wide Fruit Fly Control in Eastern Egypt	Jorge Hendrichs
ETH/5/012	Integrating SIT for Tsetse Eradication	Udo Feldmann
INT/5/145	Promotion of Insect Pest Control Using the Sterile Insect Technique	Jorge Hendrichs
IRQ/5/016	Field Monitoring and Rearing of Old World Screwworm	Udo Feldmann
ISR/5/010	Upgrading the Area-wide Control of Mediterranean Fruit Fly using the Sterile Insect Technique	Jorge Hendrichs
JOR/5/009	Upgrading the Area-wide Control of the Mediterranean Fruit Fly using the Sterile Insect Technique	Jorge Hendrichs
KEN/5/022	Integrated Area-wide Tsetse and Trypanosomosis Management in Lambwe Valley	Udo Feldmann
MAG/5/011	Feasibility Study of SIT-based Integrated Pest Management of Fruit Flies	Walther Enkerlin
MAR/5/015	Feasiblity Study for Integrated Use of the Sterile Insect Technique for Area-wide Tephritid Fruit Fly Control	Jorge Hendrichs
MEX/5/027	Transfer of Genetic Sexing Mass Rearing Technologies for Fruit Fly Production	Walther Enkerlin
PAL/5/002	Area-wide Application of SIT for Medfly Control	Jorge Hendrichs
RAF/5/051	SIT for Tsetse and Trypanosomosis Management in Africa	Udo Feldmann
RAF/5/052	SIT Development for Control of Anopheles Mosquito	Bart Knols
RLA/5/045	Preparation for Pilot Fuit Fly-free Areas using the Sterile Insect Technique in Central America	Walther Enkerlin
SAF/5/007	Expanding the Use of the Sterile Insect Technique against Fruit Pests in the Western and Northern Cape	Jorge Hendrichs
THA/5/046	Area-wide Integrated Control of Fruit Flies	Walther Enkerlin
	Ongoing Projects Started in 2005	
BGD/5/025	Studying the Feasibility of Integrating the Sterile Insect Technique	Udo Feldmann

	in Sun-dried Fish Industry Project	
BRA/5/057	Establishment of Medfly, Fruit Fly Parasitoids and Codling Moth Rearing Facility	Walther Enkerlin Carlos Caceres
BKF/5/004	Feasibility Study on Applying the Sterile Insect Technique to Create a Tsetse-free Zone	Marc Vreysen
CHI/5/047	Upgrading Release Systems for Mediterranean Fruit Fly Containment in the Arica Region	Walther Enkerlin
INT/5/149	Interregional Training Course on the Use of the Sterile Insect Technique and Related Techniques	Jorge Hendrichs
ISR/5/011	Strengthening the Capacity for the Area-wide Control of the Mediterranean Fruit Fly Using the Sterile Insect Technique	Jorge Hendrichs
JOR/5/010	Stengthening the Capacity for the Area-wide Suppresion of the Mediterranean Fruit Fly Using the Sterile Insect Technique	Jorge Hendrichs
MAL/5/020	Feasibility Study for the Creation of a Zone Free of Tsetse	Marc Vreysen
MEX/5/029	National Prevention Campaign against the Cactus Moth	Walther Enkerlin
MOR/5/028	Assessing the Feasibility of Medfly Suppression through the Sterile Insect Technique	Udo Feldmann Walther Enkerlin
PAL/5/003	Strengthening the National Capacity for the Area-wide Suppression of the Mediterranean Fruit Fly	Jorge Hendrichs
PAK/5/043	Development of Biological Control for Cotton Pest Management Using Nuclear Techniques	Jorge Hendrichs
SAF/5/009	Preparation for the Creation of Zone Free of G. *brevipalpis and* G. *austeni*	Marc Vreysen
SEN/5/029	Feasibility Study to Create a Tsetse-free Zone Free Using the Sterile Insect Technique	Marc Vreysen
TUN/5/022	Implementation of the Pilot Programme Using Sterile Insect Technique Against the Mediterranean Fruit Fly, Phase II	Walther Enkerlin
URT/5/022	Assistance to a Feasiblity Study for the Use of the Sterile Insect Technique	Marc Vreysen
UGA/5/024	Integrated Area-wide Tsetse Eradication Programme in the Lake Victoria Basin	Marc Vreysen

In keeping with our policy to highlight activities of a few of our Technical Cooperation Projects, the following projects are discussed in this issue:

TC Project in Bangladesh on Studying the Feasibility of Integrating the Sterile Insect Technique Against Fly-Strikes During Sun-Drying of Fish (BGD5025)

Bangladesh produces about 270 000 metric tons of marine fish annually from the Bay of Bengal. A large quantity (about 30 000 metric tons) of fish is sun-dried on the offshore islands and some other coastal areas. Fish drying is a seasonal business, starting from late September to March. High densities of fly populations affecting fish during sun drying are observed in the drying beds ('bashas') between October and March, with the peak infestation period from late October to early November. It has been estimated that without strict control measures that may be hazardous to human health about 25% of the fish is lost every year due to fly strikes. At present, traditional intervention methods include salting and dipping fish in insecticides. Most consumers do not like salted fish, and there is raising concern regarding the use of insecticides, as they cause health hazards and environmental pollution. Therefore, authorities have requested to explore alternative approaches, including the feasibility of a SIT com-

ponent for addressing this problem. Upon request of the Government of Bangladesh, the IAEA approved in late 2004 a TC project that aims at exploring the technical and economic feasibility of using the sterile insect technique (SIT) as part of an integrated approach for preventing or reducing insecticide use and losses due to fly strikes among marine fish during sun-drying in offshore islands and coastal areas.

Prior to the initiation of activities under this project, the Bangladesh Atomic Energy Commission (BAEC) undertook research and development activities relevant to blow fly suppression using SIT. These efforts resulted in some relevant national capability in rearing, radiation biology of blow flies and SIT-relevant field activities, including test releases of sterile flies. Experimental results have shown good prospect to rear and release the relevant blow fly species at the laboratory level and to conduct test releases in the field.

Fish is dipped in insecticide before it is dried to prevent infestations from the blow fly.

In 2005 and 2006 the project activities, which involved expert missions (in entomology and agricultural economics), fellowships and the provision of rearing equipment, focussed on systematic field sampling and small-scale rearing of blow fly species. The project has meanwhile identified a site and developed architectural drawings for the construction of a small mass-rearing centre at the premises of the Atomic Energy Research Establishment, BAEC, in the vicinity of Dhaka. Two blow fly species appear to be most important in causing the fly strike losses, namely the 'sheep blowfly', *Lucilia cuprina* (Wiedemann), and *Chrysomya megacephala* (Fabricius), also known as 'Oriental latrine fly'. Specialists at the Natural History Museum in London, UK, and an FAO reference centre for the identification of screwworm, blow fly and related insect pests, will collaborate in analysing field specimen collected over the seasons. This will be instrumental for assessing possible intervention options and the feasibility of a SIT component.

Some 30 000 tonnes of fish are sun dried before distribution to local markets

Meanwhile the project also arrived at an estimate on how inexpensive it is for the dry fish producers to 'protect' their fish against fly strike losses by using (usually illegal, mainly organophosphate) insecticides: an investment of only $ 0.01 per kg dried fish is required. However, an economic assessment should not only measure the losses in protein from fly strikes during fish drying. In this context the project now aims at involving specialists from Dhaka University to also assess the socio-economic and health losses to the human population as a result of ingesting long-persistent insecticides. As one measure the number of disability adjusted life years, (DALY) is intended to be calculated.

Since 2005 the project has benefited substantially from the close interaction between staff of the BAEC and the Department of Agricultural Extension, Ministry of Agriculture and Dhaka University. It has been proposed that, in addition, an effort be undertaken to generate awareness and explore options for collaboration with a) relevant human health authorities (particularly regarding the health aspects of pesticide accumulation in humans); and b) DFID, FAO and other bi- or multilaterally funded projects in Bangladesh and the ASEAN sub-region, which aim at improved post-harvest utilisation of fish in an effort to increase the quality and quantity of fish protein for local consumption and for exports. It is also anticipated to involve MSc students of the Dhaka University in project activities on entomology, economics and food chemistry or related fields. Thus it is expected to generate a better understanding on aspects including: a) the movement and population dynamics of the main fly species involved in the fly strikes, including the seasonality of population increase, taking into consideration climatic changes and, for example, the intervals of supply with large and small fish; b) work on fly attractants and possible fly control methods in the vicinity of the fish drying

'bashas' other than dipping fish in insecticides and which can be used in support of a possible SIT component; c) analysis of the types of insecticides / pesticides used in the fish-drying process and their persistence and risk of accumulating in the human body; d) socio-economic and health losses to the human population as a result of ingesting long persistent insecticides and e) awareness generation among fish farmers regarding safety aspects of fish drying. It has also been proposed that the activities under IAEA-TC project BGD5025 be closely harmonised with activities under a newly proposed TC project on persistent organic pollutants and pesticide residues, provided this project will be approved.

Meeting of National Coordinators Under the Regional Tsetse TC Project "Sterile Insect Technique for Area-wide Tsetse and Trypanosomosis Management" (RAF5051), Vienna, 7–9 December 2005

The IAEA's "Tsetse - The Way Forward" review process in 2004 re-emphasised the Agency's focused role in integrating the SIT component into Member States' efforts to fight the tsetse and trypanosomosis (T&T) problem. During the past two years the Pan African Tsetse and Trypanosomosis Eradication Campaign of the African Union (AU-PATTEC) and initially six Member States, namely Burkina Faso, Ethiopia, Ghana, Kenya, Mali and Uganda (five of whom are supported by the IAEA under the Technical Cooperation Programme) were successful in obtaining substantial loans and some grants to support intervention campaigns against the tsetse and trypanosomosis (T&T) problem in the context of agriculture and rural development, including a loan from the African Development Bank (AfDB) worth about US $80 million. The AfDB support aims to create sustainable tsetse-and-trypanosomosis-free areas by integrating suppression, control and eradication technologies, while ensuring that the reclaimed areas are sustained and equitably and economically utilized. Some of these national or transboundary campaigns may necessitate a sterile insect technique (SIT) component and, therefore, IAEA assistance.

In support of the overall goals of AU-PATTEC, the regional IAEA-TC project *Sterile Insect Technique for Area-wide Tsetse and Trypanosomosis Management (RAF5051)* seeks to assist in the development of an African network fostering the introduction, as appropriate, of the SIT as a component of an area-wide integrated pest management (AW-IPM) approach for establishing and progressively expanding zones that are free of tsetse flies. Activities include:

- mapping of tsetse infestations to identify isolated or confined fly populations in development areas;
- defining and evaluating the inputs required for the removal of tsetse flies from such areas and designing appropriate implementation protocols;
- assisting the AU and Member States in the task of implementing PATTEC's Plan of Action;
- promoting an area-wide, concerted approach to combat this transboundary problem through enhancement of regional cooperation, central coordination, and harmonization of tsetse control policies, strategies and activities.

Approved IAEA inputs under this project include: expert services; regional training events; organization of and support to participation in meetings, conferences, seminars, and workshops; materials and equipment for tsetse mass production, reproductive sterilization and release; SIT-relevant information and planning materials; maintenance and provision of seed colony material and support to transboundary exchange of biological material; partnership building for SIT and regional networking.

A RAF5051 Project Coordination Meeting of national counterparts of IAEA-assisted TC projects was held in Vienna from 7–9 December 2005. Invited speakers and counterparts had been requested to prepare for and make presentations in the respective sessions. In particular, counterparts were requested to include in their presentations information on:

- Management set-up
- Partners on board (including specification of the role of the partners)
- Information / evidence of national commitment
- Possibly necessary bi-lateral / sub-regional agreements
- Steps towards getting AfDB funds
- Description of target field area
- Available baseline data
- Description of approach (with feasibility considerations) and time lines
- Specification of SIT component (how many flies needed, when, from where)
- Steps in place to secure sterile males
- Current status in the field and the 'lab'

The following Member States and international organizations and fora were represented at the meeting:

Western Africa: Burkina Faso, Ghana, Mali and Senegal. Eastern Africa: Ethiopia, Kenya, Sudan, United Republic of Tanzania and Uganda. southern Africa: Botswana and Zimbabwe. International organizations and fora: AU-PATTEC, FAO, IAEA, WHO, PAAT.

One session of the meeting aimed at identifying where the mandated international organizations (FAO, IAEA and WHO), would come with their specific support. Two sub-regional sessions were held, in which the Member States, were asked to identify and specify the needs regarding support relevant to the IAEA tsetse SIT package. A draft proposal was prepared with terms of reference for possible FAO, IAEA and WHO technical assistance to the six AfDB supported national PATTEC projects along an agreed phased and conditional approach. Below are some concluding points that resulted from the meeting:

- All countries demanded the assistance of UN-mandated organizations. The phased conditional approach for international (FAO, IAEA and WHO) assistance to T&T projects is increasingly accepted and understood by Member States. Continued awareness generation regarding this approach is needed.
- Further detailed feed-back is required from the counterparts in each Member States and IAEA TC field project on the specific assistance that may be needed from FAO, IAEA and WHO. To facilitate this, a questionnaire was distributed among the counterparts.
- The meeting participants appreciated receiving a copy of the draft "FAO/IAEA Guidelines for Conducting Baseline Tsetse Surveys for Area-Wide Integrated Pest Management Programmes". With feed-back from the counterparts and from participants in a FAO/IAEA Regional Training Course on the subject (Nairobi, 13 March – 7 April 2006) and respective revisions, the guidelines are expected to be finalized later in 2006 and made available to collaborators in Member States.
- In addition to training on technical aspects there is need for management training for senior staff involved in operational area-wide T&T intervention projects.
- SIT remains among the major tools for T&T intervention but may not be needed in all scenarios. Particularly in case there is need for a SIT component, the planning of the concerned intervention campaigns needs to be based on the area-wide concept of integrated pest management (AW-IPM), and action is needed to reduce the substantial shortage regarding the number of available sterile males.
- An assessment of the technical, economic and environmental feasibility of the sequential aerosol technique (SAT) is needed in several countries. PAAT and mandated organizations were requested to develop a position paper on SAT. Member States are urged to conduct respective local studies to generate the required information for decision makers.

The Southern Rift Valley Tsetse Eradication Project – STEP, supported by IAEA Through TC Project "Integrating Sterile Insect Technique for Tsetse Eradication" (ETH5012)

In 1997 the Ethiopian Government – assisted by the IAEA – initiated a collaborative effort against the tsetse and trypanosomosis (T&T) problem in the Southern Rift Valley (SRV) of Ethiopia with two long-term objectives: a) creating a zone free of the T&T problem in a 25 000 km² area under agricultural development in the SRV; and b) establishing a national capacity for applying the concept of area-wide integrated pest management (AW IPM) against the T&T problem, involving a sterile insect technique (SIT) component.

An important first measure was the collection and evaluation of entomological, veterinary, environmental and socio-economic baseline data. The information generated thereof was instrumental for generating international acceptance for the SRV being an area with high priority for T&T intervention and related sustainable agriculture and rural development (SARD). This brought "on board" FAO and other important international partners and greatly facilitated approaching donors.

At the same time the project initiated the colonization of the target tsetse fly species, using a local *Glossina pallidipes* strain from the SRV. "Seed" fly materials for the eventual production of another species, *G. fuscipes fuscipes*, which does not occur in the main SRV but in parts of a small adjacent valley, along a few rivers that drain to the West into the Omo river basin, are available from elsewhere. In 2005, another mass rearing adapted strain of *G. pallidipes*, which is reported to be behaviourally compatible with the target *G. pallidipes* strain, is scheduled to be transferred to the first of in total six sterile male production factory modules at Kaliti, Addis Ababa.

In 2002, the project initiated community-based tsetse suppression activities involving insecticides on cattle and on blue-black-blue fabric targets that attract tsetse flies. Furthermore, some limited entomological and veterinary

monitoring was initiated. Meanwhile tsetse suppression is taking place in all operational grids of the 10 500 km² STEP block-1 area, of which approximately 20% is inaccessible and an additional 15–20% is in-between communal land and not covered by the community-based tsetse suppression activities. Over the past year the control measures contributed to some reported improvements of the livestock performance.

While the community-based tsetse control efforts reduced the apparent density of *G. pallidipes* by 92%, the trypanosome prevalence only decreased by 58%, even though infected animals received curative doses of trypanocides. This can be explained by the possibility that cattle may have grazed in areas with no ongoing tsetse control and by the fact that tsetse flies are known to be efficient vectors of trypanosomosis even at substantially reduced vector population density. This is why a sustainable removal of the tsetse-transmitted trypanosomosis problem necessitates a complete elimination of the vector in all parts of the project area along an AW IPM approach.

Prior to the initiation of SIT operations it will be necessary to introduce tsetse control measures also in the inaccessible 20% and all other currently not covered land of the project area, possibly involving methods like the sequential aerosol technique (SAT) involving the repeated (usually 4–5 cycles in approximately 16 day interval) spraying of ultra-low volume formulations of non-persistent insecticides.

Test releases of sterile males are anticipated to take place as of late 2006 and – provided the required activities can be implemented as scheduled – operational releases may be initiated in 2007 or 2008, subsequent to a phase of intensive area-wide pre-release tsetse suppression.

There are some important non-technical issues that should be addressed before STEP enters the operational phase. Among these are: a) the introduction of set of implementation rules and regulations that are tailored to the special needs of an operational AW IPM campaign; b) the need for efficient management structures that permit responding in an appropriate, efficient and flexible manner to developments that may not be entirely predictable; and c) the provision of some financial flexibility.

Several factors contributed to the progress reported so far under STEP. These include high and consistent Government commitment at the national and regional level in Ethiopia, the recruitment and adequate training of highly dedicated project staff in the laboratory and the field, emphasis on strong community participation, involvement of the local academia in various project activities and targeted support from the main partner institution (IAEA) and other supporting donors, including the US Government, China and the OPEC Fund. This brought on 'board' important additional partners like FAO and greatly facilitated approaching donors like the African Development Bank (AfDB) and the United Nations Trust Fund for Human Security (UNTFHS or Japan Security Fund). In 2005 AfDB approved a loan and a grant in support of STEP amounting to US$ 13.27 million and US$ 350 000, respectively. In March 2006 the United Nations Trust Fund for Human Security (UNTFHS; also called the Japan Security Fund) approved US$ 1.712 million in support of STEP and related rural agricultural development activities (also see below copy of joint FAO/IAEA/UNTFHS press-release 1st March 2006).

Other Relevant Development Related With Technical Cooperation Project ETH5012: "Japanese Government and UN to Support Ethiopian Tsetse Fly Control Campaign"

The Japanese Government and the United Nations have committed over $1.7 million to a joint IAEA-FAO project to remove the tsetse fly and the diseases it transmits from the Southern Rift Valley in Ethiopia.

The money is being made available through the UN Trust Fund for Human Security, which has distributed US $256 million since it was established in the UN Secretariat at the initiative of the Japanese Government in 1999.

Ridding the Southern Rift Valley of the tsetse fly will reduce pressure on overcrowded hillsides to which farmers have retreated to escape the spread of the tsetse fly, leaving fertile river valleys unused.

The tsetse fly transmits the trypanosome parasite. In Ethiopia trypanosomosis causes a devastating disease among domestic livestock. Elsewhere, in some of the 37 sub-Sahara Africa countries infested by the tsetse fly, trypanosomosis also causes sleeping sickness in humans.

Welcoming the Japanese commitment, IAEA and FAO officials said that the assistance marks the conclusion of years of consensus building on the right approach to follow in fighting the tsetse and trypanosomosis problem.

It also follows a major effort by the Ethiopian government to invite international agencies to agree on a national approach to be pursued in the tsetse-infested Southern Rift Valley

The programme in Ethiopia will integrate the sterile insect technique (SIT), which involves the release of colony-bred sterilised flies with other control methods to suppress the wild population, coupled with the development of a programme for sustainable use of newly available land.

Reporting on Ongoing and Planned Coordinated Research Projects (CRPs) and RCMs

The First RCM on Development of Standardised Mass Rearing Systems for Male Mosquitoes Was Held in the Austria Centre, Vienna, 5-9 December, 2005.

The first Research Coordination Meeting (CRP) focusing specifically on mosquito rearing in an SIT context brought together scientists from Kenya, Pakistan, Sudan, United Republic of Tanzania, United Kingdom and the USA. An expert in aquaculture from Belgium (Prof. Sorgeloos) also attended the meeting, besides several staff of the Insect Pest Control Subprogramme.

The research in this CRP focuses on three critical steps in the development of mosquito SIT: a) the transition of wild-type insects from a prospective field release locality into the laboratory (i.e. colonisation), b) the step-wise increase in production of high-quality and competitive male mosquitoes to levels required for releases (i.e. mass production), and c) the pre-release adult maintenance requirements including nutrition and preparation for release (i.e. holding, packaging, transportation).

This meeting assembled the existing contract and agreement holders plus IAEA staff and consultants to review progress and plans made by the members and those in related disciplines. Based on this, existing plans were refined in view of priority areas of research that were discussed during the meeting.

Two days were spent in formal presentations, followed by discussions over three days to formulate priorities and research plans. One afternoon consisted of a tour of the Entomology Unit in Seibersdorf for demonstrations of the procedures and equipment being developed or already implemented for the cultivation of tsetse, fruit flies, and *An. arabiensis*.

New CRP Improving SIT for Tsetse Flies through Research on their Symbionts and Pathogens, 2007-2012.

The CRP was approved following a Consultants Meeting held in Vienna in March 2006 involving major experts on arthropod and insect pathology with the objective of advising the Agency, in the context of SIT-based area-wide tsetse and trypanosomosis intervention, on: a) possible obstacles, as well as, synergistic or enhancing effects associated with pathogens and symbionts of tsetse flies; b) opportunities and priorities for research and methods development aiming at alleviating or eliminating problems and maximizing possible benefits linked to tsetse pathogens and symbionts; and c) possible collaborators to address identified research themes.

The consultants recommended, given the limited knowledge available to manage tsetse symbionts and pathogens, and the importance and current demand for improving the cost-effectiveness of SIT application against major tsetse species, to initiate a new CRP focused on: a) developing a better understanding of the biology of microorganisms related to tsetse, and b) addressing current constraints related to these organisms to allow enhancing the efficiency of the SIT for tsetse. The new CRP, harnessing the recent developments in tsetse, symbiont and pathogen genetics and genomics, will focus on the development of methods to manage the virus infection in tsetse colonies, an assessment of natural incompatibility related to the presence of *Wolbachia*, the development of improved population suppression methods using fungal pathogens, and the development of tsetse strains refractory to infection by trypanosomes.

Achieving the objectives of the CRP would be of direct benefit to the expansion of the SIT for tsetse through mass production of healthy colonies for production of sterile males, development of parasite resistant SIT lines that can be applied in disease endemic areas, and incorporation of natural incompatibilities for production of fitter sterile males. The beneficiaries would be: 1) livestock and people in the endemic areas through reduced disease from trypanosomosis; 2) livestock producers through increased profitability; 3) the environment through reduced insecticide use; 4) countries free of tsetse by greatly reducing, or possibly eliminating, the risk of introduction of these devastating pests and therefore, greatly improved farm productivity.

Researches in the fields of microbiology and molecular biology and others with interest in the biology, manipulation or control of tsetse symbionts and pathogens are encouraged to apply for research contracts or agreements.

The first research coordination meeting is planned for March/April 2007 in Vienna, Austria, and the deadline to submit applications for research contracts and research agreements is October 2006. The application forms may be downloaded from the web at http://www-crp.iaea.org/html/forms.html

New CRP on "Field Biology of Male Mosquitoes in Relation to Genetic Control Programmes" (planned for the period 2007-20011)

The current mosquito SIT feasibility project at the FAO/IAEA Agriculture and Biotechnology Laboratories addresses the following issues: a) developing methods of mass rearing, b) improving sterilization, handling and release methodology, c) devising genetic and molecular methods for the production of males, and d) improving field evaluation of release mosquitoes.

Unlike female mosquitoes, that frequently imbibe blood (every 2-3 days), male mosquitoes are not blood feeders and thus do not transmit disease. They do, however, transfer genes to females during mating and are therefore logical agents for genetic control. Paradoxically, although female biology and behaviour have been intensively studied, relatively little is known about males. In particular, the specific factors that contribute to male reproductive success are virtually unknown. Nevertheless, the success of any genetic control programme will hinge on the sexual competitiveness of the mass-reared released males.

Any genetic control programme is a process, beginning with colonization and mass rearing of males, followed by shipping and finally release of these males in the target population. An ongoing CRP is focusing on developing methods of mosquito mass rearing, leading to the point of release. As a logical extension, this CRP proposes to study the factors occurring following release that may have an impact on the success of the programme. Accordingly, the objectives of the proposed CRP are to study laboratory and field populations of adult male mosquitoes to establish the specific biological and behavioural determinants that contribute to male sexual competitiveness.

A competitive male is defined as one that will be able to copulate wild females in the field at a rate comparable to wild males, and subsequently prevent females from laying viable eggs. The factors that contribute to this competitiveness are myriad and are determined both by natural and sexual selection, therefore this CRP will focus on male physiology and sexual behaviour, male bionomics, and male influences on the females they inseminate. Considering the current absence of sampling methods for male mosquitoes, and appropriate marking methods to study the fate of released males, research in these two areas has also been included.

Specifically the proposed CRP will focus on the biology and competitiveness of male mosquitoes in the field once they have been mass-reared and released, and will strive to acquire detailed, specific and field-based information on all events in the life of adult male mosquitoes that impact their sexual competitiveness. Specific activities will be: a) male physiology and behaviour, including a) male nutrition, b) spatial and temporal partitioning of sexual encounter sites, c) male copulatory success, d) male effects on females, e) male dispersal, and f) male survival rate; and B) Male sampling tools, including a) development of sampling methods for male mosquitoes, and b) marking methods for male mosquitoes.

We encourage applications for research proposals. Research contract and research agreement forms can be obtained from the web at http://www-crp.iaea.org/html/forms.html

Developments at the Entomology Unit Seibersdorf

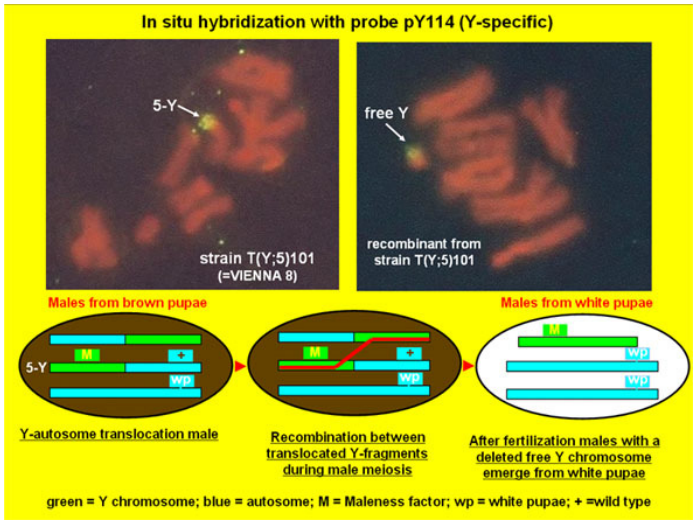
FRUIT FLIES

Type-2 Recombination in Y-autosome translocation strains

The most common instability in genetic sexing strains (GSS) is caused by genetic recombination between the translocated and the free autosome (type-1 recombination). GSS males are heterozygous for the respective selectable marker(s) (e.g. white pupae; *wp* and/or temperature sensitive lethal, *tsl*), i.e. the wild type allele of the marker is linked to the Y chromosome and the mutant allele is found on the free autosome. Type-1 recombination leads to a reversal of the correlation between marker and sex found normally in a GSS, i.e. recombinant females emerge from brown pupae and recombinant males from white pupae. However, in a mass rearing colony only the recombinant females accumulate because they have a selective advantage as compared to the non-recombinant females. The type-1 recombinant males, although they are generated initially at the same frequency as the recombinant females, can be detected only at very low frequencies, i.e. they do not accumulate in the colony.

In all cases where GSS were reared in the past, the scenario described above is changed by a very rapid accumulation of males emerging from white pupae. Although these males have the same phenotype as the type-1 recombinant males they are genetically distinct. In genetic test crosses they show no pseudo-linkage between the marker and sex, i.e. they behave as if they carry a free Y chromosome. To verify this, cytological analyses are required. Already the analysis of mitotic chromosomes reveals that indeed the Y-autosome translocation is reverted to a free Y chromosome. To obtain a more detailed insight into the nature of the recombination the different parts of the Y chromosome are labelled via in situ hybridization with appropriate DNA probes (in collaboration with A. Zacharopoulou, University of Patras). Especially useful for this analysis are two probes, a Y-specific clone, pY114, isolated by D. Haymer (University of Hawaii) and clones derived from the rDNA cluster. The figure on this page shows the result of an in situ hybridization experiment using the probe pY114. On a wild type Y chromosome this probe labels ca 90% of the long arm of the Y chromosome. It does not hybridize to the short arm and the proximal 10% of the long arm. These regions are labelled exclusively with the rDNA probe. In a short stretch both regions overlap.

As described in Newsletter 63 two related GSS, T (Y5)101 and T(Y; 5)101-Sr, were mass reared in Seibersdorf. During the routine QC assessment males emerging from white pupae were detected. With 56 of these single male families were established and analysed genetically. This analysis showed that none of these families carries a translocation. In the figure a mitotic spread of the original GSS (T(Y; 5)101 = VIENNA 8) is compared to one prepared from one of these exceptional males emerging from white pupae. It is evident that the latter carries a free Y chromosome. Experiments are ongoing where the rDNA probe is used.



Result of an in situ hybridization experiment using the probe pY114

The free Y chromosome is the consequence of a recombination event (called type-2 recombination) between the two translocated Y fragments (see figure). Depending on where the recombination took place on the two fragments, the resulting free Y chromosome carries shorter or longer deletions of the Y material. In extreme cases Y chromosomes with a deletion of roughly two thirds of the distal part of the long arm were observed. Despite this very long deletion such males do not show any obvious phenotype, i.e. it can be concluded that this part of the Y chromosome does not carry any essential function. A free Y chromosome restores the fertility, i.e. while the normal Y-autosome translocation carrying GSS males are semi-sterile, the type-2 recombinant males are fully fertile. This explains why they accumulate so extremely rapidly in the mass rearing colony. In a Filter Rearing System type-2 recombinant males can be detected and removed in the filter. However, due to the extremely rapid accumulation in the colony it cannot be excluded that type-2 recombinant males are present at a certain frequency in the amplification or the release colony. This will lead to a reduction in productivity as these males are homozygous for the selectable marker(s) and will be eliminated in the sexing procedure.

Assessment of Transgenic Strains

Transgenesis offers the possibility to generate sexing strains or other strains improving the SIT even in pest species where genetic knowledge is minimal or even lacking completely. Many species have been transformed already, but many questions related to the applicability of such strains in SIT are still unanswered. Especially, the performance of such strains under mass rearing conditions has not been tested. For example, the stability of the transgene in large colonies maintained for extended periods of time cannot be predicted with the data available today.
In the continuing effort to generate and evaluate transgenic sexing strains a new set of transformation experiments was performed. In collaboration with Al Handler (USDA, Gainesville, USDA) six different constructs, all based on the mobile element *piggyBac*, were injected into Mediterranean fruit fly embryos. In total, ca 3600 embryos were injected and between 33% and 65% survived to the larval stage. Additional injections were done with the Mexican fruit fly, *Anastrepha ludens*. Unlike in the experiments with Mediterranean fruit fly, the survival of the injected embryos was here very low, i.e. of ca 400 injected embryos only 30 (= 4%) survived to the larval stage. The survival of later stages was within the values observed for medfly. All surviving G0 flies were crossed with flies from an appropriate strain, i.e. 20-25 G0 females in middle cages and 5-6 G0 males in small cages. G1 eggs were collected every second day in total 9 times.

In one of these experiments, an attempt was made to generate strains that carry a deleted transformation vector lacking one of the terminal inverted repeats. This is in the context of generating stable strains, i.e. strains where the inserted transgene is fixed to its original position in the genome. All transformation vectors in use today are based on mobile elements that are members of families of related elements. It follows that one potential cause for instability could be the cross mobilization of the integrated transgene by related endogenous elements present in the target species. Such a process would require an interaction between the transposase produced by the endogenous element and the two inverted repeats of the *piggyBac* transformation vector. These two repeats are initially required to allow *piggyBac* transposase-mediated integration of the construct into the target genome. However, after integration they are dispensable and could be removed without negative consequences.

For this purpose Handler et al. have generated, and tested successfully in *Drosophila*, a construct that carries three inverted repeats: two left (L) and one right (R) in the order L_1-L_2-R. Two fluorescent marker genes are inserted, *EGFP* (green fluorescence) between L_1 and L_2 and *DsRed* (red fluorescence) between L_2 and R.

As a first step this construct (plus the required helper plasmid providing the *piggyBac* transposase activity) was injected into medfly embryos and the resulting offspring was screened for individuals that express both markers. Such a phenotype would indicate that the entire construct, and not only the fragment L_2-R which in itself would be sufficient for integration, was integrated into the genome. This was achieved successfully, i.e. several lines were generated with varying intensities of the two types of fluorescence.

In a second step, one of these lines was re-injected with only the helper plasmid to provide transposase activity to mobilize, and thereby eliminate, the subfragment flanked by L_2 and R. If successful, offspring is generated that show the green but lack the red fluorescence. This was achieved successfully and several individuals with only green fluorescence were detected. Further experiments will be required to analyse the genetic and molecular constitution of these lines.

South American Fruit Fly Maturation

As reported in previous newsletter and in the Annual Report 2005, a preliminary experiment was conducted in collaboration with a consultant (P. Teal, USDA, Gainesville, USA) to determine if either topic treatment or feeding of adults with Juvenile Hormone "JH" (methroprene) could accelerate sexual maturity of the South American Fruit Fly (*Anasterpha fraterculus)*. Results of a laboratory mating competitiveness test have shown that 7-day-old males treated with methoprene obtained more matings than untreated 14-day-old males. An additional experiment has been planned to be conducted in the Seibersdorf laboratory during June 2006. This experiment will be conducted in collaboration with a consultant from "Instituto Nacional de Tecnologia Agropecuaria" (INTA), Castelar, Argentina, Mr. Diego Segura. These experiments have the objective to corroborate whether or not methoprene accelerates sexual maturity and enhance mating success of *A. fraterculus* males when tested at field cage level.

Olive Fly Mating Compatibility

Three colonies of the olive fruit fly (*Bactrocera oleae*) are maintained in the Entomology Unit. One from Democritos, Greece (more than 30 years old), a hybrid strain (5 backcrosses between Democritos ♀ x Valencia ♂, one

Olive fly oviposition cage

year old) and a new laboratory colony received from Dr. Mark Robertson USDA-ARS, California. This strain was colonized with wild material from infested olives collected in California. These strains have been maintained to conduct strain behaviour and compatibility studies. In collaboration with a consultant from the University of Heraklion, Greece, Mr. Antonis Chrisantis, field cage tests were conducted to determine the sexual activity profile and mating compatibility of three strains: a laboratory colony from Heraklion, Greece; the Seibersdorf colony (originally from Democritos, Greece) and the laboratory strain from California. Strains were released in the field cage around 9.00 a.m. In all tests there was very little fly movement for the first 2 hours with most flies being found on the cage netting in groups of 20-30 individuals. After this period the flies started to approach the host trees and the first mating started at about 13:00–14:00 hrs when light intensity was 3050 lux. The sexual activity was maintained until sun set with most mating occurring when light intensity was between 2 and 400 lux. For flies from Heraklion, the first mating was observed at about 13:00–14:00 hrs when light intensity was 1450 lux and the peak of sexual activity for this strain occurred when light intensity was 100 to 200 lux. The flies from California only started mating at about 15:30 hrs when light intensity was 187 lux. One possible explanation for this is that the Californian colony is a new colony (about 4-5 years old) and may still have some behavioural elements of the wild population, which normally starts mating at the end of photophase, slightly before the sunset. It was also concluded that laboratory flies from all colonies had a good index of participation in mating.

At the same time, preliminary mating compatibility test between laboratory flies from the colony from Democritos, Greece, and wild flies from Heraklion, Greece, were also conducted following the field cage protocols specified in the FAO/IAEA/USDA Manual for Product Quality Control and Shipping Procedures for Sterile Mass Reared Tephritid Fruit Flies. Results have shown that wild and laboratory insects were synchronized and started mating at almost the same time (15:30 hrs). Results based on the Isolation Index (ISI) (0.09 ± 0.21) have shown no evidence of mating isolation between laboratory and wild flies from Heraklion. These preliminary studies are important since one of the conditions for a useful SIT release programme is to have a high degree of compatibility between sterile and wild populations. Further experimentation is required to consolidate these findings and corroborate the compatibility between laboratory flies and different wild populations from Member States that have interest to use SIT as the main component to suppress olive fly populations.

Mediterranean Fruit Fly Rearing

During the 2 months fellowship of Mr. Luciano Arnolds from South Africa several types of brewer's and torula yeast were evaluated as a source of protein for medfly larval diet. This evaluation is important since the identification of good quality yeasts that can be obtained locally can result in a significant reduction of rearing cost given that the local market can offer cheaper products than those imported from abroad. The conclusion from these experiments was that at least one type of locally available brewer's yeast in South Africa can be used in the medfly rearing facility. This will result in significant savings in production costs if the current torula yeast, imported from Europe, is replaced by the locally produced yeast.

During the 3 months of the fellowship of Mr. Nathan Vermeulen and Mr. Hilton Asia from South Africa, experiments were conducted to reassess mass rearing protocols for the genetic sexing strain, VIENNA-8. Medfly GSS generate individuals that carry unbalanced chromosomes and these can die during the embryo, larval, pupal or adult stage, depending on the chromosome segments involved in the translocation responsible for the genetic mechanisms. This means that different mass rearing protocols should be used for each specific strain. The objective of the evaluation was to assess the effect on pupal production and adult quality of different egg density rates as well as different amount of diet per larval tray. The main conclusion of the experiment was that a density of 1ml of eggs/kg of diet and trays loaded with 4 kgs of larval diet using wheat bran will be the optimal choice for colony maintenance of VIENNA-8 strain in South Africa.

TSETSE FLIES

Colony Status

The tsetse colonies at the Bratislava facility are continuing to be developed and a new IAEA contract is now in place. As completion of the mass-rearing facility in Addis Ababa, Ethiopia, approaches they are preparing to send material for colony initiation. It is planned that *Glossina fuscipes fuscipes* will be shipped first, with *G. pallidipes* (Uganda strain) to follow later. It is anticipated that the Ethiopia mass-rearing facility will be opened in June 2006. Meanwhile the Entomology Unit will be supplying *G. morsitans centralis* to TTRI, United Republic of Tanzania to establish a colony there for possible use in the *G. m. centralis* belt in southern Africa, encompassing parts of Namibia, Angola and Zambia. The establishment of *G. m. centralis* in TTRI, United Republic of Tanzania, has been made possible by the completion of quarantine security on one of their insectaries last year.

The Entomology Unit *G. pallidipes* colony has experience high mortality and low fecundity during the first half of 2006, and the total colony size declined sharply from 25,000 to less than 15,000. The colony has stabilized, but fecundity remains low and re-growth is slow. This drop in the colony follows a rise in the incidence of salivary gland hypertrophy seen in the colony, from 3-4% to above 10%.

Salivary Gland Hyperplasia in *G. pallidipes*

As reported in the last newsletter, PCR analysis confirmed that the salivary gland hyperplasia virus (SGHV) infection rate was 100% in the *G. pallidipes* colony originating from Uganda, and the virus was detected also in *G. pallidipes* colony originated and established in Ethiopia with very high level (93%). Subsequently the virus has been detected at various levels in several species from colonies in France and Belgium. Due to the negative impact of the virus on colony productivity under certain stressful condition it is important to understand more about the virus with the goal to develop a management strategy for the virus. As a step in this process we have obtain the nucleotide sequence of this virus.

To obtain the nucleotide sequence of this virus, it was necessary to obtain sufficient quantity of the purified virus. This was done by injecting the virus into 3rd instar larvae and collecting it after dissection. Using this approach sufficient virus could be purified and confirmed under the electron microscope. Viral DNA was extracted and the quality and quantity was determined by spectrophotometry. The DNA was digested with EcoRI restriction endonuclease and migrated through agarose gel. The DNA length was estimated to be 185-220 kbp. To obtain the DNA nucleotide sequence as we report in the last newsletters 415 colonies were sequenced totaling 60-90kpb. Recently a new sequencing technology was announced at the end of last year to read the genome sequence in microfabricated high-density picolitre reactors. We prepared sufficient quantity of purified viral DNA (8 µg) and sent the DNA samples to the 454 Life Sciences Company in the USA. The sequences obtained were assembled to give 29 secuences with lengths from 138 to 72790 nucleotides. The total length of DNA was estimated at 187198 nucleotides. The results also indicate the presence of gaps in the sequence and attempts to fill in these gaps are underway.

Another important aspect to study is the impact of antiviral drugs on SGHV infection; five antiviral drugs were tested to determine their toxicity effect on tsetse. To analyse the effect of the antiviral drugs on viral DNA replication a quantitative PCR test was established by choosing two primers and preliminary tests to quantify the number of viral DNA copies made.

Tsetse Production Unit 3.2

As reported in the last newsletter, we have now received the new cages and holding system, but their supply and evaluation was delayed by problems with obtaining the materials. Because of the problem with the *G. pallidipes* colony mentioned above, all flies were removed from the TPU3.2 early in the year, and no further testing has been possible.

Alternative Processing of Blood

The arrival of Idrissa Kabore from Burkina Faso on 1st April for a 12 month period has greatly enhanced our capacity to work on blood issues. Idrissa visited the manufacturers of the UV processing system in Scottland in May to learn about the system (see picture), including calibration, operation and cleaning.

Whilst UV irradiation is an effective way to reduce bacterial and viral contamination, it also has an impact on the blood quality. Work has started on testing both the acceptable range of exposure times for feeding tsetse and on the bacterial reduction achieved in defibrinated frozen blood using bacterial isolates from the blood collected for the Seibersdorf colonies and so presumably typical of slaughterhouses in this area.

UV system for blood decontamination

MOTHS

Codling Moth

In the previous newsletter, it was reported that field cage mating compatibility studies between different geographical populations of the codling moth, *Cydia pomonella*, have been carried out in support of the CRP to "Improve Components of Codling Month SIT to facilitate the Expansion of Field Application". Both wild and laboratory populations from many regions of the world were included in the tests. This evaluation was conducted in collaboration with Mr. Gustavo Taret and Mr. Mario Sevilla from Argentina, who have conducted the first set of field cages tests in Seibersdorf and with colleagues who collected wild diapausing larvae for these experiments and also provided us with material from their colonies. The populations tested were:

1) SWI, Switerzand, (from colony of a commercial company)

2) CC, Canada, (from the rearing facility in British Columbia)

3) CHI, Chile, (diapausing larvae from a wild population)

4) SYRW, Syrian Arab Republic (diapausing larvae from a wild population)

5) NC, New Zealand (from a laboratory colony)

6) NW, New Zealand (diapausing larvae from a wild population)

7) ARW, Armenia (diapausing larvae from a wild population)

8) AW, Argentina (diapausing larvae from a wild population)

Results based on Isolation Index (ISI) have shown some degree of mating isolation between some of the crosses, e.g. CHI x CC, SYRW x NC and ARW x NW. All the other crosses showed no evidence of assortative mating. These quite extensive studies support the possibility of shipping sterile moths from a central facility to release programmes in different parts of the world as is done for sterile fruit flies.

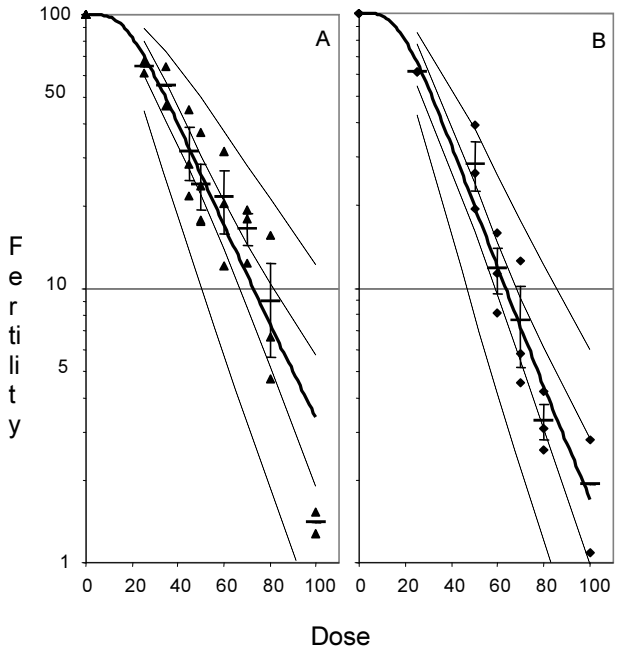
MOSQUITOES

Radiation Biology

In the last newsletter we discussed the completion of the experimental work on the dose-sterility curves for pupal and adult stage of *An. arabiensis*. The data have now been analysed and published and are summarised here. The dose-sterility curves in *An. arabiensis* for pupae and adults show the classic pattern found for such curves of a linear relationship at low doses and the flattening of the curve at higher doses. The highest dose of 100 Gy induced >98% sterility. Overall, we found that fertility is slightly more sensitive to exposure in the adult stage than in the pupal stage.

Plotting fertility on a logarithmic scale against dose as done in the attached figure provides insight in the nature of dominant lethal mutations. A linear response indicates a "one-hit" relationship whereas departures from linearity indicate a "multi-hit" relationship. Graphs for the pupal and adult stage show a predominantly linear relationship suggesting a one-hit relationship to dose; i.e. a large proportion of dominant lethal mutations result from single events in the gametes. As expected, at higher doses the lines tend to depart from linearity suggesting that gametes carry more than one dominant lethal mutation.

Current investigations focus on competitiveness of males irradiated with 70-80 Gy at pupal stage in large laboratory-based cages.



Regression line (± 95% CI for mean and individual values) for fertility versus irradiation dose (Gy) for male An. arabiensis *pupae (A) and adults (B). Symbols indicate observed individual values. Means (±SE, if n>2) are indicated by a horizontal line.*

Blood Feeding and Anti-Coagulant Research

Colonies of *An. arabiensis* are maintained by feeding female mosquitoes on human blood twice weekly. The relatively small size of the colony kept exclusively for research purposes means that the dietary requirements are proportionally modest; 36 ml of blood is drawn weekly from laboratory staff to sustain the colony in Seibersdorf.

For mass production, like the magnitude required for sterile insect technique (SIT), where millions of mosquitoes are produced weekly, a much greater volume of blood will be required. Live animals are used widely as blood source for routine laboratory maintenance. While this comes with the advantage of feeding blood in a natural condition, the drawbacks of keeping live animals in the laboratory could not be discounted. The nursing of live animals will incur additional demands for space, time and manpower. Also, severe stress is placed on the animals by the feeding, thereby increasing the potential for induced illness due to the feeding stress or due to subsequent crowding in the holding cages. There is also the necessity for shearing and preparing the animal for feeding and special equipment is needed for holding the animal during the confinement in the mosquito cages.

Anopheles arabiensis demonstrated a stark preference to fresh human blood over human blood that had been stored at 4°C. The female feeding response (on Hemotek® feeding membranes) was determined by scoring the number of individuals that did not feed against those that probed and engorged. A comparison was made between the oviposition rates of females that were fed

From human to bovine blood for mass production of anopheline mosquitoes. Samuel Kemboi, a fellow from Kenya, volunteers to use his blood for experimental purposes.

with 5, 4, 3, 2, 1 day-old and fresh blood (<6 hour from the time of withdrawal). There was a discernable decline in the feeding response and fecundity in females fed with stored blood.

These findings, although not novel, cogently support previous studies on other vector species.

In a separate experiment, the effects of mixing old and new blood were investigated. Results show that more eggs were oviposited by mosquitoes fed with a mixture of 4-day old and fresh blood (<6 hours old) than by females fed with 4-day old blood alone. Similarly, mosquitoes fed with 5-day old blood and fresh blood laid more eggs than those fed only with the 5-day old blood.

Further experimentation will uphold the validity of the foregoing findings and will also elucidate some facts about the positive interaction between stored blood and fresh blood. The methodology of the original experiment has been modified and experimentation will commence presently.

The Hemotek® 5W1 membrane feeding system was used in the feeding experiments (Discovery Workshops, Lancashire, UK). The system includes 5 FU1 feeders with a built-in temperature control and heater. Each feeder has a detachable meal reservoir that holds up to 5ml of blood. A piece of collagen membrane is stretched over the aperture of the meal reservoir and secured with a rubber ring. Blood is poured into the reservoir through 1 of the 2 openings. Once the reservoir is filled and air bubbles are expelled, the holes are sealed with plastic plugs to prevent the contents from spilling out of the receptacles. The reservoir is then screwed to the heating plates. Blood is warmed to 37.5°C before placing the feeders on the tubes holding the experimental mosquitoes.

Blood Storage

Finally, the response of the mosquitoes to bovine blood preserved in 3 different anticoagulants, namely, sodium citrate, ethylene diamine tetraacetic acid (EDTA), and heparin lithium were investigated using the same methods of the previous experiments. The aim is threefold: first, to test the suitability of bovine blood as a valid substitute to human blood currently in use in the Seibersdorf insectary. Secondly, to determine the best choice of anticoagulant for storage by comparing the feeding response and fecundity of mosquitoes fed with blood stored in sodium citrate, EDTA and in heparin lithium. Thirdly, the experiments will determine the length of time bovine blood can be stored.

Artificial blood feeding and storage are expected to have a combined effect of a reduced response and lower fecundity in laboratory-grown *An. arabiensis*. An efficient feeding regimen would abate the negative results of artificial membrane feeding and storage. In addition, the feeding response and the fecundity rates of colonies fed in this way should be comparable to colonies fed by natural means.

Through our experimentations we hope to gain a posteriori knowledge of how best to artificially feed mosquito colonies with stored bovine blood. Insight gained from these experiments will make valuable contributions to our existing knowledge of mass rearing *An. arabiensis* for SIT.

Mosquitoes being fed on blood containing different anti-coagulents under controlled laboratory conditions.

Germline Transformation as a Supporting Technology for Genetic Sexing

Parallel to the more conventional approach to genetic sexing (based on radiation-induced translocation of a resistance marker to the male-determining chromosome) efforts are underway in the mosquito group to achieve genetic sexing of *An. arabiensis* using a transgenic strategy.

While *Anopheles gambiae*, the major vector of human malaria, has previously been transformed using the *piggyback* transposable element, significant difficulties, mostly related to handling of injected specimens, have not only hindered successful application to other members of the *An. gambiae* complex but also the rapid

Mr. J. Thailayil screening for transgenic GFP-*fluorescent* A. arabiensis *G1 larvae*.

spread of such technology across research institutions. Confronted with such challenge, we have increased our interactions and exchange of information with other laboratories in Europe and the USA that are also involved in the development of transgenic mosquitoes. As a result new collaborations have been established, particularly with the laboratory of Dr. Crisanti at Imperial College, UK. Such collaboration has led to the recent testing of a *piggyBac*-derived construct specifically designed to facilitate the development of a transgenic sexing strain.

Following Ms Labbé's completion of an MSc degree and her subsequent departure from the mosquito project, Mr. Thailayil was recruited to assist in this effort.

After a period of intensive training Mr. Thailayil quickly reached the necessary level of proficiency for mosquito injection and handling. *piggyBac* injections are now performed on the vigorous *An. arabiensis* Dongola strain which was successfully colonised and transferred from Northern Sudan to Seibersdorf in 2004. While testis-specific *GFP* expression is readily observed in *An. arabiensis* mosquito individuals injected with *piggyBac*, an indication that the plasmid DNA was properly delivered during the injection, transgenic lines are yet to be obtained from back-crosses with these fluorescent specimens.

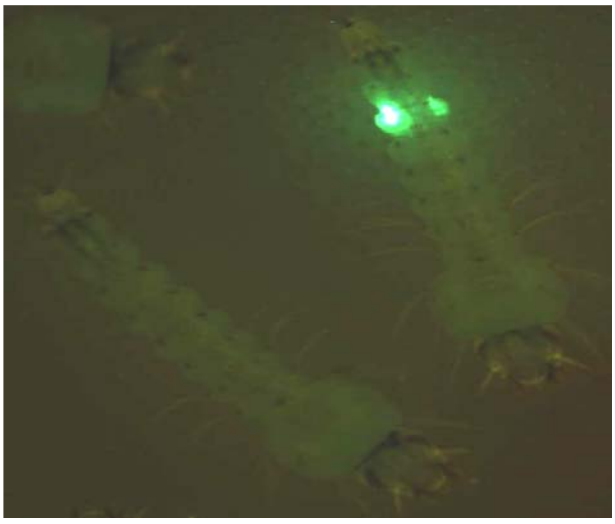
Field Site Developments

Larval surveillance along the Nile River in Northern Sudan has continued on a monthly basis since March 2005. A meeting to plan activities in Sudan for 2006 was organised in Vienna in December 2005. Larval surveys will continue, and the second year of work will be funded by the Agency's Technical Cooperation Department. An outdoor field cage has been completed to assist in studies on the behaviour and ecology of *An. arabiensis* in Northern Sudan.

Following a meeting of the scientific steering committee in Vienna in December 2004, a document was drafted to define the preparatory research programme needed for the elimination of *An. arabiensis* from the island of La Reunion using SIT. This document has been distributed via the French mission and the French Atomic Energy Commission (CEA) to the national and local institutions as well as international experts identified as potential partners in the proposed feasibility study.

This initiative has generated renewed interest for the La Reunion project and a meeting sponsored by CEA was organized in November to which the main research institutions (Institut Pasteur, IRD and CIRAD) participated.

The severe Chikungunya epidemics which increasingly affected people in La Reunion during 2005 also prompted the adaptation of the strategic plan by including *Aedes albopictus*, principal vector of the virus on the island, in the proposed mosquito SIT feasibility study. A document has recently been forwarded to the French authorities for consideration.



L3 An. arabiensis injected larvae displaying somatic, testis-specific GFP *expression.*

ANNUAL REPORT 2005

For more detailed information on the 2005 R&D activities conducted by the Entomology Unit, Seibersdorf, see Annual Report 2005:

www.iaea.org/programmes/nafa/d4/index.html

Special News and Reports

Patagonia Argentina Declared Fruit Fly Free

Apple and pear production areas in Patagonia, Argentina.

In December 2005, the Animal Plant and Health Inspection Service (APHIS) of the United Status of America officially recognized, through publication in its Federal Register (Vol. 70, No. 235), all of Patagonia region in Argentina as the first fruit fly free area in the country.

This major success culminates ten years of joint efforts of the Servicio Nacional de Sanidad y Calidad Agroalimentaria (SENASA), the Fundacion Barrera Patagonica (FUNDAPA) an NGO that supports public programmes, the Provincial Governments and the fruit industry. Technical support to this effort from national and international organizations including the Instituto Nacional de Tecnologia Agropecuaria (INTA) and the IAEA and FAO were of fundamental importance for this success. Technical backstopping of the IAEA and FAO was carried out through a technical cooperation project for the implementation of the sterile insect technique as part of an area-wide integrated pest management approach.

This achievement will allow Patagonia to export fresh fruits and vegetables to the USA without any quarantine treatments, which according the Servicio Nacional de Sanidad y Calidad Agroalimentaria (SENASA) represents annual savings of two million dollars. The elimination of these costly quarantine treatments applies to most of the 3 million boxes of quality pears and apples that this region also exports to many other regions in the world. Furthermore it also opens the possibilities of exporting other fresh fruit crops, particularly stone fruits such as cherries, whose cultivation is rapidly expanding as well as opportunities for market diversification.

National and provincial authorities acknowledged the significant role of the IAEA and FAO, as well as, the SIT in achieving the goal, which follows establishment of similar free zones with Agency support in Argentina's Mendoza province. Following these successes, the Ministry of Agriculture has now announced its approval to fund the initiation of a new fruit fly management programme also involving SIT implementation over an area of 56,000 hectares comprising the main citrus producing provinces of Argentina (Entre Ríos and Corrientes) in the northeast of the country.

Selection of apples for the export market Patagonia, Argentina

Development of a Feasibility Study Report: The Creation of a Tsetse-Free zone in the Republic of South Africa and in the Southern Part of Mozambique

The IAEA, through Technical Cooperation Project SAF5005 and SAF5009, has been supporting the Government of South Africa with a feasibility study to assess whether a sustainable tsetse-free zone can be created in KwaZulu Natal, using an area-wide integrated pest management (AW-IPM) approach (targeting an entire, discrete population of pest insects in a delimited geographical area). Cattle producers in Kwazulu Natal and in the southern part of Mozambique continuously suffer significant losses due to the debilitating effects of nagana of African Animal Trypanosomosis, a devastating disease transmitted by both species of tsetse flies (*Glossina austeni* and *G. brevipalpis*) occurring in this region. The disease reduces the overall fitness of livestock, especially of calves, causes spontaneous abortion and results in reduction in meat and milk production. Draft animals also are affected, resulting in lower overall agricultural productivity. Animals not treated in time will prematurely die.

Vaccines are not available and farmers have to rely on prophylactic and curative treatment with expensive, toxic chemical drugs to treat trypanosome-infected cattle. Trypanotolerant cattle do exist, but due to their low production potential, small size and ineffectiveness in high-trypanosome challenge areas, their usefulness is limited. Crossbreeds intended to increase production are extremely susceptible to trypanosomosis and cannot be used in a tsetse-infested area. Insecticidal control of tsetse flies on a 'farm-by-farm' basis has proven costly (needs to be done permanently) and ineffective.

The Onderstepoort Veterinary Institute, Pretoria and the KwaZulu Natal Veterinary Services implemented this feasibility study with the aim to develop a sustainable, long-term solution to the trypanosomosis problem in KwaZulu Natal. Some of the significant progress made in this project was already reported in the IPCS Newsletter no. 63 (July 2004).

The results of the studies conducted were compiled into a document entitled: *Feasibility Study – The creation of a tsetse free zone in the Republic of South Africa and in the Southern part of the Republic of Mozambique)*. The document was prepared by Dr Rob Bagnall, Veterinary Services KwaZulu Natal, and an external consultant Dr Pat Greany with the assistance of the staff of the IPCS. The report provides a comprehensive analysis of all studies undertaken and gives an outline of a potential strategy to create a tsetse-free zone in South Africa and Mozambique. The following conclusions were extracted from the report:

- A suitable and efficient tsetse trap (H-trap) was developed to sample the two tsetse species in adequate numbers. This was necessary as tsetse traps, developed elsewhere in Africa were very ineffective against *G. austeni* and *G. brevipalpis*.
- Essential base-line data on the basic biology and ecology of the two tsetse species were collected (e.g. population dynamics, activity patterns, dispersal, etc.) – information that is critical for the development of an efficient control operation.
- Field surveys, using 524 trapping sites indicated that the distribution of the two species of tsetse is confined to discrete, isolated pockets in KwaZulu Natal with a total estimated size of 12,000 km^2. These data were confirmed and fine-tuned by the development of a satellite-derived prediction model of tsetse presence. The model likewise predicted that the tsetse distribution extends only for about 25 km into Mozambique.
- More efficient insecticide-impregnated targets to suppress the two tsetse species have been developed. A field trial showed that the targets were *not* a feasible option for a large-scale control operation as they must be used at a density of up to 12 per square kilometres. They could however, be used by the farmer communities in selected, smaller areas or for barrier establishment between the different zones of the various phases of the operational programme.
- A study, analysing the suitability of available tsetse suppression techniques, ascertained that the project area was suitable for the Sequential Aerosol Technique (SAT), an aerial spraying-based suppression programme, like that used successfully in the Okavango Delta of Botswana. It was postulated that a campaign combining the SAT and the release of sterile males (sterile insect technique - SIT) would be the most effective and cost efficient.
- An Environmental Impact Analysis indicated that environmental impacts of SAT are likely to be minimal and short-term in nature. The necessity for a full Environmental Impact Assessment before and during the control operation was stressed.
- A benefit/cost analysis showed that there will be substantial financial benefits following the creation of a tsetse-free zone in KwaZulu Natal and in southern Mozambiqeu. The economic return on investment is very favourable with the annual benefit to cost ratio, as of year 9, fluctuating from 90 to 493 per each dollar invested. The benefit/cost analysis showed an overall benefit to cost ratio of 3.4 after 15 years.
- Experimental colonies of both species have been established by the Onderstepoort Veterinary Institute and after only two years have reached the maximal capacity of the research facilities (i.e. 45,000 producing females). A SIT programme requires flies that are adapted to mass-rearing and that the expertise to rear and maintain these colonies is present. These colonies can be used for further methods development as well as to provide seed material colonies for a future mass-rearing facility that will be needed for the operational programme.

The report concludes that:

The results of the various components of the feasibility study showed that the best way to achieve a tsetse-free zone would be to use a combination of environmentally-sensitive techniques to suppress tsetse populations followed by release of sterile male tsetse flies to mate with the wild females and thereby curtail their reproduction. The permanent removal of the disease vectors, the two tsetse species, using an AW-IPM approach would be the only long-term, sustainable solution to the nagana problem in South Africa and southern Mozambique.

In anticipation of the use of the SIT in South Africa, the Nuclear Energy Corporation of South Africa (NECSA) has identified facilities that would be suitable for the mass-rearing of tsetse and has agreed to fully support the

development of such a mass-rearing facility. NECSA has a number of buildings that are underutilized and would be suitable for conversion into a mass-rearing facility.

In order to ensure the success of such a control operation, it is essential that an autonomous management structure be established to run the whole project under the guidance of a high-level tsetse control committee. An independent project management team needs to be appointed who will be responsible for the drawing-up and implementing the final project proposal. Input from the environmental agencies will be essential from the initial planning stages of the project.

Finally, the report points out that the programme to create a tsetse free zone in South Africa and southern Mozambique using an AW-IPM approach has other benefits. The expertise and the facilities developed for this programme would also be available for other countries implementing tsetse control operations and South Africa could be a driving force in the expansion of the Pan African Tsetse and Trypanosomosis Eradication Campaign (PATTEC) in the rest of southern Africa. The skills and knowledge developed also will be of great value in the monitoring and possibly preventing the spread of *G. morsitans* into the tsetse-free Kruger National Park as a result of the creation of the Greater Limpopo Transfrontier Park that unites game areas in Zimbabwe and Mozambique with the Kruger National Park in South Africa.

Travel Report on the First Session of the Commission on Phytosanitary Measures (CPM), of the International Plant Protection Convention (IPPC). FAO Headquarters Rome, Italy, 3-7 April 2006

The IPPC is identified in the World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures (the SPS Agreement) as the international organization responsible for setting phtytosanitary standards. The IPPC is based on an international treaty (the Convention) which has equivalent legal status to WTO agreements.

The New Revised Text of the IPPC, approved by the FAO Conference in November 1997, and that entered into force on October 2005, provides for the establishment of a Commission on Phytosanitary Measures (CPM). The First CPM session was held in Rome, Italy from 3rd to 7th April 2006.

The IPPC has a relatively short history of standard-setting. From 1993 (when the IPPC adopted its first standard) to March 2006, the organization had completed 24 ISPMs, including one ISPM on irradiation as a phytosanitary measure (ISPM 18). However, the critical role of the IPPC in harmonizing the procedures internationally and

Board room FAO Headquarters, Rome, Italy.

facilitating agricultural trade through the preparation of ISPMs and improving the phytosanitary infrastructure in Member States, is in jeopardy. The annual budget of US $1.9 million covers only a fraction of the ambitious work plan approved by the CPM. If additional resources are not made available to the IPPC, the working programme will have to be reduced substantially and cuts of up to half of the operational staff may need to be made.

Two professionals of the Joint FAO/IAEA Programme of Nuclear Techniques in Food and Agriculture, attended the session with specific objectives: Mr. Walther Enkerlin to provide technical support to the Technical Panel on Fruit Flies (TPFF) for the approval and adoption of the proposed International Standard on Pest-Free Areas for Fruit Flies; and Mrs. Tatiana Rubio to discuss the required future work related to the Annex of the approved ISPM 18.

At the opening ceremony of the First CPM Session, Mrs. Louise Fresco (FAO Assistant Director General) emphasized the excellent foundation that had been laid for the CPM through the work of the Interim Commission of Phytosanitary Measures (ICPM) and strongly encouraged members to try to maintain IPPC progress in the three major areas of standard setting, information exchange and technical assistance. She stated that while the FAO recognized the significance of the IPPC as an international treaty, the CPM Members must take ownership of the Commission, and as the beneficiaries take responsibility for the ongoing strategic direction, size and associated funding of its programme.

The Insect Pest Control Subprogramme has been actively providing technical support to the IPPC Technical Panel on Fruit Flies (TPFF). The Panel has organized two meetings, the first, in Bangkok, Thailand in September 2004 and, the second, in Costa Rica in August 2005. As a result of these meetings, a draft ISPM on Establishment of Pest-Free Areas for Fruit Flies and on Establishment of Pest Low Prevalence Areas for Fruit Flies, a discussion paper on Systems Approach for Fruit Flies and a number

of specifications for upcoming ISPMs have been prepared. This support was acknowledged by the CPM in one of the documents distributed prior to the meeting under Agenda Item 16.2 "Report on cooperation with relevant organizations".

A week before the First CPM's Session, the Food and Environmental Protection Section sent a statement to the IPPC Secretariat on activities of the Joint FAO/IAEA Programme related to Phytosanitary Applications of Irradiation. This information was distributed to the participants as a Conference Room Paper No 7.

The participants of the Joint FAO and IAEA Programme were involved in the following activities and decisions during the week-long CPM Session:

1. On the Agenda item number 10.3 (Interventions by Other Organizations) - The participants introduced a paper outlining the activities of the Joint FAO/IAEA Programme in relation to the phytosanitary application of irradiation. It was emphasized that following the approval of ISPM No. 18 (Guidelines on Irradiation as a Phytosanitary Measure) in 2003, the Joint FAO/IAEA Programme had received an increased number of requests to support Members States in issues related to irradiation as a quarantine treatment. These requests were mainly from countries which are trying to replace methyl bromide (MB) as a phytosanitary treatment. It was noted that the Joint FAO/IAEA Programme has seen a need to increase capacity building on these phytosanitary issues.

In relation to fruit fly ISPMs under development, it was also noted that the Joint FAO/IAEA Programme had, in response to Member State requests, published a fruit fly trapping guideline developed through an expert working group meeting, and would welcome continued collaboration with the IPPC to update this guideline under the framework of the IPPC Technical Panel on Fruit Flies (TPFF). The TPFF will decide if the Trapping Guideline should be used as an appendix to various fruit fly ISPMs or as the basis for developing an ISPM on trapping procedures. During the Plenary Session a number of Member Sates (including Australia, and members of the Organismo Internacional Regional de Sanidad Agropecuaria (OIRSA) and Comite de Sanidad Vegetal del Cono Sur (COSAVE) expressed their agreement on using the FAO/IAEA Trapping Guideline as the standard guideline for fruit fly ISPMs.

2. On Agenda item 11.2.3 Adoption of International Standards – Regular Standard Setting Process *Establishment of Pest Free Areas for Fruit Flies (Tephritidae)*, an informal working group composed of delegates with fruit fly expertise had reviewed the comments prior to meeting in an the open-ended working group and prepared a redrafted ISPM text. The open-ended working group chaired by Ms. Bast-Tjeerde (Canada), working daily after the plenary sessions, was able to address all queries raised by Member States and come to unanimous agreement on all issues raised. As a result, **the CPM then officially adopted the new ISPM on the "*Establishment of Pest-Free Areas for Fruit Flies*".** This is a major achievement, to which the Joint FAO/IAEA Programme made a significant contribution. The CPM thanked the members of the open-ended working group for dedicating the time and effort to addressing and finding solutions to all Member State comments.

3. On Agenda item 11.4 Topics and Priorities for Standards, several members suggested the Standards Committee for consideration of the following issues:

3.1. The Technical Panel on Fruit Flies (TPFF) should consider combining some fruit fly ISPMs such as the draft ISPMs for Fruit Fly Free Places of Production and Fruit Fly Free Production Sites into the recently adopted ISPM on Establishment of Pest-Free Areas for Fruit Flies (FF-PFA). This could be easily done by using the mechanism of "supplement information" which means including additional information to the approved ISPM without modifying the current text.

3.2. The Technical Panel on Phytosanitary Treatments should consider developing Annex 1 (specific approved treatments) of ISPM 18 in cooperation with the Joint FAO/IAEA Programme.

3.3 The Joint FAO/IAEA Programme emphasized the need to include in the CPM work plan for 2006 the development of the Annex 1, ISPM 18 in order to respond to requests to facilitate the international trade of food and commodities which need a phytosanitary treatment. As a result of this intervention, the representatives of 15 countries supported this proposal (Argentina, Bangladesh, Brazil, Chile, Guatemala, India, Jordan, Mexico, Paraguay, Russian Federation, Sri Lanka, Thailand, Togo, United States of America and Uruguay) and the subject was included in the work plan 2006 with a high priority. It was assumed that if some extrabudgetary resources were needed to complete the Annex of the ISPM 18, the Joint FAO/IAEA Programme would contribute some funds.

4. The IPPC Secretariat expressed the need for continuous support of the Joint FAO/IAEA Programme to the development of fruit fly ISPMs through an active participation of staff of the Insect Pest Control Subprogramme in the TPFF.

5. Other issues

The possibility of including the term "Area-wide integrated pest management (AW-IPM)" in the FAO Glossary of Phytosanitary Terms (ISPM No. 5) was discussed with the Standards Officer (Mr. Brent Larson). The procedure is as follows: 1) The term needs to appear in an ISPM, 2) A technical panel prepares a definition and re-

quests the Standard Committee the inclusion of the term in the ISPM No. 5 (FAO Glossary of Phytosanitary Terms), and 3) The CPM adopts the new term.

In order to start working on the Annex of ISPM 18, the specifications were developed during the First CPM's Session. These specifications must be sent through the official channel to the IPPC Secretariat, to be included in the agenda of the next IPPC Standard Committee meeting in May 2006. The draft of these specifications was given to Mr. Brent Larson during the last day of the Session.

During the Session it was also noted that several Latin American Phytosanitary Organizations were interested in organizing a regional workshop on the use of irradiation as a phytosanitary treatment. This subject was discussed with representatives of COSAVE, the North American Plant Protection Organization (NAPPO), the Inter-American Institute for Cooperation on Agriculture (IICA) and OIRSA. All these organizations are willing to be co-sponsors of an FAO/IAEA Regional Workshop at the beginning of 2007 (tentative date: the end of March 2007).

The draft report (English and Spanish versions) of the meeting of the First Session of the CPM and the list of participants are available at the Insect Pest Control and Food and Environmental Protection Subprogrammes. This information can also be found on the IPPC web-site [https://www.ippc.int/servlet/CDSServlet?status=ND03NTQyMyY2PWVuJjMzPSomMzc9a29z].

In conclusion:

1) The CPM adopted the ISPM on ***Establishment of Pest-Free Areas for Fruit Flies*** and approved the development of a number of other fruit fly ISPMs as indicated in the table above.

2) The development of the Annex 1 of the ISPM 18 was included with high priority in the work plan of the CPM, and the Joint FAO/IAEA Programme was asked to contribute to its development.

3) The IPPC Secretariat is expecting continuous support of the Joint FAO/IAEA Programme to the development of ISPMs through an active participation of the Programme's staff.

4) Latin American Phytosanitary Organizations are willing to co-sponsor a Regional Workshop on the use of irradiation as a quarantine treatment.

Recommendation:

The Joint FAO/IAEA Programme is considered to be the world leading organization in nuclear applications in food and agriculture, including food irradiation and the integrated area-wide application of the sterile insect technique. The know-how developed at the Joint FAO/IAEA Programme through research and development and transfer of this technology to Member States through TC Projects is being used by the IPPC Secretariat as the basis for the preparation of a number of International Phytosanitary Standards (ISPM's). The standards include ISPM 18, the recently approved International Standard on Fruit Fly Free Areas and a number of ISPM on fruit flies that are being drafted by the TPFF and the Annex on Irradiation as a Postharvest Treatment.

Consultants Meeting: Assessing the Minimum Size Area for Application of an Area-wide SIT Programme Against Selected Insect Pests, Vienna, Austria, 24-28 April 2006

The paper on 'Strategic Options in Using Sterile Insects for Area-wide Integrated Pest Management', by Hendrichs, J., Vreysen, M., Enkerlin, W. and Cayol, JP, that was published in the SIT book 'Dyck, V. A., J. Hendrichs, and A. S. Robinson (eds.), Sterile insect technique. Principles and practice in area-wide integrated pest management.' poses a very pertinent question on page 591:

At what spatial scale is an area-wide approach no longer technically and economically feasible? Is there a minimum size of the target area below which effective implementation of AW-IPM programme using the SIT becomes technically impossible and economically unjustifiable?

To address this topic, a consultant group meeting was convened in Vienna and experts with a different background (Drs Hugh Barclay (Canada), Robert Matlock (USA), Stuart Gilchrist (Australia), Jesus Reyes (Central America) and Max Suckling (New Zealand)) were invited. The meeting was likewise attended by an observer from Israel (Mr Doron Timar).

The consultants group, with the assistance of IPCS staff, developed the basis for a decision-support tool that would enable an assessment on the minimum dimensions of a control zone for insect pest suppression or eradication. Each area-wide integrated pest management programme (AW-IPM) contains the same basic spatial elements i.e. a core area and a buffer zone. The latter is defined as the area of an AW-IPM programme that should have a size large enough to prevent the pest insect from entering the core area. In the core area (which usually contains the commodity that needs to be protected), the aim is to reduce (in case of a suppression strategy) or eliminate (in case of an eradication strategy) the insect pest species.

An outline of a model was developed that contained two main elements, i.e. a mathematical and an economic component. The mathematical part describes the distributions (dispersal, movement) of wild and sterile insects

across the buffer zone. The group agreed that a diffusion process is probably the best way of describing dispersal of insects. Various parameters such as the diffusion coefficient, birth and death rates, ambient density of the pest insect, competitive ability of the insects and sterile release rate were identified as essential for inclusion in the diffusion model. This part of the model is largely based on biological parameters of the pest insect and will provide the width of the buffer. The economic component of the model allows the calculation of a benefit/cost ratio of the control programme. This part of the model will provide the size of the core area in relation to the width of the buffer in order to reach the breakeven point.

Consideration was given to a fixed area model (with no moving pest control front) and the Rolling Carpet Model (with a moving control front as described by Hendrichs et al. (2005)). The initial model was kept simple but additional complexities such as inherited sterility, wind, temperature, rainfall and habitat heterogeneity were considered to be important additions which could be included in later, more complex but more accurate versions of the model.

Values of the various parameters for the model were estimated for the Mediterranean fruit fly and used to test the model. This pest species was chosen in view of the many successful AW-IPM programmes and the broad experience with medfly SIT.

The conceptual model remains however largely underdeveloped and heuristic and requires further work to become a valuable decision support tool.

Agriculture Research Council (ARC) Researcher Gets Fruit Industry Award

Dr. Brian Barnes of the Plant Protection Division at ARC Infruitec-Nietvoorbij in Stellenbosch in South Africa was the winner of the Deciduous Fruit Industry's award for research that made a significant contribution towards the industry during 2005. This is the fourth time the award has been made at the South African fruit industry's annual Gala Evening.

The award was made in recognition of Dr Barne's exceptional contribution over the past 9 years to the implementation of the sterile insect technique (SIT) for the control of key fruit pests in the Western Cape.

Fruit flies are serious phytosanitary pests that can impede the free trade in export fruit. At the invitation of the IAEA in Vienna, which has refined the use of SIT worldwide, Dr Barnes successfully submitted a comprehensive project proposal to the Agency. The application was successful and unfolded into the Hex River Valley fruit fly SIT project which was spearheaded by Dr Barnes, and which was supplied with sterile fruit flies from the small Medfly rearing facility at ARC Infruitec-Nietvoorbij.

Dr. Brian Barnes. Plant Protection Division at ARC Infruitec-Nietvoorbij in Stellenbosch, South Africa.

As coordinator of the SIT projects, Dr Barnes has also been instrumental in helping to expand the fruit fly project to two other fruit production areas – the Elgin, Grabouw, Vyeboom and Villiersdorp area, and the Riebeek Valley area.

The fruit fly project has since been extended to include pilot SIT projects on two other key pests of fruits, codling moth and false codling moth. Today, 9 years later, the value of the Agency's contribution to SIT in the Western Cape exceeds R9 million.

Dr Barnes is well-known and respected by the large international fruit fly and SIT community. He has travelled widely and made presentations at many international meetings, including a keynote address to a fruit fly symposium in the United States of America.

Dr Barnes is the husband of Dr Jo Barnes, an epidemiologist from the Department of Community Health of the University of Stellenbosch. She recently won the Cape Times Caltex Environmental Award for her important work on the rivers of the Boland, and the Plankenbrug River in Stellenbosch in particular.

Source: South Africa Fruit Journal No. 52, December 2005.

Travel Report on FAO/IAEA Interregional Training Course on "The Use of the Sterile Insect and Related Techniques for the Integrated Area-wide Management of Insect Pests", University of Florida/USDA, Gainesville, Florida, USA, 10 May – 7 June 2006

The course offered a broad view of area-wide integrated pest control programmes worldwide with emphasis on the sterile insect and related techniques. Lectures were presented by 28 lecturers most of them considered to be top specialists in their field of expertise. The course was attended by 23 participants from the following Member States: Armenia, Bangladesh, Brazil, China, Dominican Republic, Ethiopia, Guatemala, Grenada, Iraq, Israel, Italy, Jordan, Lebanon, Mauritius, Morocco, South Africa, Senegal, Seychelles, Tunisia, Turkey, Uganda, United States of America and Uruguay. Only the participants from Burkina Faso and Pakistan were not able to attend the course.

The course continues to be the best forum to expose carefully selected pest control managers from around the world, to the area-wide pest management concept and related state of the art technologies including the sterile insect technique (SIT). The interregional course allows animal health and plant protection specialists from various regions in the world to have the opportunity to interact and share experiences and information on area-wide pest control. For example, it allows a very positive interaction between participants from regions in the world such as the Americas where the area-wide SIT is more advanced with those from other regions such as Africa where the concept is less developed. The setting also allows trainees to develop of an interregional communication network which favours the information exchange on a worldwide basis.

As in the previous course held in 2004, at least half of the participants were either directly involved in area-wide pest control programmes using SIT or in research and development in support of such programmes. For the purpose of comparison, in the course held in 1986 only two of the participants were involved in area-wide pest control programmes. Furthermore, in 1986, the course had a theoretical orientation as very few cases of area-wide SIT programme implementation existed and the course included very few lectures on case examples of are-wide SIT application. In 2006, 20 years latter, the course has evolved together with the application of this pest control alternative. The course programme includes a very adequate balance between theory and practice, and a number of lectures (in this case 11) on case examples of ongoing area-wide SIT programmes against a variety of insect pests in various regions of the world.

This is a good measure of the contribution that this interregional course, together with other training events, has had over the years to further this more cost-effective and environment friendly nuclear application for insect pest control.

One of the major factors contributing to the success of the course is the direct involvement of the University of Florida and the USDA, contributing eminent lecturers (for this course 19 of the total number), first world communication and learning facilities, as well as significant financial resources from the US State Department. The organisation was excellent and dedication of the support staff is to be commended.

In conclusion, the course continues to be the only venue in the world to expose senior pest control managers from Member States to the integrated area-wide pest management approach and related state of the art technologies including the sterile insect technique (SIT). Many managers of ongoing programmes in the world have been trained at this course. No other institution or organization teaches the course subject. It is vital therefore that this unique FAO/IAEA interregional course is continued in future biennia.

Cost-Benefit Analysis of the Okanagan-Kootenay Sterile Insect Release Programme, an Area-wide Suppression Programme Against the Codling Moth, British Columbia, Canada

The codling moth (*Cydia pomonella* L.) is the most important pest of pears and apples in British Columbia (BC), Canada. A successful suppression programme (Okanagan-Kootenay Sterile Insect Release Programme (OKSIR)) using an area-wide integrated approach including the release of sterile insects was initiated in 1994. Since then, the apparent density of the wild codling moth population in the first intervention zone has been reduced by >97%, the proportion of orchards with no detectable codling moth damage increased from 42% in 1995 to 91% in 2000, and the amount of organophosphate insecticides purchased decreased from 18,903 kg in 1991 to 3,403 kg in 2001.

A consultants group (Ross Husdon Management Ltd.) was commissioned by the OKSIR board to conduct an economic study of the programme. The report has been received in the mean time by the board and the main conclusions are the following:

- The total cost of the OKSIR programme for 2006 was budgeted at US $2.7 million, consisting of an area-wide management component (administration, orchard management and urban management: 32.1% of the budget), an SIT component (administration, rearing, orchard operations: 54.1% of the budget) and a mating disruption component (13.7% of the budget).
- The total annual direct economic benefits of the OKSIR programme were estimated at US $2.81 million. These benefits were derived from the reduction in codling moth control costs in commercial orchards (US $1.16 million), the provision of economic benefits to the region in terms of GDP (US $1.42 million) and in terms of benefits to the urban population through the control of codling moth in urban trees (US $222 500).

- In addition to these direct, quantifiable benefits, the OKSIR programme has several other indirect benefits such as those emanating from an increase in the tourist industry, from reduced pesticide loadings to the environment and from improved air quality.

Although the report did not attempt to quantify these indirect benefits, it is obvious that the benefits of the OKSIR programme clearly outweigh the costs.

Tephritid Workers Database (TWD) [www.tephritid.org]

The tephritid Workers Database (TWD) is a free, non-commercial web based database, providing information service to fruitfly workers worldwide on:

- The Directory of fruit fly workers (Who's who)
- Who's doing what
- The Virtual Fruit Fly Library
- News and Events
- Links

The philosophy of this service is that you MEMBERS ARE THE MAIN DEVELOPER OF THE DATABASE by adding/updating regularly your TWD data including your publications related to tephritid fruit flies. TWD welcomes your continuous contributions and receiving information about upcoming events, news, job offers, research opportunities for students, URL of fruit fly web site you know, and any good ideas you would like to share with other fruit fly workers. TWD welcomes you to use its services and looks forward to be of interest and use to your activities. The database will continue expanding to meet your expectation and we look forward receiving your feedbacks.

Two years since it has been launched, TWD has reached more than 560 members from 84 countries and contains over 900 publications.

How to Join

1. Already a member:

You are heartily invited to update your profile and particularly, ADD REFERENCES of your publications on fruit flies to help build the Virtual Tephritid Library. Just LOG IN and then click on UPDATE PUBLICATIONS. Let me know if you do not remember your username and password.

2 . New member:

You need to create your profile (5 min!).

- Enter www.tephritd.org
- Click on Membership – fill out the form, enter your ANY username and password, then submit. Remember to save your password and username in a safe folder.
- Return to the main page of TWD and click on Log in and enter your username and password.
- New forms will appear at the left hand frame. Fill out each form and submit.
- Congratulation! You become a TWD member. No more forms to fill out! Next time you would like to add/update your profile just LOG IN. Your profile will hold your current contact information, background and skill, activities, and PUBLICATIONS.

Prof. Abdel Jelil Bakri
Database administrator
A. Bakri [bakri@ucam.ac.ma], University Cadi Ayyad, Marrakech, Morocco)

Hawaii Area-wide Fruit Fly Pest Management Programme (HAW-FLYPM)

HAW-FLYPM is a cooperative partnership between the University of Hawaii, College of Tropical Agriculture and Human Resources, USDA Agriculture Research Service and the Hawaii Department of Agriculture.

For the last few decades, Hawaii has been plagued by four fruit fly species costing the agriculture industry billions of dollars. This collaboration of federal, state and university scientists has developed an area-wide system of field sanitation, biological controls and lures to quell the problem. One of the largest producers on Oahu, Aloun Farms, saw crop losses from melon fly drop from 22 to 1% in one year. The approach is being applied on over 200 small farms in 2004 and continues to grow each year.

The Goal of HAW-FLYPM:

The goal of the Hawaii Area Wide Fruit Fly Integrated Pest Management Program (HAW-FLYPM) is to develop and implement environmentally acceptable, biologically based, sustainable pest management strategies that reduce use of organophosphate and carbamate insecticides while suppressing fruit flies to economically manageable levels for the benefit of Hawaii.

The Mission:

- Promote a sustainable suppression program utilizing an "area-wide" approach to managing fruit flies
- Introduce environmentally acceptable, cost-effective technologies that address grower needs
- Increase community involvement in educational programs supported by USDA-ARS, UH-CES and HDOA.
- Increase economic benefits to growers, the community, and the state through expanded opportunities in diversified agriculture.

HAW-FLYPM has been awarded the following Team Awards:

- US Department of Agriculture, Agriculture Research Service, Technology Transfer Award (Outstanding Category) for 2004
- Entomological Society of America, The Entomological Foundation, Integrated Pest Management Team Award for 2004
- US Department of Agriculture Secretary's 2004 Honor Award for creating an effective area-wide suppression program for fruit flies in Hawaii which provides the basis for a sustainable rural economy --2004
- Federal Laboratories Consortium 2004 Award for Technology Transfer for the impacts made by the Hawaii Area Wide Fruit Fly Pest Management Program – 2004
- Pacific Branch, Entomological Society of America Integrated Pest Management Team Award – 2004 for the Hawaii Area Wide Fruit Fly IPM Team

HAW-FLYPM Web-Site:
http://www.extento.hawaii.edu/fruitfly/

Early Warning Systems in South Africa: Exotic Fruit Flies Surveillance Workshop

The Division Early Warning Systems of the Directorate Plant Health aims on protecting the country of South Africa against exotic fruit flies, which involves strategic planning on how surveillance should be conducted, and this serves as part of its objectives as the National Plant Protection Organization of South Africa (NPPOSA). The worksop to finalize the early warning system for exotic *Bactrocera spp* was conducted on the 29th – 30th November 2005.

Representatives from the South Africa fruit industry, Zimbabwe, USDA (APHIS), ARC and the Directors APIS and Plant Health attended the workshop to discuss effective prevention, detection and control programmes against exotic invasive fruit flies.

The role different parties can play assisting with reosurces, finance traning logistics and free flow of knowledge and experience, was debated.

Three fruit fly species were discussed with special attention to the fruit fly, *Bactrocera invadens* as it is a highly invasive pest which has already spread to several parts of the African continent and has a high risk of introduction and establishment within southern Africa.

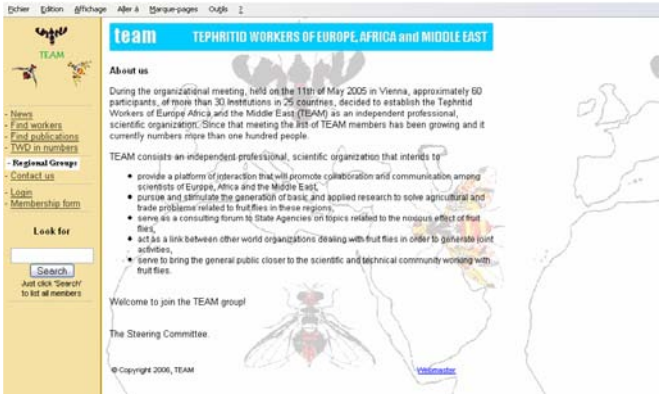
Presentations were given with regards to *Bactrocera invadens* and the seriousness of the pest to the fruit import/export and local market was highlighted. The pest has a large host range, including natural hosts and it is an agresive invader outcompeting indigenous fruit flies. Other fruit fly species that have invaded parts of the African mainland and represent a major threat to the South African fruit industry are the melon fly, *Bactrocera cucurbitae* and the peach fruit fly, *B. zonata*.

An integrated approach between the national Plant protection Organizations (NPPO's) in the region, industry, the public and research institutes is identified as an approach to follow to ensure the best chances for early detection and control. Commitments and suggestions between the parties present, and action plans will be drafted to finalise the programs within the early warning system.

Announcements

News! Tephritid Workers of Europe Africa and the Middle East (TEAM)

On May 2005, members of the **Tephritid Workers of Europe Africa and the Middle East** (**TEAM**) in Vienna recommended to develop the website of TEAM which will act as a platform to promote collaboration and communication between their members and to bring their ongoing activities to the general public and to other world organizations dealing with fruit flies.



After one year of work, TEAM web site is ready to be launched on the internet in June 2006.

As the Tephritids Workers Database (TWD), TEAM is a free, non-commercial web based database. Under www.tephritid.org, click on **Regional Groups** on the left hand menu to access TEAM web site

Call for registration membership:

We welcome new members from the Europe Africa and the Middle East region. Registration can be done online. Just fill out the **Membership Form** on the left hand menu, choose your favourite username and password and submit. Then login to complete your registration.

For more information, please contact:
-Dr. N. Papadopoulos (University Thessaly, Greece) Chairperson (npapadop@agro.auth.gr),
-Prof. A. Bakri, 1st Vice Chairman and database administrator (bakri@ucam.ac.ma)
-Yoav Gazit, 2nd Vice Chairman (yoav@jaffa.co.il)

Source: A. Bakri [bakri@ucam.ac.ma], University Cadi Ayyad, Marrakech, Morocco.

Status and Risk Assessments of the Use of Transgenic Arthropods in Plant Protection. IAEA-TECDOC Series No. 1483

New developments in the modern biotechnology have opened up the possibility of introducing genes into the germline of many insect species, including those of agricultural importance. This technology offers the potential to improve current pest control strategies that incorporate the sterile insect technique (SIT). Potential improvements include the developemnt of strains that (1) produce only male insects for sterilization and release and (2) carry a marker that distinguishes them from wild insects.

To address this issue a meeting was held in FAO Headquarters, Rome, in April 2002. The meeting was the first effort to bring together sceintists and regulators in order to discuss risk assessment and regulation of transgenic insect release.

The publication presents the repisrt of working groups and the overall conclusions of the meeting.

The Medfly Rearing Facility in Israel is Granted ISO Certification

Dael Levy, Director of Bio-Fly Ltd. proudly announced that “as of November 2005, the Medfly rearing facility in Israel has been granted the ISO 9001:2000 certification for the sake of our customers”.


IQC
מכון לבקרה ואיכות
CERTIFICATE תעודה
This is to certify that
the Quality Management System of
ביו-פליי אגש"ח בע"מ
BIO-FLY LTD.
קיבוץ שדה אליהו
Was audited by the IQC and found to be in compliance with the requirements of the standard:
ISO 9001:2000
This certificate is valid for the following scope of activities:
ייצור זבוב הפירות חים-תיכוני מעוקר
STERILE MEDITERRANEAN FRUIT FLY PRODUCTION
This certificate is valid until: 29.11.2008
This certificate is subject to the continuing satisfactory operation of the Quality System and periodic auditing by IQC
Date of first approval: 29.11.2005
Date 28.12.05
Managing Director

Australian and New Zealand Entomological Societies' Conference. 24-27 Septemberb 2006, University of Adeliade, South Australia (submitted by V. Cockington)

On behalf of the organising committee, we extend a warm invitation to you to attend a joint Conference of the Australian and New Zealand Entomological Societies to be held in Adelaide, South Australia from September 24 – 27th 2006. The conference will bring together approximately 150 researchers (scientists and students) from a broad range of interests to discuss the latest research in entomology. The conference has the theme of "Biosecurity – Caring for the Environment and Agriculture" and part of the scientific program will be devoted to this area. However, intending delegates are encouraged to submit papers/posters on their own areas of expertise and interest as the overall program will be designed to cover a much broader range of topics than just this theme. A fruit fly symposium is being organized as a part of the Conference. For more information on this symposium contact:

Vanessa Cockington
Research Officer
Fruit Fly Ecology
South Australian Research and Development Institute
Delivery: SARDI Entomology, Rm E110b,
Waite Building, Waite Road, Urrbrae SA 5064
Mail: GPO Box 397 Adelaide SA 5001
Telephone: 08 8303 9537 Facsimile: 08 8303 9542

Adelaide, the capital of South Australia, is set beside the River Torrens between the Adelaide Hills and the waters of Gulf St Vincent. The city centre, surrounded by parklands, is a charming blend of historic buildings, wide streets, commercial shopping, street cafes and restaurants. Adelaide is known as the 20-minute city as you can experience it all on a series of easy short walks. The city centre is just 6 km from the airport.

The conference will be held on the North Terrace Campus of the University of Adelaide that houses most of its teaching and research facilities. Set in the cultural heart of the city on the northern edge of the city centre, the North Terrace Campus offers excellence in its educational and social facilities. Established in 1874, the North Terrace Campus is home to the schools of Physics & Chemistry and Molecular & Biological Sciences; as well as part of Earth & Environmental Sciences. The School of Agriculture and Wine is located on the Waite Research Precinct in the suburbs of Adelaide about 8 km from the city centre. SARDI, the Australian Wine Institute and CSIRO are also co-located on this Precinct.

Two New Manuscripts Have Been Published By The Mosquito SIT Group At The FAO and IAEA Laboratories in Seibersdorf

Radiation-induced sterility for pupal and adult stages of the malaria vector *Anopheles arabiensis*

<http://www.malariajournal.com/content/5/1/41>

Trapping of the malaria vector *Anopheles gambiae* with odour-baited MM-X traps in semi-field conditions in western Kenya.

<http://www.malariajournal.com/content/5/1/39>

Insect Rearing and Diet Science and Technology Workshop October 2-6, 2006 in Tucson, Arizona, USA, Presented by Insect Diet and Rearing Research, LLC (submitted by Allen C. Cohen)

Insect Diet and Rearing Research, LLC conducts on-going cutting edge research for the advancement of insect diet and rearing science and technology through several grants (2 USDA SBIR's: Monarch butterflies and predators of invasive weeds, a USDA-ARS cooperative research project on bee health, Adelgid feeding with North Carolina State, and an Adelgid predator diet with the Forest Service to mention a few). Some of the groups we have taught include FMC, Monsanto, Pioneer/DuPont, the USDA and S.C. Johnson in addition to the Tucson, Arizona workshops. Consultation is ongoing with several companies. Browse the website to learn more and register for the workshop on-line: www.insectdiets.com

Special course features:

- Genetics of domesticated insects taught by Dr. Alan C. Bartlett
- Pathogens and contaminants in the insectary taught by Dr. J. Robert Harkrider
- Tour of the USDA, APHIS Pink Bollworm Facility led by Mr. Ernie Miller
- Visit to the USDA, ARS Carl Hayden Bee Research Center
- Electron microscopy of your specimens at the University of Arizona Imaging Center guided by Allen Cohen and Mr. David Bentley
- Multiple hands-on activities that help you learn by doing
- Meeting Site: The gorgeous and comfortable Windmill Inn Suites! Visit the hotel website at http://www.windmillinns.com/ie40/tuc/tuc.htm
- Workshop fee: $1,100

The workshop takes you beyond Allen Cohen's text *Insect Diets: Science and Technology,* CRC Press in an easy to understand hands-on format:

- The course contents are the result of cutting edge current research by at Insect Diet and Rearing Research, LLC. The contents also reflect the choices of most interesting and useful materials as suggested by former workshop participants and have evolved over the past several years.
- Data-based quality control system for your insectary.
- Detect and prevent diet deterioration from microbial sources, physical components, oxidative stress.
- Bio-assays for testing toxins and nutrients.
- Detecting and preventing pathogens in the insectary.
- Diet processing equipment and how it affects your diet.
- Handling & storage of diet ingredients from procurement to use in diets.
- Insectary genetics.
- Group and individual problem solving specific to participants' laboratory situations.

List of Official IAEA Publications

Joint FAO/IAEA Programme of Nuclear Techniques in Food and Agriculture

Insect Pest Control Subprogramme

Title	Year	Type of Publication	Reference number (ISBN/ISSN)	Price (Euros)
EASTMED A Proposal for Medfly Control or Eradication with the Sterile Insect Technique	1995	Technical Document	STI/PUB/982	unpriced
Economic Evaluation of Damage Caused by, and Methods of Control of, the Mediterranean Fruit Fly in the Maghreb	1995	IAEA-TECDOC-830	ISSN 1011-4289	€15
Standardization of Medfly Trapping for use in Sterile Insect Technique Programmes	1996	IAEA-TECDOC-883	ISSN 1011-4289	€15
A Farewell to TSETSE	1996	Video Available in English PAL format in Cassette		unpriced
Evaluation of Genetically Altered Medflies for Use in Sterile Insect Technique Programmes	1997	Proceedings of Symposium	92-0-103897-6	€29
Control of the Mediterranean Fruit Fly in the Near East Region Using the Sterile Insect Technique	1997	Technical Document	STI/PUB/1020	unpriced
Genetic Engineering Technology for the Improvement of the Sterile Insect Technique	1998	IAEA-TECDOC-993	ISSN 1011-4289	€15
Development of Female Medfly Attractant Systems for Trapping and Sterility Assessment	1999	IAEA-TECDOC-1099	ISSN 1011-4289	€15
Proceedings of an FAO/IAEA Research Coordination Project on Medfly Mating. Florida Entomologist. March 2002, Vol. 85, No. 1.	2002	Scientific Journal	ISSN 0015-4040	unpriced
The Sterile Insect Technique An Environment-Friendly Method of Insect Pest Suppression and Eradication	2002	Video available in English, Spanish and French (NTSC and PAL format in Cassette and CD)		unpriced
Trapping Guideline for Area-Wide Fruit Fly Programmes	2003	Miscellaneous (English and Spanish versions)	IAEA/FAO-TG/FFP	unpriced
Improved Attractants for Enhancing Tsetse Fly Suppression	2003	IAEA-TECDOC-1064	ISBN 92-0-110403-0	€15
Automation for Tsetse Mass Rearing for Use in Sterile Insect Technique Programmes	2003	IAEA-TECDOC-1353	ISBN 92-0-104303-1	€15
Biology, History, Threat, Surveillance, and Control of the Cactus Moth, *Cactoblastis cactorum*	2004	Miscellaneous	ISBN 92-0-108304-1	€30

Title	Year	Type of Publication	ISBN/ISSN/reference number	Price (Euros)
The Cactus Moth, *Cactoblastis cactorum*: An Economic, Social and Ecological Threat	2005	Video Available in English NTSC format in Cassette and CD		unpriced
Environmental Benefits of Medfly SIT in Madeira and Their Inclusion in a Cost-benefit Analysis	2005	IAEA-TEC-DOC-1475	ISBN 92-0-110505-3	€15
Status and Risk Assessment of the Use of Transgenic Arthropods in Plant Protection	2006	IAEA-TEC-DOC-1483	ISBN 92-0-113005-8	€15

IAEA Publications

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