INSECT PEST CONTROL NEWSLETTER

Joint FAO/IAEA Division
of Nuclear Techniques
in Food and Agriculture and
FAO/IAEA Agriculture and
Biotechnology Laboratory, Seibersdorf

International Atomic Energy Agency
Vienna

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A. TO THE READER

There are several interesting developments to report during the first half of 2002. One is the meeting on "Status and Risk Assessment of the Use of Transgenic Arthropods in Plant Protection" that took place at FAO headquarters in Rome in April 2002. This very timely meeting was jointly organized by FAO/IAEA and the International Plant Protection Convention (IPPC) secretariat and chaired by Alan Robinson. Experts in both the technology of transformation as well as regulatory procedures and risk assessment participated. Transgenic technology is now almost routinely used in many insect species and currently arthropod transgenesis is mainly concerned with the stability and fitness of these strains. These topics will probably be the main issues to be addressed in a new Coordinated Research Project (CRP), is being proposed for initiation in 2003. From the regulatory point of view, risk assessment is mainly focused on horizontal transmission and the impact on biodiversity, and these concerns will need to be addressed when moving on a case-by-case basis, from the laboratory through field cages to open field release. Regulatory approval in the USA for the first field cage release of genetically transformed arthropod (pink bollworm) provided a timely background for the meeting. The proceedings of the meeting should provide the basis for the rational development of the use of transgenic arthropods.

During the first half of the year we have had a successful start of the CRP on "Genetic Sexing and Population Genetics of Screwworms" with a workshop and 1st RCM at the Laboratory of Animal Genetics, CBMEG/UNICAMP in Campinas, Brazil. CRP participants agreed to focus during the next five years of this CRP on population genetics of New World screwworm (NWS), population genetics of Old World screwworm, and molecular and Mendelian approaches to develop genetic sexing strains in NWS. We have also organized two moth SIT/F-1 Sterility related events that will take place in August 2002: the start of a new CRP on "Improvement of Codling Moth SIT to Facilitate Expansion of Field Application", and an interregional training course to take place at the codling moth SIT suppression programme in British Columbia, Canada. For both events we have had good response. Based on a consultants meeting recently held in Vienna on developing product quality control for standardization of tsetse mass production, a new CRP will be proposed on "Improved and Harmonized Quality Control for Expanded Tsetse Production, Sterilization and Field Application". We will encourage applications directly and indirectly related to this field, in view of the Pan African Tsetse and Trypanosomosis Eradication Campaign (PATTEC) initiative and the urgent need to develop tsetse quality control procedures in terms of behaviour, diets, radiation biology, field release studies, and colony maintenance.

Following resolutions by IAEA and also FAO governing bodies in support of the PATTEC initiative, that was launched by African Heads of State (reported in previous issues), several press releases and media reports have been issued on this topic. Of particular importance is a press release issued jointly by FAO, IAEA, OAU and WHO (text given inside this newsletter) at the beginning of the **World Food Summit –Five Years Later**, recently held in Rome in June 2002. This joint press release acknowledges the magnitude of the tsetse problem in tsetse-infested areas of sub-Saharan Africa, where about 85 percent of the poor are

located in rural areas, more than 80 percent of the population depends on agricultural production for their livelihood, and half the population suffers from food insecurity.

The joint press release results from the harmonization of positions among the four mandated organizations, stressing the need for an integrated areawide approach to help combat tsetse and sleeping sickness in humans and Nagana in livestock. The proposed intervention strategy duly protects the environment and brings together all active tsetse control technologies, including the use of sterile flies to ultimately eliminate the tsetse population and the diseases they carry. According to the four organizations, the "area-wide integrated approach is essentially a comprehensive approach, linking agricultural practices and tsetse fly intervention, in areas with mixed livestock and crop farming where there is strong potential for sustainable agricultural development."

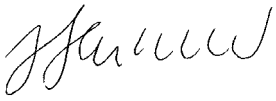
The harmonization among the four organizations took place at a two-day workshop held 2-3 May 2002 at the Rome Headquarters of FAO to reach consensus on the respective activities as they relate to the Programme Against African Trypanosomiasis (PAAT) and PATTEC. The workshop participants also concluded that two specific tsetse and trypanosomiasis intervention projects, one in Ethiopia and the other in a cross-border area of Burkina Faso and Mali deserve full implementation support by the organizations. The workshop also looked at ways to ensure a sustainable approach towards improved human health and socio-economic development of tsetse-infested areas.

The joint press release adds some precision and realism to a previous press release and some statements from various non-technical parties and press officers within IAEA, OAU, and PATTEC to the media, suggesting eradication of "tsetse" from all of continental Africa. This has led to unwarranted criticism by implying that the IAEA is attempting to eradicate every single tsetse species from every location in Africa. This is obviously not being advocated and specific populations in specific areas will be targeted just as has been done with economically important species for fruit flies, moths and screwworms. A significant number of tsetse species is of no economic importance, and there are areas and regions where tsetse eradication is of no benefit. The agreed focus over the next decades is to establish tsetse-free areas in selected areas where an integrated areawide approach to tsetse is feasible and technically and economically justifiable. The technical position of the Joint FAO/IAEA Division on the tsetse / trypanosomosis has recently been published by FAO as Paper No.3 of the Technical and Scientific Series of PAAT (see abstract of this paper in this newsletter). To avoid future misunderstandings we should all refrain from loosely using the term "tsetse", and instead using common and scientific names for the species involved.

In terms of staff, we have been fortunate to have Andrew Parker returning to the team in charge of the programme to develop tsetse rearing and quality control methods at the FAO/IAEA Laboratories in Seibersdorf. Andrew has great experience working in Africa and on tsetse SIT, and will therefore be a great support to the expanding tsetse programme. We are also fortunate to have Abdeljelil Bakri for another twelve months to continue his work on databases of arthropod disinfestations and sterilization doses and as well as radiation facilities.

On a very sad note, we would like to dedicate this newsletter to the memory of the late David Rumsey. Dave was a friend and a very generous and kind person. In spite of his young age, he was respected for his effective management of the large and very successful Los Angeles Basin SIT medfly programme. More and more SIT specialists in the US are retiring without being replaced and Dave was an important exception, representing hope for

the future of SIT in the USA. His premature departure represents a great loss to his family and to CDFA and USDA. Dave was also very supportive of the FAO/IAEA SIT activities and went on numerous missions as an expert to assist countries in various regions of the world. We all, SIT, fruit fly and plant protection colleagues in many parts of the world, who were fortunate to have known him, will miss him very much.



Jorge Hendrichs
Head, Insect Pest Control Section

B. STAFF

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

Insect Pest Control Section, IAEA, P.O. Box 100, A-1400 Vienna, Austria
(Tel = +43-1-2600-21628 Fax = +43-1-26007-21632)

Jorge Hendrichs e-mail: J.Hendrichs@iaea.org	Section Head
Udo Feldmann e-mail: U.Feldmann@iaea.org	Technical Officer (Tsetse/Screwworm)
Walther Enkerlin e-mail: W.Enkerlin@iaea.org	Technical Officer (Fruit Flies)
Jean Pierre Cayol e-mail: J.P.Cayol@iaea.org	Technical Officer (Fruit Flies)
Arnold Dyck e-mail: V.A.Dyck@iaea.org	Interregional Officer
Marc Vreysen e-mail: M.Vreysen@iaea.org	Technical Officer (Tsetse/Screwworm)
Abdeljelil Bakri e-mail: A.Bakri@iaea.org	Visiting Scientist
Marta De Coronado e-mail: M.de-Coronado@iaea.org	Senior Secretary
Magali Evrard e-mail: M.Evrard@iaea.org	Secretary

Entomology Unit, FAO/IAEA Agriculture and Biotechnology Laboratory, A-2444 Seibersdorf, Austria
(Tel: +43-1-2600 28402; Fax: +43-1-26007 28274)

Alan Robinson e-mail: A.Robinson@iaea.org	Unit Head
Gerald Franz e-mail: G.Franz@iaea.org	Genetics and Molecular Biology
Andrew Parker e-mail: A.Parker@iaea.org	Tsetse Rearing Technology
Carlos Caceres e-mail: C.Caceres@iaea.org	Fruit Fly Rearing Technology
Gratian Mutika e-mail: G.Mutika@iaea.org	Tsetse Quality Control
Lucia Kruzic e-mail: L.Kruzic@iaea.org	Secretary

Field experts:	
James Novy e-mail: screworm@daffodil.infochan.com	JAM/5/006 Eradication of the New World Screwworm, Jamaica
John Kabayo e-mail: jkabayo@hotmail.com	RAF/5/040 SIT for Tsetse and Trypanosomosis Management in Africa
René Garcia e-mail: rgarcia@gerona.inf.cu	RLA/5/044 Preparing the Caribbean for Eradication of the New World Screwworm
Jesús Reyes e-mail: jreyes@protecnet.go.cr	RLA/5/045 Establishing Pilot Fruit Fly-Free and Low Prevalence Areas Using an Area-wide Integrated Approach in Central America and Panama

C. FORTHCOMING EVENTS

I. Research Co-ordination Meetings (RCM)

"Enhancement of the Sterile Insect Technique through Genetic Transformation Using Nuclear Techniques", 8–12 July 2002, Capri, Italy, 4th and Final RCM.

"Improvement of codling moth SIT to facilitate expansion of field application", 19-23 August 2002, Kelowna, British Columbia, Canada, 1st RCM.

"Use of nuclear techniques for the colonization and production of natural enemies", 23-27 February 2003, Damascus, Syria. 3rd RCM.

"Quality assurance of mass produced and released fruit flies" 19-23 May 2003, Perth, Australia. 3rd RCM.

"Application of genetics to improve the SIT for tsetse" 23-27 June 2003, Edmonton, Alberta, Canada. 4th and final RCM.

"Genetic sexing and population genetics of screwworms" 22-26 September 2003, Bogor, Indonesia. 2nd RCM.

New CRP on "Development of product and process quality control for standardization of tsetse mass production, sterilization and SIT" (in conjuction with IOBC meeting on QA of Mass Reared Arthropods), 15-19 September 2003 Montpellier, France. 1st RCM.

New CRP on "The use of molecular tools to improve the effectiveness of SIT" 6-10 October 2003, Vienna, Austria. 1st RCM.

"Development of improved attractants and their integration into fruit fly SIT management Programmes" (in conjunction with Western Hemisphere meeting on Fruit Flies of Economic Importance). October 2003, Miami, Florida, USA. 3rd RCM.

II. Consultants and other planning meetings

Coordination meeting on the Central America Fruit Fly Regional Project RLA5045, Panama City, 8-9 July 2002.

Consultants meeting on "Study and Control of Insect Pest of Ecological and Agricultural Importance in North America and the Caribbean using the Sterile Insect Technique (SIT)" Vienna, Austria, 14-18 July 2002.

Consultants meeting on "Identification of improved rearing techniques for *Anastrepha* and *Bactrocera*", Vienna, Austria, 23-27 September 2002.

Consultants meeting on "Development of guidelines for verification of tsetse fly free areas" Vienna, Austria, September 2003.

III. Other Meetings/Courses

Interregional Training Course on the "Use of the Sterile Insect and Related Techniques for the Areawide Management of Insect Pests", Okanagan Valley, British Columbia, Canada. 5 – 30 August 2002.

The course is being organized by the IAEA and the FAO in co-operation with the Government of Canada, the Okanagan University College and the codling moth SIT project in the Okanagan Valley in British Columbia.

The purpose of the course is to provide a thorough overview and training on the application of nuclear and related techniques within the context of areawide integrated insect pest management programmes to managers of insect control programmes, animal health and plant protection officials and applied research entomologists. The course will include radiation-induced sterility, the Sterile Insect Technique (SIT), F-1 Sterility, other methods of insect control, integration of control methodologies for areawide insect management, the biology, ecology and dynamics of pest insect populations subjected to control, economic analysis and management of areawide programmes and reviews of successful and ongoing SIT programmes.

The course will also include field visits related to the Okanagan Kootenay Sterile Insect Release Programme, a programme that successfully releases sterilized codling moths as part of an areawide strategy of Integrated Pest Management in apple and pear orchards.

International Training Course on "Fruit Fly Management with Emphasis in the Sterile Insect Technique (SIT)", Retalhuleu, Guatemala, 22 September to 9 October, 2002.

The Second International Fruit Fly Course Under the Central America Fruit Fly Regional Project RLA5045 is being organized by the IAEA and the Guatemala-Mexico- United States Moscamed Comission at the International Fruit Fly Training Centre in Retalhuleu, Guatemala. The purpose of this course is to continue building-up in the region the human resource capacity in the field of areawide fruit fly management. The course will focus on covering the essential topics of fruit fly management programmes including: 1) organization and operation of fruit fly programmes, 2) basic biology and taxonomy of fruit flies, 3) mass rearing of fruit flies and parasites, 4) detection and control techniques including: trapping, fruit sampling, bait sprays, sterile fly release and quarantine, 4) sterile-fertile differentiation, and 5) operational aspects of the establishment and maintenance of fruit fly low prevalence and free areas for fruit exports. The course will offer a fare amount of theoretical knowledge on the various techniques, but will focused more on the operational aspects of the technology. Participants from the Central American and some South American countries will be attending the course.

Regional East Africa Training Course on Establishing National GIS Capacity for Ongoing and Planned Tsetse/Trypanosomosis Intervention Campaigns, Oct/Nov, 2002, Addis Ababa, Ethiopia.

This course is based on the recent GIS course held in South West Africa (Ouagadougou, Burkina Faso). The program for the course is currently under preparation

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D. PAST EVENTS (2002)

I. Research Co-ordination Meetings (RCM's)

"Development of Improved Attractants and their integration into Fruit Fly SIT Management Programmes" 30 April – 3 May, 2002, Stellenbosch, South Africa; 2nd RCM. Held in conjunction with the 6th International Fruit Fly Symposium on Fruit Flies of Economic Importance, 6-10 November 2002.

"Improved attractants for enhancing the efficiency of tsetse fly suppression operations and barrier systems used in tsetse control/eradication campaigns" 18 – 23 March 2002, Kampala, Uganda; Final RCM.

"Genetic Sexing and Population Genetics of Screwworms", 5-14 February 2002, Campinas, Brazil; 1st RCM and Workshop.

"Enabling Technologies for the Expansion of SIT for Old and New World Screwworm" 28 Jan. – 5 Feb. 2002, Campinas Brazil; 1st RCM.

Note.- The proceedings of these meetings are available on request at the Insect Pest Control Section's office.

II. Consultants And Other Planning Meetings

Consultants meeting on "Developing product and process quality control for standardization of tsetse mass production, sterilization and SIT release", Vienna, Austria, 10-14 June 2002.

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"Third Meeting of the National Co-ordinators of Fruit Fly Projects in the Near East" 30 April – 3 May, 2002; Stellenbosch, South Africa.

FAO and IAEA Meeting on "Risk Assessment of Transgenic Arthropods" 8 – 12 April, 2002; Rome, Italy.

"AOAD/FAO/IAEA harmonisation meeting on intervention against the Old World Screwworm Fly in Regional West Asia, 18-20 February 2002, Cairo, Egypt.

"First Meeting of the Management Committee for the Use of the USAID-MERC funds" 28-29 January, 2002, Vienna, Austria

III. Other meetings/events

Regional Training Course on Establishing National GIS Capacity for Ongoing and Planned Tsetse/ Trypanosomosis Intervention Campaigns, 6-24 May 2002, Ouagadougou, Burkina Faso.

"Journalist trip on establishment of tsetse free areas in Africa" 12-20 May, 2002, Uganda, Ethiopia and Tanzania.

"6th International Symposium on Fruit Flies of Economic Importance" 6-10 of May, 2002, Stellenbosch, South Africa.

"FAO/IAEA/OAU/WHO workshop to harmonise joint international activities against Tsetse and Trypanosomosis under the Programme Against African Trypanosomoasis (PAAT) and the Pan-African Tsetse and Trypanosomosis Eradication Campaign (PATTEC)". 2-3 May 2002, FAO, Rome.

"Workshop on Fruit Fly Control – Co-operation in the Asia-Pacific Region" 18-23 March, Okinawa, Japan.

"Workshop on Arthropod Pest Problems in Pome Fruit Production (IOBC/OILB). Bundesanstalt fuer Pflanzenschutz. 10-14 March, 2002, Vienna, Austria.

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Presentation on SIT at the 2nd International Conference on "Alternative control methods against plant pests and diseases" 4-7 March, 2002, Lille, France.

Presentation of the status of the peach fruit fly in the Near East at the "EPPO Workshop on peach fruit fly" 5-6 March, 2002, Paris, France.

Expert consultation in Brazil to assess the "Feasibility of building a medfly mass rearing and sterilization facility in the North East of Brazil" 19 February – 1 March, 2002, Brasilia, Brazil.

WHO/PATTEC meeting to explore public- private-sector interaction on tsetse and trypanosomosis, 23-25 January 2002, WHO, Geneva.

E. TECHNICAL CO-OPERATION PROJECTS

During the biennium 2001-2002, the Subprogramme has currently technical responsibilities for the following technical co- operation projects. They fall under five major areas, namely:

- Tsetse
- Fruit flies
- Old and New World Screwworm
- F-1 Sterility for the Control of Lepidopteran Pests
- *Anopheles arabiensis* mosquitoes.

Operational Projects (2001-2002) are:

EGY/5/025 Area-Wide Fruit Fly Control in Eastern Egypt.

ETH/5/012 Integrating SIT for Tsetse Eradication.

INT/5/145 Promotion and Transfer of Sterile Insect Technology.

ISR/5/010 Upgrading the Area-Wide Control of the Mediterranean Fruit Fly using the Sterile Insect Technique.

JAM/5/007 New World Screwworm Eradication.

JOR/5/009 Upgrading the Area-Wide Control of the Mediterranean Fruit Fly using the Sterile Insect Technique.

KEN/5/022 Integrated Area-Wide Tsetse and Trypanosomosis Management in Lambwe Valley.

MAR/5/009 Control of Diamondback Moth by Sterile Insect Technique.

MLI/5/017 Integrated Control of Animal Trypanosomosis through creation of a Tsetse Fly Free Zone.

PAL/5/002 Area-wide Application of SIT for Medfly Control.

RAF/5/051 SIT for Tsetse and Trypanosomosis Management in Africa.

RAF/5/052 SIT Development for Control of Anopheles Mosquito.

RAW/5/008 Integrating the Sterile Insect Technique into an Areawide Approach Against The Old World Screwworm.

RLA/5/044 Preparing Caribbean Eradication of New World Screwworm.

RLA/5/045 Preparation for Pilot Fruit Fly-Free Areas using the Sterile Insect Technique in Central America.

RLA/0172 An FAO Technical Co-operation Project entitled "Establishment of Mediterranean fruit fly (*Ceratitis capitata*) free areas in Belize, Costa Rica and Panama".

SAF/5/002 Sterile Insect Technique Integrated Management of Fruit Fly.

SAF/5/005 Situation Analysis of the Feasibility and Desirability of Tsetse Fly Eradication.

SLR/5/002 Feasibility Study for a Mass Rearing Insect Facility.

THA/5/046 Area-Wide Integrated Control of Fruit Flies.

TUN/5/019 Control of the Date Moth using Radiation Sterilization.

TUN/5/020 Establishment of a Medfly Mass-Rearing Facility and Introduction of a Pilot Sterile Insect Technique Control Programme.

UGA/5/023 Integrated Sterilie Insect Technique Based Intervention against Tsetse in Buvuma Island.

URT/5/019 Support to National Tsetse and Trypanosomosis Management.

In keeping with our policy to highlight activities in a few of our Technical Co-operation projects in each Newsletter the following project is discussed in this issue:

General overview of progress made in tsetse projects

The Insect Pest Control Section of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture is providing technical backstopping to several IAEA Technical Cooperation Projects in support of national and regional tsetse intervention activities in Sub-Sahara Africa. The following outline provides a summary of progress made in the first half of 2002.

Preparation for areawide intervention against tsetse fly in:

Ethiopia (Supported under TC project ETH5012)

After the completion of the design work for the development of a modern mass rearing facility with a capacity to maintain a colony of 10 million tsetse flies, construction of the first module was initiated in late February 2002 and is scheduled to become operational in 2003. The funds for the construction of the planned six-module facility, an estimated US$ 2 million, are entirely provided by the Ethiopian government. It is expected that the facility will provide sufficient sterile male flies for the SIT component of the integrated intervention campaign against *G. pallidipes* in the Southern Rift Valley.

Kenya (supported under TC project KEN5022)

Following difficulties with the establishment of a *G. pallidipes* colony at the Kenyan Tsetse and Trypanosomiasis Research Institute (KETRI) in Nairobi, a local contract was provided to a Kenyan company to investigate the causes of the high mortality in the colony. The results of the analysis will indicate if the problems with the colony establishment were related to a suspected insecticide contamination of the holding rooms and/or equipment.

In order to increase the efficiency of the implementation of national tsetse intervention programmes, the Kenyan Government is considering action to streamline their national tsetse and trypanosomosis structure under a national centralised office with the mandate to coordinate all ongoing and future planned tsetse intervention campaigns in the country.

Mali (supported under TC project MLI5017) and Burkina Faso (supported under TC project RAF5051)

Considerable progress has been made during the first phase (preparatory activities) of the tsetse intervention campaign in the Northern Niger River Basin (NNRB) in Mali. An experimental colony of the target species *G. palpalis gambiensis* (Gpg), originating from the river systems around Bamako, has been initiated at the Laboratoire Central Vétérinaire. The colony is currently expanding and will provide the male and female fly material to assess in large field cage tests the mating compatibility of the native flies of the NNRB with those maintained at the CIRDES facility in Bobo Dioulasso, Burkina Faso. These tests will confirm the absence/presence of mating barriers between released sterile male flies and native female flies i.e. crucial information before the releases are initiated.

The entomological surveys have advanced well and the collection of entomological base-line data in the very difficult and remote La Faya system (a tributary of the Niger with a vast network of smaller tributaries) has been finalised. The results of the surveys indicate that 1.) Gpg is the only species present in the region, 2.) the apparent density of the Gpg population fluctuates significantly with the seasons, 3.) the Gpg population density is very high in certain river systems (200-400 Gpg/trap/day) and 4.) Gpg is present in all surveyed river systems and on many of the islands in the Niger River. All sampling sites were geo-referenced and the data plotted on Landsat 7 Satellite imagery by Joint Division GIS staff. The results of the surveys will constitute the basis for the development of a Gpg fly population suppression strategy. The different options to be considered are the deployment of insecticide-impregnated traps in densely inhabited areas with the participation of local farmer communities, the use of the live-bait technique in areas of high livestock densities and the Sequential Aerosol Technique in remote, inaccessible areas.

Veterinary surveys have been carried out in selected areas around the capital of Bamako i.e. the Tiènfala and Banguinéda area. The results indicate a low prevalence rate of trypanosomosis in cattle (< 4% in September 2001), which is however attributed to the continuous prophylactic treatment of livestock with trypanocidal drugs.

Mr Souleymane Bado of the Laboratoire National d'Elevage, Ouagadougou, Burkina Faso, carried out an IAEA mission to the Northern Niger River to assist the counterparts with the sampling of Gpg flies in areas considered critical for the development of the suppression/eradi-cation strategy and for the implementation of the programme according to the area-wide IPM approach. After his field mission, the expert proceeded to the Entomology Unit of the FAO/IAEA laboratories in Seibersdorf to extract the DNA from the sampled and preserved Gpg flies. The genetic material of these Gpg populations of the different river basins will be processed statistically to assess the degree of gene flow between the different populations, which will provide an indication of the degree of isolation of the Gpg population in the Northern Niger River system.

The Director General of the 'Centre International de Recherche-Développement sur l'Elevage en Zone Subhumide' (CIRDES) has signed an 'agreement of collaboration' with the Minister of Animal Resources of Burkina Faso. This is an important milestone in the collaborative tsetse intervention effort of Mali and Burkina Faso. A Gpg colony of 100,000

female flies has been maintained at the CIRDES facility for many years, and it is planned to expand this colony to a size of at least 400,000 female flies to produce sufficient sterile male flies for the programme in Mali. Discussions are now underway to develop the technical protocols and management details. The IAEA has assisted the rearing aspect of the programme with the provision of equipment (under the regional TC tsetse project RAF5051 with funds (US$ 300,000) from the Norwegian Government) to introduce new tsetse rearing techniques at CIRDES, such as self-stocking of male and female flies in holding cages and the installation of a semi-automated holding/feeding system (TPU3).

In preparation of the SIT component of the programme in Mali, trial releases of sterile male Gpg flies are scheduled for the second half of 2002 (during the rainy season) to assess the survival, dispersal and competitiveness of the mass-reared flies after release in the field.

South Africa (supported under TC project SAF5005)

The Agricultural Research Council – Onderstepoort Veterinary Institute (ARC-OVI) in collaboration with the KwaZulu-Natal Veterinary Services has been engaged since several years in R&D activities related to the development of a control/eradication strategy for *G. brevipalpis* (Gb) and *G. austeni* (Ga) in KwaZulu Natal. The most important achievements so far have been 1.) the development of a trap (H-trap) suitable for sampling both Gb and Ga flies, 2.) the identification of efficient chemical components to be used as odour attractants for Gb., and 3.) the development of accurate tsetse and trypanosomosis distribution maps following extensive entomological and veterinary surveys. Currently, the efficiency of insecticide-impregnated targets as a technique to suppress populations of Gb and Ga is being tested in a pilot field trial.

Following a visit by the chief counterpart at the Entomology Unit in Seibersdorf, more than 4,000 Gb pupae have been shipped to South Africa in the period January-June 2002, to assist with the establishment of a Gb colony at the ARC-OVI, Pretoria. The colony is performing well with a reported fecundity of 0.85 pupae/female/10 days and a total pro-duction of 300-400 pupae/week. The Gb colony will provide the required fly material to run the quality control bio-assay of blood, collected by a reference centre in Stellenbosch for supply to various institutes and future rearing centres on the African continent. In addition, a functional colony of Gb (and at a later stage of Ga) will be established for a pilot project to assess the feasibility of using the SIT in an integrated area-wide IPM programme in KwaZulu Natal. Field collections in KwaZulu Natal of both Gb and Ga have been initiated and flies have been transferred to the insectary of the ARC-OVI.

Tanzania (supported under TC project URT5019)

The results of the first entomological survey conducted in October 2001 on Mafia Island showed that only *G. brevipalpis* was sampled but the fly was widespread over the island. To facilitate interpretation of the data, land-use/land-cover maps were developed and all trapping sites and catch data were incorporated in a GIS. A veterinary survey was carried out in February 2002 and

blood of 480 cattle was sampled and screened parasitologically for the presence of trypanosomes. Only 2 animals were found positive for *Trypanosoma congolense* (0.4%) and no *T. vivax* was found. Sera were collected from the same animals for testing with the Ab-ELISA at the Animal Disease Research Institute in Dar es Salaam. The data of the tests showed a prevalence rate of 8.5% and 4.7% for *T. congolense* and *T. vivax,* respectively and 1.6% of the cattle had mixed infections. These preliminary data will be verified during a second survey scheduled for August 2002, but so far, there is little indication that trypanosomosis is a major livestock disease on the island.

The Tsetse and Trypanosomosis Research Institute (TTRI) located in Tanga, Tanzania provided the sterile *G. austeni* males for the eradication programme on Zanzibar from 1994 to 1997. The institute is now extending its mandate to become a regional centre for the rearing of different species of tsetse flies. Currently, this entails the main-tenance of a back-up colony of *G. austeni,* which can also be used by other member states (e.g. South Africa) and the establishment of a colony of *G. pallidipes* (Gp) (Uganda origin) from pupae supplied by Seibersdorf in support of tsetse programmes in other member states (e.g. Kenya and Ethiopia). A total of 85,000 Gp pupae have been shipped in 8 shipments from March to June 2002.

Over the past decade, the TTRI has developed into an East African 'centre of excellence' with respect to expertise in rearing of tsetse flies, with an unique pool of scientists and technicians. The TTRI staff are currently transferring their knowledge to other member states e.g. TTRI scientists and technicians are providing assistance to Ethiopia with the rearing and expansion of the Gp colony.

Uganda (supported under UGA5023)

The Environmental Research Group of Oxford (ERGO) was contracted by the IAEA to produce detailed 1 km resolution maps of predicted probability of presence of *G. fuscipes fuscipes* (Gff)*, G. pallidipes* (Gp) and *G. morsitans* (Gm) around the Lake Victoria Shore. The risk prediction maps showed isolated Gff and Gp populations around the Lake Victoria Basin presenting an ideal opportunity to implement a tsetse intervention programme according to the areawide IPM concept. The maps were used as a basis for the development a strategic programme document, outlining a strategy for the creation of a tsetse free zone around the Lake Victoria Shore.

The Government of Uganda has released funds to initiate the upgrading of the insectaries at the Livestock Research Institute (LIRI) at Tororo. The facility will be used as a temporarily rearing unit to establish and expand a colony of Gff. Shipments of Gff pupae from the Entomology Unit in Seibersdorf to LIRI were initiated in June 2002 to assist with the colony establishment.

An Update of the Areawide Control of the Mediterranean Fruit Fly Using the Sterile Insect Technique in Israel (ISR5010), in the Hashemite Kingdom of Jordan (JOR5009) and in the Territories Under the Jurisdiction of the Palestinian Authority (PAL5002)

In 1992-1994, the Oslo agreements between the State of Israel and the Palestinian Liberation Organization, and the peace treaty between Israel and Jordan, provided promising grounds for the development of regional cooperation. In

1994, a panel of experts evaluated the potential of using the SIT to control the medfly in the Near East region. Considering that up to twelve pesticide applications were needed yearly to protect 530,000 hectares of fruit production, valued at USD 611 million per year, it was found that the SIT would drastically reduce the amount of pesticide used in the region, resulting in a better, environmental friendly and sustainable approach to medfly control. In 1996, it was estimated that, should no control be applied against the medfly, the annual fruit losses would amount to USD 365 million for Israel, the Hashemite Kingdom of Jordan and the Territories Under the Jurisdiction of the Palestinian Authority (TUJPA). Under the current control methods, the direct and indirect damage was estimated as high as USD 192 million a year. As a result, pilot projects were launched in Israel (ISR5009) and in Jordan (JOR5007) with the aim of demonstrating the feasibility of using SIT to control the medfly in the Arava/Araba Valley south of the Dead Sea. Aerial releases of sterile medfly males were initiated in late 1997 and are continuing.

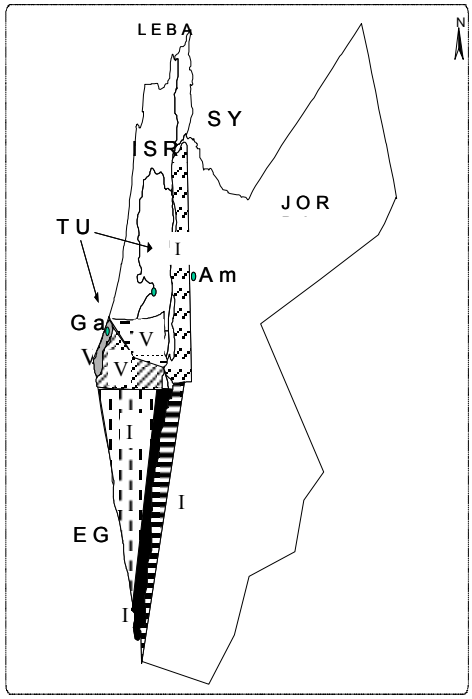

Fig. 1. Operational zones of fruit fly projects in the Near East, as agreed in the USAID-MERC proposal (*national boundaries are not mandatory and do not reflect any political opinion*)

In 1999, building upon the regional expertise gained in the region, the TUJPA initiated preparations for a medfly control project (PAL5002) and started sharing regional training, expertise and visits by fruit fly experts.

In 2001, Israel (ISR5010), Jordan (JOR5009) and the TUJPA were awarded a USD 2.5 million USAID grant to promote the Middle East Regional Cooperation (MERC) with the support of the IAEA.

The project area spreads from the Aqaba Gulf of the Red Sea in the south to the Sea of Galilee in the north and it has been defined as seven operational zones named (**Fig. 1**): Arava Valley (I), Araba Valley (II), Jordan Valley (III), Western Negev (IV), Gaza Strip (V), Northern Negev (VI) and Hebron (VII). The implementation of the project in these zones is under the technical responsibility of Israel for zones I, IV and VI, of Jordan for zones II and III, and of the TUJPA for zones V and VII.

The strategy and objective (eradication or suppression) of each operational zone have been defined during the 2nd Meeting of the National Project Counterparts held in Vienna in March 2001 (see Newsletter 57).

As from July 1998 until today, up to 16 million male pupae (of the GSS Vienna4/Tol-94 and as of 2000, of Vienna 7/Tol-2000) were shipped weekly (in two batches) from the El-Pino MOSCAMED rearing facility in Guatemala and released over zones I and II. On an average, 64.3% ± 11.6 flying medfly males emerged out of the pupae after 54.3 ± 9.4 hours in

hypoxia. As from 2001, an average of 2 million sterile male pupae are released once a week over the Western Negev. As from December 2001, an additional 6 million male pupae of the Vienna 7D53/Mix-2001 are shipped weekly from the FAO/IAEA laboratory in Austria and released over zones I, II and IV.

All major project activities have continued in spite of the unfavourable situation that prevails in the region.

In Israel in 2001, as shown in **Fig. 2**, medfly has been kept under control in the Arava Valley, though the changes in airline shipping routes after Sep. 11th affected the delivery of sterile male pupae to the projects. The successful control of the medfly in this area in combination with exclusion measures such as the use of insect-proof greenhouses, has resulted in exports of bell paper and tomatoes to the USA rapidly increasing to USD 8 million per year. It has been estimated that, should the medfly be eradicated from this valley (and proper quarantine be set-up), a potential yearly USD 100 million worth of vegetables could be exported per year. SIT operations only started in 2001 in the Western Negev (zone IV) thus it is expected that control of medfly populations will gradually be achieved.

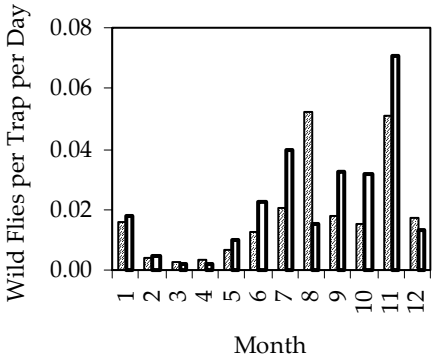

Fig. 2. Medfly captures in Tephri® traps baited with Biolure® in the "Arava Valley" (Zone I) in 2001 [wild males: dashed bars, wild females: empty bars]

In Jordan in 2001, the medfly has not been as successfully controlled in the Araba Valley (zone II) as it has been in the Arava, as shown in **Fig. 3**. The lack of immediate complementary actions (bait sprays) to compensate the lack of sterile flies after Sep. 11th has resulted in wild medfly population building up in the Northern part of the valley. Nevertheless, the southernmost city of Aqaba has been maintained with only occasional medfly detections. Though not yet well promoted, the potential project benefits could be similar to these of the Israeli Arava and could result in considerable vegetable export markets for commercial growers who would invest in this area. In addition, growers in the Jordan Valley (zone III), the major commercial fruit producing area of the country, expressed their intention to establish an areawide medfly control programme and medfly monitoring operations have been initiated.

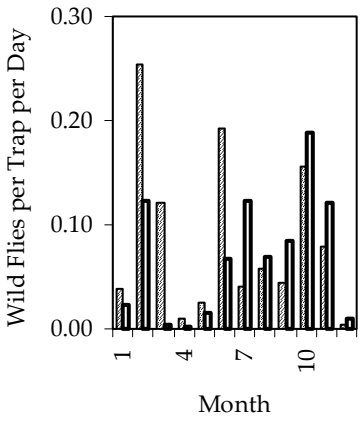

Fig. 3. Medfly captures in plastic McPhail traps baited with Biolure® in the "Araba Valley" (Zone II) in 2001 [wild males: dashed bars, wild females: empty bars]

In the TUJPA, centralized medfly monitoring have been set-up and the project has been equipped with a fruit fly identification laboratory. The authorities

are benefiting from the knowledge and expertise built-up in the region.

As a result of the regional co-operation, the three projects established detection and monitoring networks against the peach fruit fly, *Bactrocera zonata*, that has invaded Egypt. Outbreaks in bordering areas in Israel South of the Gaza Strip have been eradicated using the Male Annihilation Technique

These results illustrate that each of the three projects benefit, according to their particular conditions and needs, from a regional approach of a common concern

The Technical Co-operation Project Entitled: Preparation for Pilot Fruit Fly-Free Areas Using the Sterile Insect Technique in Central America (RLA/5/045) has been Extended

Objectives: To assist Central America and Panama in developing pilot fruit fly low prevalence and free areas to enhance the prospects for fruit exports through the implementation of an integrated and areawide approach including SIT were required, to manage major fruit fly pests.

The results obtained so far are in line with the project objectives and the participating countries in the region have expressed, through the Ministries of Agriculture, full satisfaction of Project achievements. The most significant project achievements in 2001 are summarized as follows:

1. Consolidation of the Project management structure through the creation of the Project Coordination Group (PCG) with participation of all interested national and regional plant protection organizations and placement of an IAEA Regional Project Manager (RPM) on site.

2. Assignment of National Project Coordinators who have the responsibility of closely working with the Agency's RPM for effective project implementation.

3. Capacity building through training of national staff by means of a Fruit Fly Management Course held in the International Fruit Fly Training Centre of the Moscamed Programme in Chiapas, Mexico, in August 2001.

4. Group Scientific Visit of the Project Counterparts to the avocado export programme in Michoacan, Mexico, and to the fly free area in Sonora, Mexico.

5. Preparation of the terms of reference and outsourcing of three feasibility studies including: a) technical and economical feasibility of establishing low prevalence and fly free areas, b) pest risk analysis for the selected pilot areas and c) diagnosis of the institutional capacity of the participating countries for project implementation.

6. Identification and selection of the pilot areas in each country to be developed into low prevalence or fly free areas for fruit exports. The selected sites are the following: Los Inocentes and Nicoya in Costa Rica, San Juan Opico in El Salvador, municipalities in Quetzaltenango and Totonicapan in Guatemala, Ometepe Island in Nicaragua and Penome and Arco Seco in Panama. In the case of Belize efforts are focusing on assisting the phytosanitary authorities in strengthening the countries infrastructure to maintain the medfly free status and in creating conditions for fruit exports.

Based on the Project achievements and commitments made by the participating organizations, the countries in the region have officially requested the IAEA that the Project be extended to the

next biennium (years 2003 and 2004). This would allow implementation of the second project phase aimed at developing pilot areas for fruit exports, which is the Projects expected outcome.

Project plan: To assure effective collaboration and to maximize efforts of the alliance (IICA, OIRSA, FAO, USDA, MOSCAMED and IAEA), the IAEA will continue to assign a Regional Project Manager (RPM), who will continue to work in close collaboration with the PCG and the assigned National Project Coordinators. The function of the PCG will be to plan, supervise, evaluate, and provide direction to the project.

The second phase will take advantage of the capacity building in each country and will be more focused on the technology transfer process that will allow the development of the pilot fruit fly free areas (FFA) and fruit fly low prevalence areas (FFLPA). For effective technology transfer the IAEA will contribute with further training, expert missions for technology implementation and acquisition of specialized materials and equipment. The enhanced association with Governments, regional organizations, US Department of Agriculture (USDA), and the fruit industry can speed the development of the FFA and FFLPA because export protocols must be the product of formal agreements between the national plant protection services of the exporting and importing countries. It will also facilitate the development of pest risk analysis and establishment of the appropriate systems approach for managing the existing fruit fly problem and other quarantine pests of concern. Through the RPM, the IAEA will promote national and regional programs for fruit fly control, organize on-site workshops and training, as well as expert missions to the region and fellowships and scientific visits to similar programs abroad. The RPM will assist national authorities to plan and formulate detailed project proposals and work plans for phase II, including the implementation of the recommendations provided in the feasibility studies that will be finalized by June 2002.

National commitment: The countries involved in this sub regional project will make available all relevant information, including past and recently collected data and other information that will be needed in this collaborative effort. The government bodies, in collaboration with the fruit producers, will support and participate in the preparatory activities and in the elaboration of the intervention plans. The Plant Protection General Directors will provide a project national management structure and policy support in the form adequate legislation for project implementation and operation in the identified and selected pilot sites. During the implementation phase, each participating country will provide operational support in the form of qualified technical personnel and logistic and infrastructure support as required. Where appropriate, the affected countries will contribute financial resources to the overall budget.

Besides continuing to appoint and fund a Regional Project Manager (RPM) to be located in the field the IAEA will provide expert services for areawide SIT-based Integrated Pest Management (IPM) applications and follow-up on the recommendations provided by the feasibility assessments. In addition, the IAEA will provide quality control expertise for the regional fruit fly programmes (including MOSCAMED) through its RPM and expert missions. The IAEA will follow up the activities in the region and provide technical and administrative support to its RPM.

Expected results: As a result of the second phase of this project, at least one pilot area for each participating country will be in the position of being declared a

fruit fly low prevalence or free area for fruit exports.

Project impact: Implementation of the activities outlined in the project plan will set the basis for a concerted international and regional effort to alleviate the fruit fly problem in the affected countries and will provide a means for sustainable fruit fly control or eradication using an integrated fruit fly management approach based on the SIT. Control and/or eradication of selected fruit flies will impact the economic status of export and smallholder fruit farms in the region.

F. ONGOING AND PLANNED CO-ORDINATED RESEARCH PROJECTS (CRP's) AND RESEARCH COORDINATION MEETINGS (RCM'S)

Development of Improved Attractants and their Integration into Fruit Fly SIT Management Programmes. 30 April–3 May, 2002, Stellenbosch, South Africa (CRP.D4.10.17)

During a previous FAO/IAEA CRP titled "Development of female medfly attractant systems for trapping and sterility assessment" conducted from 1995 to 1998 significant developments were made in development of a female medfly detection system.

During this CRP we will determine the efficacy of the female medfly attractants and other synthetic food lures for other species of economically important fruit flies.

The Second Research Coordination Meeting was held during 30 April – 3 May, 2002, in Stellenbosch, South Africa. 17 contract holders from 11 countries and 4 observers participated in the meeting.

During the meeting results from the first year experiments were presented and discussed. The most relevant findings were:

Mediterranean fruit fly *(Ceratitis capitata)*

Countries involved: Argentina, Brazil, Greece, Portugal and Spain.

Main Objective:

To evaluate the performance of trapping systems based on the three component lure (biolure) and different retention systems namely: Propylene glycol (PG), Triton, DDVP, sticky insert and deltamethrin card.

Results:

The most effective retention system was PG followed closely by Triton. There was no statistical difference between these two treatments.

Results confirmed once more that the female trapping system based on the three component lures is more sensitive than the conventional trapping systems based on Trimedlure, Nulure and Torula.

Recommendation for next phase:

In an effort to continue optimizing the use of the synthetic lures against *C. capitata,* testing of different combinations of the three component lures have been recommended. The basic lure will be Ammonium Acetate (AA), which will be combined with either Putrescine (PT) or with Trimethylamine (TMA) to form two components lures. The Plastic McPhail trap (PMT) will be used as the standard trap and Triton/water as the standard retention system.

Anastrepha species (*A. ludens, A. obliqua, A. striata, A. serpentina* and *A. fraterculus*)

Countries involved: Brazil, Costa Rica, Honduras and Mexico.

Main objective:

To measure the response of the different *Anastrepha* species of economic importance to different combinations of the synthetic food lure and the conventional Nulure and Torula yeast food lures.

Results:

In general the best lures were the conventional Nulure and Torula that showed to be statistically different when compared against the synthetic food lures. However, the response of the different *Anastrepha* species to the three component (3C) and two component (2C) synthetic food lures was promising. *A. ludens* and *A serpentina* respond better to the 3C lures than to the 2C lures while with *A. obliqua* and *A striata* it was the opposite, with *A. fraterculus* responding equally to the 3C and 2C lures.

It is interesting to note that under the conditions of the experiment in Mexico the three component lure in combination with PG as the retention system was the best for *A. serpentina* in total male and female catches although the female:male ratio was 1.8 to 1 which is the ratio normally obtained when the conventional Nulure and Torula yeast are used. Also in the case of Mexico, *A. obliqua* responded much better to the combination of Ammonium Acetate (AA) and Putrescine (PT) than to the conventional food lures and the other synthetic lures tested. However, again the female:male ratio was no different than the one normally obtained by the conventional treatments. Furthermore, *A. ludens* responded statistically the same to all the treatments in total catches as well as in total female catches. However, the test was conducted under conditions of very low populations thus the number of flies trapped by the different treatments was low.

Olive fruit fly (*Bactrocera oleae*)

Countries involved: Greece and Spain.

Main objective:

To compare the conventional lures used against this species (i.e. Ammonium Sulphate 2% and Spiroketal) against alternative food lures including the conventional Nulure and the synthetic Ammonium Bicarbonate (AB) and Ammonium Acetate (AA).

Results:

The conventional treatment using Nulure in a Plastic McPhail trap (PMT) showed clearly to be the best treatment even compared to a combination of AB and the male pheromone Spiroketal. As with other host specific fruit fly species, developing a more specific and cost-effective lure for this species is proving to be a difficult task.

Recommendations:

Given the poor response of *B. oleae* to the synthetic food lures tested in the past first year experiments but recognizing the need for alternatives to the conventional wet trap based on Nulure it has been recommended to test different concentrations of AB while maintaining the treatments with AA and Ammonium Sulphate (AS) as a basis for comparison and the treatment with Nulure as the control treatment.

Melon fly (*B. cucurbitae*)

Countries involved: Mauritius and Reunion

Main Objective:

To measure the response of *B. cucurbitae* to the conventional food lures Nulure and Torula Yeast and to a number of ammonium salts including: AA, AB and Ammonium Phosphate (AP).

Results:

In both localities, Torula appeared the most effective treatment. Nulure and AA were either similar in efficacy to Torula, or came in third position.

The optional treatment based on the male specific Cuelure, trapped 30 times more total flies than any other treatment but practically no females.

Recommendation:

It is necessary to continue our efforts to explore alternatives to the conventional food lures (i.e. Nulure and Torula) used in wet traps to capture females. Based on the positive response of this species to ammonium salts, different concentrations of AA will be tested as well as Di-Ammonium Phosphate and AS. The three component lure and the Torula treatments will be kept for comparison.

Peach fruit fly (*B. zonata*)

Countries involved: Mauritius and Pakistan

Main Objective:

To measure the response of *B. zonata* to the conventional food lures Nulure and Torula Yeast and to a number of ammonium salts including: AA, AB and AP.

Results:

Mauritius:

Torula appeared the most effective followed by AA. Nulure was in the third position. The other treatments were much less attractive for females.

Pakistan:

Pakistan is participating for the first time in the CRP and has followed its own protocol. Results obtained show that using a mixture of Protein Hydrolysate and Di-Ammonium Phosphate (in a 3:7 proportion in 100 ml of water) gave the highest catches (3.7 FemaleTD) among 32 tested combinations. These included various combinations of PH, casein, boric acid and molasses with ammonia in the form of Di-Ammonium Phosphate and Ammonium Acetate. The experiments were conducted using closed-bottom dry traps with 2 holes on the peripheral side.

Recommendations:

Same as in the case of *B. cucurbitae*.

Side experiments

A number of side experiments will be carried out in parallel by some of the participating countries in an effort to find other promising lures and traps that could be incorporated into the standard protocol.

Bait Station Experiments

Bait station experiments will be conducted by Spain (two participants), Greece and Portugal. The experiment will consist of two one hectare plots of a commercial crop, one with the bait stations and a second that will be used as control. In the treated plots one bait station will be placed every second tree. Medfly population densities will be assessed every week by placing in each plot 5 PMT traps baited with the three components and water plus Triton. Traps will be exposed for one full day and then will be removed. All captured insects will be counted. Systematic fruit sampling will be carried out throughout the experiment to measure fruit damage levels in the treated and untreated plots.

Tentatively it has been agreed that the Third RCM will be held during October 2003 in the State of Florida, USA, in conjunction with the 5th Meeting of the Fruit Fly Working Group of the Western Hemisphere.

Expected duration: 5 years (2001-2005).

Contract Holders (14) from: Argentina, Brazil (2), Colombia, Costa Rica, Greece, Honduras, Israel, Mauritius, Mexico, Pakistan, Spain, United States of America (2).

Agreement Holders (4) from: France (Reunion), Portugal, Spain, United Kingdom.

Enabling Technologies for the Expansion of SIT for Old and New World Screwworm. 28 January- 5 February 2002, Campinas, Brazil (CRP D4.20.09)

The 1st RCM was held in the Laboratory of Animal Genetics, CBMEG/UNICAMP Campinas, Brazil together with a workshop focussed on developing standardised protocols for screwworm DNA analysis.

The overall objective of the CRP is:

To enhance the efficiency of the implementation of SIT for screwworms and to reduce risk associated with the introduction of screwworm into new areas

The specific objectives are:

To establish genetic relationships between populations of Old and New World screwworms (OWS and NWS).

To identify the origins of new outbreaks in order to improve quarantine regulations

To develop a genetic sexing strain for New World Screwworm.

There are two major components in the CRP, one dealing with the development of a genetic sexing strain for NWS and the other providing information on the genetic relationships between different populations of both NWS and OWS. Both molecular and Mendelian approaches are being used to develop a genetic sexing strain in the NWS. Transformation experiments have already started and there are several eye colour mutations and an insecticide resistance mutation available.

There is extensive work being carried out on population genetics of NWS and the complete genome of the NWS has been sequenced. The OWS is distributed over a very wide geographic range but the distribution is discontinuous. The evidence for two geographic races was discussed and additional studies were proposed to confirm the situation. The need for a microsatellite library for both species was stressed. Cuticular hydrocarbons and secondary alcohol acetates may be important components of screwworm mating behaviour and they also may be subject to change following long term rearing mass rearing. Hydrocarbon profiles can be used to differentiate factory flies from wild flies.

The main activities during the next 18 months were developed in 3 working groups and are summarized below.

Population genetics of OWS

The main activities involve establishment of colonies, development of better distribution maps and improved sampling for population genetic analysis. More effective attractants are also necessary, as are initial studies on the cytology.

Genetic sexing for NWS

The main activities include mutation induction, chromosome analysis and the induction and analysis of male-linked translocations. Transgenic techniques will be investigated using proven constructs incorporating fluorescent markers.

Population genetics of the NWS

The main activities will involve improving the sampling of NWS in South America and the construction of a microsatellite library for population analysis. In addition, sex pheromones need to be defined in both species.

There were no major changes made to the logical framework of the CRP but in order to meet the objectives it will be necessary to recruit several new participants, in particular from Tuxtla Gutierrez, Mexico, Malaysia and Australia.

The need for a website for the CRP was discussed and it will be followed up.

It was recommended that the next RCM be in Indonesia. Tentatively Ms. Fatchurochim Sukarsih has agreed to host it in Bogor in September 2003.

Expected duration: 5 years (2002 – 2006).

Contract Holders (5) from: Brazil, Indonesia, Iran, Irak, Uruguay, Venezuela.

Agreement Holders (5) from: Sweden, United Kingdom (2), United States of America (2).

Quality Assurance of Mass Produced and Released Fruit Flies. 26 – 30 November 2001, Mendoza, Argentina (CRP D4.10.16).

The second RCM of this CRP was held at the Plan Protection and Agricultural Quality Institute (ISCAMEN), in Mendoza, Argentina from 19 to 23 November 2001. Twenty-four scientists and observers attended the meeting who discussed results of work accomplished since the First RCM focussing mainly on the field of research of each participant and the objectives, activities and outputs of the CRP framework. The progress report of the participants covered the results obtained during the second phase of the CRP. Dr. Kishor Metha, an IAEA consultant gave a workshop on Gafchromic dosimetry and irradiation harmonisation for fruit fly mass rearing facilities. On November 24 a second workshop was held for some the participants of the Western Hemisphere Workshop on Fruit Flies of Economic Importance.

The main topics of the 2nd RCM were:

- Effects of strain, size, diet, copula duration, and sperm transfer on remating propensity.
- Compatibility and competitiveness between different natural populations and between lab and wild flies of species of the genera *Ceratitis, Bactrocera*, and *Anastrepha* under field cage conditions.
- Effects of rearing conditions, as well as handling, and shipping procedures (agitation, packing, hypoxia duration, and temperature) on product quality.
- Effects of irradiation on fertility, quality attributes, and mating competitiveness in several fruit fly species.
- Analysis of mating behaviour using video recording in *A. fraterculus* and *C. capitata.*
- Quantification of lipids, glycogen, and proteins in larvae and newly emerged adults of *C. capitata.*
- Studies on chemical communication related to pheromone, host and other odors (“aromatherapy”).

- Current status of some SIT programmes.

General recommendations:

Mass rearing conditions, sterilization and long distance shipping produce changes in sterile male behaviour that affect the compatibility and competitiveness of released sterile insects and reduce the effectiveness of the SIT. Quality assurance and quality control tests, procedures and the research on which they are based should lead to an optimization of the SIT. Accordingly the recommendations of the CRP deal with identifying means of improving current tests and procedures, suggesting new ones and pointing to novel areas of research.

- Colonization, mass production and sterilization

- Continue to validate existing tests and procedures.

- Develop and improve rearing methodologies with defined parameters.

- Incorporate genetic tools to correlate behavior and genetic changes.

- Implement Gafchromic dosimetry system in all production facilities

Long distance shipping

- Quantify the effects on pupae of different packaging materials and containers, storage temperature, storage duration and in-transit agitation, and identify appropriate storage atmosphere.

Eclosion, post teneral development

- Preconditioning of adults by manipulating the nutritional and olfactory environment.

Release and field performance

- Fine-tune, standardize and update details of the Mating Competitiveness Test (MCT) in the QC manual.

- Develop a simple and accurate method to quantify sperm in female spermathecae.

- Formulate and include in the QC manual a detailed test for remating; explore the possibility of manipulating the heritability of remating inhibition to further SIT goals.

- Incorporate GIS and GPS technology in analyzing dispersal and survival of released males.

- Finally, mechanisms for data capture, dissemination and exchange of information should be formalized and put to universal use.

Expected duration: 5 years (1999-2004).

Contract Holders (12) from: Argentina (2), Chile, Costa Rica, Guatemala, Israel (2), Lebanon, Mexico (2), Peru, Philippines and Portugal.

Agreement Holders (4) from: Australia, France, Japan and the United States.

Improvement of Codling Moth SIT to Facilitate Expansion of Field Application. 19-23 August, 2002, Kelowna, BC, Canada (CRP D4.10.18)

The objective of this **NEW CRP** is to improve the application of the sterile insect technique (SIT) and inherited sterility (IS) for codling moth control and its integration with other environmentally friendly control methods to expand its use in field control applications and reduce insecticide use.

Codling moth (*Cydia pomonella* (L.)) (CM) is a serious pest of pome fruit and some walnut orchards in the temperate regions of all major continents. Between 60-80% of apples and pears can be infested on neglected apple and pear trees. Control of the CM has relied mostly on the intensive use of organophosphate and other broad-spectrum insecticides. The need for 4 to 5 spraying cycles in each growing season has led to the development of resistance and cross-resistance to most of the traditionally used insecticides and to the disruption of natural controls of the secondary pest complex. Alternative methods such as the use of insect growth regulators, mating disruption, attract and kill, biological control agents have only proven to be effective under certain conditions. Environment friendly methods which show great potential for integration with these other methods for the control of Lepidoptera (including CM) are the SIT and IS. Considerable R&D and field evaluation are still required however, before the implementation of operational projects can be expanded. Several aspects of both the rearing and field application will be addressed through a co-ordinated research approach:

1) research to improve the cost-effectiveness of rearing, sterilisation, release and distribution of sterile moths,

2) research to develop production and product quality control tests and standards to ensure consistent production of high quality moths,

3) research on the genetics of CM in order to facilitate the development of genetic sexing strains,

4) research on the genetics of CM populations in different regions,

5) research on the improvement of monitoring techniques,

6) research to better understand the combination of SIT with other techniques such as parasitoids, mating disruption, etc.

Expected duration: 5 years (2002-2006).

Contract holders (9) from: Argentina (2), Armenia, Brazil, Canada, Chile, Czech Republic and Syria (2).

Agreement holders (5) from: Canada, South Africa, Switzerland and United States of America (2).

The deadline for submissions of applications expired in March 2002 and contract holders are set to start. The first Research Coordinated Meeting will be held 19-23 August 2002, in Kelowna, British Columbia, Canada.

Improved Attractants for Enhancing the Efficiency of Tsetse Fly Suppression Operations and Barrier Systems Used in Tsetse Control/ Eradication Campaigns. 18-23 March, 2002 Kampala, Uganda. (CRP D4.20.08)

This CRP aimed at alleviating the shortcomings in attractants for a number of important tsetse species where the standard odours used for *Glossina morsitans* and *G. pallidipes* are poor or ineffective, and in general to try to improve attractant effectiveness for a) entomological monitoring, b) tsetse population suppression and c) barrier maintenance.

Eight CRP participants and several observers attended the 4th and final RCM. The meeting was hosted by the Government of Uganda at Kampala, 18-22 March 2002. Participants in the CRP presented eight papers. In addition, two presentations were given on a) Tsetse and Trypanosomosis Control Efforts in Uganda (by Dr. Nicholas Kauta, Commissioner of Livestock Health) and b) The role of COCTU in the National Tsetse and Trypanosomosis Control Programme (by Mr. Lawrence Semakula, Director, Co-ordination Office for Control of Tsetse and Trypanosomosis in Uganda - COCTU).

A field visit was made to Buvuma Islands, the site where the field tests under Mr. Frederick Luyimbazi's research contract on "Field Evaluation of different combinations of candidate attractants for *Glossina fuscipes fuscipes*" took place.

In preparation of a comprehensive publication on the work done under this CRP a summary report of the work done under the CRP was drafted and recommendations were made on specific operational research to be followed up for utilising the CRP findings in support of tsetse field projects, partially supported by IAEA TC.

- New traps/modifications of existing traps were identified and / or tested for some species that previously were difficult to monitor.

- The screening for synthesised, stereo-isomerically related compounds of known tsetse attractants resulted in the identification of several new candidates with promising potential.

- Electrophysiological screening (EAGs) and substantially improved wind tunnel experiments provided an efficient basis for the laboratory screening of candidate attractants prior to the initiation of laborious field tests.

- The combination of some plant volatiles with new and standard host odours form attractant odour blends for several tsetse species for which previously no odour attractants were known.

- The meeting recommends an incorporation of specific operational research with selected host and habitat odour blends for *Glossina fuscipes fuscipes*, *G. palpalis gambiensis* and *G. swynnertoni* as part of ongoing IAEA-TC supported tsetse intervention projects. Thus the findings under this CRP can be refined for large scale field application and eventually benefit integrated tsetse intervention campaigns through availability of improved standard tools for fly population monitoring and establishment of (temporary) barrier systems.

Expected Duration: 6 years (1995-2002).

Contract Holders (7) from: Mali, Burkina Faso, Kenya, Uganda, Tanzania and Hungary.

Agreement Holders (2) from: Switzerland and the United States of America.

G. DEVELOPMENT AT THE ENTOMOLOGY UNIT SEIBERSDORF

TSETSE R&D

Behavioural observations in a field cage

In view of the need to maximize the quality of tsetse flies that are produced for release in a sterile insect technique (SIT) release programme, a range of quality checks are required. In order to provide results as close to field conditions as possible, these should include direct observation of behaviour in a field cage. Recent work in Seibersdorf has utilised a 2.9m diameter by 2m high field cage, containing one or more small citrus trees, to develop protocols and collect baseline data.

Initial investigations to assess mating behaviour were done with *Glossina pallidipes*. This has now been extended to other economically important tsetse species maintained at Seibersdorf, namely *G. morsitans centralis*, *G. brevipalpis*, *G. fuscipes fuscipes* and *G. palpalis palpalis*. In experiments with *G. m. centralis, G. fuscipes* and *G. brevipalpis* irradiated and unirradiated males of the same age competed for mating opportunities where the flies were released at a ratio of two males to one female. The proportion of irradiated males that mated was equal to or greater than the unirradiated males. *G. m. centralis* frequently probed the observer especially when there was movement by the observer in efforts to ward off a fly attempting to feed. Further competitive mating experiments have been carried out with *G. brevipalpis*, *G. f. fuscipes* and *G. p. palpalis* males of different ages. A greater proportion of old males than young males mated during the period of observation.

The mating response in the field cage was excellent, with at least one third of the total possible number of mating pairs being recorded on each day the test was run for each species studied. Mating pairs were picked up from the tree, roof and walls of the cage. In addition there was successful engagement of genitalia in flight after a chase. Cross-mating studies between different populations of the same species will be carried out in the next phase of research.

Rearing developments

Development of an alternative to the current cages is continuing. The first prototype of an injection moulded cage failed only on the feeding; self stocking and larval exit both proved satisfactory. As a result the design company was commissioned to produce a new design for the grid with hexagonal instead of round holes, which in preliminary tests has proved satisfactory for all aspects, feeding, self-stocking and larval exit. Ten copies have been cast in a resin similar to the one that would be used for injection moulding, and are about to start tests. Survival and fecundity will be measured over a complete unit cycle.

In other cage developments, the use of hot melt glue to replace the solvent glue currently used to affix the cage netting has proved mostly satisfactory. A number of cages are now in use to test them. The reason for a few of the netting sides coming loose will be investigated. The hot melt glue has one main desirable characteristic, the lack of any volatile

solvents; apart from environmental problems associated with volatile organic solvents, there are health concerns for the workers using them, possible toxicity to the colony, and problems with air freight restrictions. Another development is the use of elasticated netting sides, which are held by metal clips without any glue; such cages have been supplied to Burkina Faso and are awaited in Seibersdorf.

Support for Field projects

In anticipation of various field projects, the colonies in Seibersdorf are being adjusted to provide the necessary seed material, and this is being augmented by rearing in other locations. 85,000 *G. pallidipes* pupae have been shipped to TTRI, Tanzania to initiate a colony there which should reach 100,000 breeding females before the end of the year, and agreement in principal has now been reached with the Institute of Zoology, Slovak Academy of Sciences to initially set up a colony of *G. pallidipes* othere. Shipment of *G. fuscipes fuscipes* to Uganda will start in the next few weeks. Shipment of pupae to Tanzania continues to be difficult however with one shipment of 10,000 pupae dead on arrival. The courier company are attempting to improve the conditions and shorten the time of shipment. A *G. morsitans centralis* colony from Botswana is being build-up in Seibersdorf.

Diet developments

The large mass rearing facilities being planned in Africa will require large quantities of quality assured blood for colony maintenance. In an effort to develop alternatives to the reliance of fresh frozen blood, activities have been restarted to try to look for alternatives. In collaboration with the Veterinary Department at the University of Vienna a graduate student has started to look at the possibility of using proprietary blood products as substitutes for fresh frozen blood.

MEDFLY R & D

Storage And Transport Of Eggs

Further experiments have been conducted to assess the possibility of developing medfly male-only mass rearing facilities for large SIT operational programs. In this approach, eggs would be shipped from a central colony facility to smaller facilities that would rear only males for sterilization and release. Eggs collected 0-6 hours after oviposition were incubated for 24 hours at 24˚C, then the eggs were stored at 10 or 25˚C for 0, 24 and 72hours. The eggs were held either in water or in an Agar solution (0.1%). Agar solution has a higher density than eggs and would avoid egg sedimentation during shipment. After storage the eggs were incubated at 34˚C for 24 hours to give the thermal treatment in order to kill the female population. Subsequently eggs were transferred to the larval diet. There was a significant reduction in the number of adult males recovered when the eggs were stored either in water or agar solution at 25˚C for 72 hours. No significant difference were observed between the other treatments, but eggs stored in Agar solution at 25˚C for 24 hours, eggs stored in water at 10˚C for 72 hours and the control produced the most male insects.

To assess the long distance shipments under operational conditions an agreement was made with the Moscamed Program in Guatemala. Eggs were produced at the El Pino medfly mass rearing facility in Guatemala and six egg shipments were sent to Seibersdorf by commercial airline. The protocol used for

egg collection and storage was the one indicated above. The eggs were collected and incubated for 24 hours at 24˚C, then 250 ml of eggs were stored in approximately 250ml of water or agar solution (1:1 ratio of eggs to transportation medium) at 5˚C in metallic thermos of 0.5 liters capacity. The thermos were packed in a cardboard box and shipped by air to Seibersdorf, taking between 56 to 82 hours. In Seibersdorf the eggs were washed and transferred into a flask for incubation at 24˚C for 12 hours, followed by a treatment of 34˚C for 12 hours to kill female zygotes.

The complete results are still being analysed, but initial analysis shows that pupal yield was not affected by shipment time or conditions. The early results suggest that it will be possible to ship eggs from egg production facilities to male-only production and release centres.

Analysis of Flies from South Africa.

In December 2001, the SIT suppression project in South Africa reported that larvae were detected in grapes and other fruits in the fly release area and this despite the fact that only released (marked) flies were trapped i.e. no wild flies were detected. This created the suspicion that fertile genetic sexing strains (GSS) flies had been accidentally released. A GSS strain is being reared to produce flies for release, but due to a high level of recombinants, 30% sterile females were also being released. It was necessary to determine whether the mtDNA marker from the GSS could be detected in the field population.

In January 2001, several samples from the release area and the buffer zone were received. None of the 137 pupae were *wp* (the release material contained ca 7% *wp*). 88 flies emerged and were set up in cages with *w wp* test flies. None of the 39 females laid eggs through the egging nets which is very indicative that they were wild females. A similar argument applies for the males i.e. only relatively few succeeded in reproducing (13 out of 49). These findings are quite different from a control sample from the mass rearing facility. Here 6 out of 8 males and 2 out of 3 females reproduced and in their offspring white and brown pupae were found. The mtDNA analysis showed that none of the flies from the field contained the GSS haplotype confirming that there had not been a fertile release from the rearing facility.

New Genetic Sexing Strain

The isolation of an inversion on chromosome 5 has enabled a re-evaluation to be made of translocations that were initially considered unsuitable for GSS. One such case is translocation 101. This translocation has characteristics that make it very attractive for inclusion in a GSS. Firstly, the adjacent-1 individuals it produces are females as opposed to males as in previous GSS and secondly, it has an inherently higher fertility than other translocations. Both these factors can have a major positive impact on the production statistics of a GSS. Translocation 101, together with the inversion, has now been incorporated into a GSS and the strain is undergoing evaluation by the mass rearing group.

Improving Male Mating Success with Chemical Preconditioning

Ginger root oil (GRO) has been shown to have a positive effect on male mating success in different species of fruit flies. Experiments to confirm this in medfly GSS were carried out in field cages using wild flies from Madeira and Guatemala and males VIENNA-7-2000. Exposure to GRO increased the mating success of males from a GSS strain in competition with wild males from two different source populations. Following

GRO exposure, the mating frequency of GSS males increased approximately 2-fold and 2.4-fold in tests involving flies from Guatemala and Madeira, respectively. Although substantial, these increases were actually smaller than those observed for a mass-reared, bisexual strain in Hawaii. It appears, therefore, that although GRO exposure may consistently elevate male mating success, the magnitude of this increase may vary among different combinations of mass-reared and wild flies. The present study also demonstrated that exposure to GRO did not adversely affect male survival and that treated and control males do not appear to differ in their ability to induce a female refractory period following mating. It appears that pre-release exposure of males to GRO has the potential to increase the effectiveness of GSS in the SIT. It should be relatively easy to incorporate a treatment with GRO into the current adult male handling procedures in operational programmes both in terms of logistics and cost.

H. SPECIAL NEWS AND REPORTS

6th International Fruit Fly Symposium

A very successful 6th international Symposium on Fruit Flies of Economic Importance was recently held in Stellenbosch, South Africa, from 6 to 10 May. This Symposium is held every 4 years, this being the first time it had been held on the African continent.

The Symposium was organised under the auspices of the International Fruit Fly Steering Committee, by an Organising Committee chaired by Dr Brian Barnes of the Agricultural Research Council's Infruitec-Nietvoorbij Research Institute in Stellenbosch. Dr Barnes is the Counterpart of an IAEA Model Project which is investigating the feasibility of suppressing fruit flies in the Western Cape using the sterile insect technique.

The Symposium was attended by over 200 delegates from 44 countries. The Organising Committee made a special effort to attract a significant number of African delegates, who are not normally able to attend the International Fruit Fly Symposiums.

The Organising Committee succeeded in obtaining significant sponsorship from national and international organisations. The main sponsor was the FAO/IAEA Joint Division of the UN based in Vienna. A substantial amount of the sponsorship was used to enable meritorious delegates mainly from African countries to attend the Symposium. These delegates contributed a unique and interesting perspective to the Symposium, resulting in an exchange of ideas to the benefit of both sides.

The scientific programme followed a similar format to that of preceding years, covering all aspects of fruit fly biology, behaviour, genetics, biosystematics and biodiversity, biochemistry, quarantine and control. A total of 53 oral papers and 111 posters were presented over a period of 4 days, with one day being set aside for technical and social tours to areas of scientific and other interest. Three entertaining evening functions were arranged for delegates, which were well attended and much enjoyed.

As the Symposium was held in the heart of the Western Cape fruit production area, all presentations on fruit fly detection and management were scheduled on a single day to cater for the applied fruit fly interests of local fruit growers and technical representatives. A special 1-day registration package was offered for this purpose.

Judging from the response of delegates, the Symposium was a great success. The Organising Committee received many compliments from delegates, many of whom vowed to return to see more of South Africa.

At the end of the Symposium Dr Patrick Gomes (USDA) stepped down after a successful term as Chairman of the International Fruit Fly Steering Committee. Dr Brian Barnes (ARC Infruitec-Nietvoorbij, Stellenbosch) was elected as the new Chairman. It was also announced that the 7th International Fruit Fly Symposium will be held in 2006 in Salvador, Brazil, under the Chairmanship

of Dr Aldo Malavasi, Coordinator of the Carambola Fruit Fly Programme.

The Organising Committee gratefully acknowledges its major sponsors: FAO/IAEA, Aventis, the Agricultural Research Council of South Africa, the Deciduous Fruit Producers' Trust, Hym-Lure®, the National Research Foundation of South Africa, the Centre Technique de Coopération Agricole et Rurale, The Netherlands**.**

(Brian Barnes Chairman: Organising Committee 6th International Fruit Fly Symposium).

Presentation of the Status of the Peach Fruit Fly, *Bactrocera zonata*, in the Near East Region to the Workshop on Peach Fruit Fly Organised by the European Plant Protection Organisation (EPPO). 5 March, 2002, Paris, France.

This informative workshop organised by the EPPO aimed at: getting an update about the situation of the peach fruit fly in the Near East; evaluating the risk of spreading; providing information based on risk analysis; recommending EPPO Member States on a strategy to prevent introduction and on measures to be taken in case of introduction. Though participants from the Hashemite Kingdom of Jordan, the Territories Under the Jurisdiction of the Palestinian Authority, Malta and Germany attended the workshop, the absence of representatives of the most highly exposed EPPO Member States in North Africa and Southern Europe was noticed.

The meeting was chaired by a representative of the EPPO, and lectures were given by invited speakers on: (i) History and situation of the present outbreak of *Bactrocera zonata*; (ii) Chemical control of fruit flies using Bait Application Technique (BAT) and Male Annihilation Technique (MAT); (iii) Peach fruit fly risk analysis for the Hashemite Kingdom of Jordan; and (iv) Taxonomy and diagnosis of *B. zonata* and related Tephritid species. The preventive actions taken in Jordan and in the TUJPA were briefly reviewed by the respective representatives.

On the basis of the information made available, the following conclusions were reached:

(i) The peach fruit fly is now widely spread and established in Egypt, and no reliable control operations have yet been launched.

(ii) Occurrences of the pest have been recorded out of Egypt at the Rafah checkpoint south of the Gaza Strip and in Kerem Shalom. In both cases, MAT operations have been launched leading to the successful elimination of the outbreaks.

(iii) Detection trapping networks using methyl-eugenol baited traps are in place in Israel, Jordan and the Gaza Strip, however only Israel is ready for emergency MAT operations in case of introduction of the PFF.

(iv) The peach fruit fly represents a serious and immediate threat to the Near East region, North Africa and, by extension, to Southern Europe.

(v) MAT (which could be complemented by BAT) is the most suitable method available to date for elimination of outbreaks of the PFF.

(vi) Additional data is needed to fine-tune the list of host plants of the PFF and its geographic

distribution in order to be able to do a realistic and accurate pest risk analysis for the entire circum-Mediterranean region.

Since the PFF is threatening the fruit and vegetable industry of the EPPO region, the group of experts recommended that:

(i) PFF be listed as a major quarantine pest by the EPPO Member States (i.e. A1 list of quarantine pests);

(ii) EPPO Member States should set-up PFF detection trapping network and acquire material for emergency MAT operations in case of introduction of the pest;

(iii) MAT operations be launched preventively in the southern part of the Gaza Strip to avoid the potential spread of the pest throughout the region.

The technical support of the FAO to the FAO/EPPO Member States was recommended to efficiently set-up detection network and emergency MAT operations. The full report of the workshop is available from the EPPO website at: http://www.eppo.org/MEETINGS/2002_meetings/02-9338.doc.

FAO/IAEA Meeting On "Risk Assesment Transgenic Arthropods". 8–12 April, 2002, Rome, Italy

The meeting was jointly organised by the IPC section in Vienna and the IPPC secretariat in Rome. The goals of the meeting were to:

- Assess current status of transgenesis in pest insects.
- Assess biosafety concerns for transgenic arthropod release.
- Provide guidance for future risk assessment protocols for a case by case analysis.
- Consider establishing a working group under IPPC on "Development and Use of Transgenic Insect Technology".

Transgenic technology is now almost routine in many insect species and improvements are continually being made. Genetic vectors are functional in many insect orders and there is no technical reason why this technology cannot be applied for any pest or biocontrol agent. However, major technical concerns involve the genotypic and phenotypic stability of the transgenic strains and their ability to express the transgene in a reliable and predictable way. A second area of concern is the biological fitness of transgenic strains. In addition to these technical questions, the whole area of trangenesis and the release of transgenic organisms will require a thorough risk assessment protocol, moving from the laboratory through field cages to open field release. Regulatory approval in the USA for the first "release" of a genetically transformed arthropod (pink bollworm) provided a timely background for the discussions.

This joint meeting between the FAO and the Agency brought together both scientists involved in transgenic technology and experts in the field of risk assessment and regulatory procedures. The meeting was opened by Mr. J. Dargie, Director of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture followed by presentations of all the working papers. The working papers covered both the technical aspects

of insect transgenesis and regulatory aspects. Subsequently, the participants split into 3 working groups to discuss and report on the following topics:

WG1 Current Status of Transgenesis in Pest Insects.

WG2 Identification of Risks Associated with a Transgenic Release.

WG3 Development of Risk Assessment Protocols.

Two scenarios were used by the 3 working groups to provide a framework for their discussions and to try to create some continuity in the reports. The two scenarios were considered to be at the extremes of the possible use of transgenic arthropods.

The first was the release of sterile medflies carrying a fluorescent marker gene and the second was the release of fertile mosquitoes carrying a refractory gene with the aim of spreading that gene in the population. The strategy enabled the key elements of the discussions of each working group to be focused on these two cases. It was also concluded that regulatory approval of any transgenic arthropod release is likely to be on this case by case basis. The working group reports presented a series of detailed recommendations dealing with both technical and regulatory issues. The proceedings of the meeting will be published.

The Cactus Moth (*Cactoblastis cactorum*) an Ecological and Agricultural Threat for North America and the Caribbean

Problem Definition

Why is the cactus moth important?

The control of exotic invasive cacti in Australia by the cactus moth, *Cactoblastis cactorum* (Lepidoptera: Pyralidae), has long been cited as one of the success stories in classical biological control of weeds. However, the spread of this same cactus moth through parts of the Caribbean after a single country introduced it intentionally without proper quarantine controls, and the more recent unintentional arrival of the cactus moth in Florida, has raised many concerns. Native and rare cactus species of the genus *Opuntia* in the Florida Keys are in immediate danger. The potential spread of this insect to the cactus-rich areas of the Western USA and Mexico is of greatest concern. Mexico is the center of endemism (which receives special protection under the Convention on Biological Diversity) for *Opuntia* species in North America. In addition, cactus is Mexico's 7th leading agricultural crop.

In addition to threatening the biodiversity in North America and the Caribbean, the negative public reaction to such non-target effects by a biological control agent could heighten concern over the use of exotic natural enemies and jeopardize future biological control programs against weeds.

What can be done about it?

Although the cactus moth has been mass reared for use as a biological control agent in the past, use of sterile insect technique to control it is still untested in the field. Inherited (F_1) sterility could be a valuable tool to predict and manage the expanding populations of *C. cactorum*. The use of F_1 sterility for control would be most appropriate for:

(i) control of *C. cactorum* from areas of new introductions, or from isolated and/or environmentally sensitive areas;

(ii) establishment of a barrier through the release of irradiated moths along the leading edge of the *C. cactorum* geographical range; and

(iii) provisioning sterile *C. cactorum* as hosts in the field to increase the initial survival and establishment of released natural enemies of the cactus moth.

Studies co-funded by FAO/IAEA on the radiation biology of *C. cactorum* have been initiated at the USDA-ARS laboratory in Tifton, GA in collaboration with USDA-APHIS in Tallahassee, FL. Collaboration is also facilitating the involvement of Caribbean and other international experts and the transfer of the findings to those island nations that wish to rid themselves of the moth, which is now well established in that region. For example, the world authority on *C. cactorum* biology (H. Zimmermann) works in South Africa and he has been collaborating with scientists in Mexico to develop an awareness campaign for this potential invasive pest. South Africa is also the best location for rearing and irradiating large numbers of *C. cactorum* for use in an action program in the immediate future. Since parts of the Caribbean have been infested with *C. cactorum* since the 1960's, field work could take place there. This would include shipping and release of sterile *C. cactorum* to assess host range on representative cactus from the southwestern US and Mexico, and to conduct a pilot field test for control.

Preparing A Coordinated Plan

As a first step toward launching a coordinated plan for addressing the growing ecological and agricultural threat by *Cactoblastis cactorum* in North America and the Caribbean, a 3-day consultant's meeting is being convened in Vienna, Austria, from 15-19 of July 2002, to facilitate the development of strategies and action plans. The meeting will include researchers from South Africa, Mexico, the United States and some Central American and Caribbean countries. Experts on pest cactus ecology from biodiversity related Non-Governmental Organization (NGO) are also being invited to incorporate that dimension into the plan. An action plan outlining a short term strategy to address the immediate needs for basic scientific knowledge and a more medium term strategy to apply the sterile insect technique against *C. cactorum* will be produced and submitted as part of an application to fund a regional technical cooperation project.

Some of the topics to include in such action plan are the steps necessary for:

(i) elucidation of the host range of *C. cactorum* for key native *Opuntia* cactus species present in the US, Mexico, Central America and the Caribbean (and thus identification of key areas in which the most vulnerable species are abundant);

(ii) prediction of the potential geographic range of *C. cactorum* in North America and the Caribbean;

(iii) delineation of the impact of native natural enemies on the spread of *C. cactorum*.

Expected Benefits For Member States

Creation of a regional *C. cactorum* network for information exchange, training and operation of an early detection information system.

Assistance to Member States to define national programmes and institutional roles and responsibilities.

Capacity building for early detection and emergency intervention on site in case of an outbreak outside *C. cactorum* current distribution range.

Demonstrate effectiveness of SIT control measures against *C. cactorum* to meet with regional and national requirements in the event of an introduction and outbreak of the pest.

Report on a Mission to Brazil to Assess the Feasibility of Building and Operating a Mediterranean Fruit Fly Mass Rearing and Sterilization Facility as the Basis for a Fruit Fly Control Programme in the North East of Brazil.

The government of Brazil requested the IAEA expert support to undertake a mission to assess the feasibility of building and operating a Mediterranean fruit fly mass rearing and sterilization facility as the basis for a fruit fly control programme in the North East of Brazil and to assess the economic viability of such a programme. The IAEA responded to the request by recruiting two experts from the region and by facilitating a staff member of the Insect and Pest Control Section of the Joint FAO/IAEA Division. The mission was requested to provide advice on the following issues: most suitable site in the semi-arid North East of Brazil for location of the facility, required production capacity, suitable organizational structure for a fruit fly programme and economic feasibility of integrated SIT application.

The location of the facility was determined based on the analysis of the following parameters: government commitment, available electricity, water, solid waste management and transportation infrastructure, technical and logistical support, technical and professional quality of staff, client service, ownership and climate. A list of advantages and disadvantages for two potential locations separated by at least 1000 kilometers with differences in infrastructure and climate was carefully worked out. The recommendation was for construction of the facility in the city of Juazeiro in the state of Bahia. Juazeiro is one of two major cities in the irrigated San Francisco Valley, where the fruit industry is strong, producing fruits for exports including more than 70% of the total mango, papaya and grape exports from Brazil. The growers and exporters association of the San Francisco Valley understand the medfly problem (only fruit fly of concern in the Valley) and showed to be committed to an areawide SIT programme.

The production capacity of the mass rearing and sterilization facility was assessed based on the medfly population levels in the San Francisco Valley and the extension of fruit hosts where the medfly occurs. A modular facility with a production capacity of 200 million sterile flies per week was recommended. This production level would be sufficient to cover the needs of the valley and some production would be left for other commercial fruit production areas in the state of Bahia or elsewhere. The production capacity of the facility would be increased by adding production modules as the demand for sterile flies grows in Brazil.

In relation to the nature of the SIT programme, it was recommended that a national fruit fly control programme be established in Brazil with a centralized federal organizational structure with full support and active participation from the state governments and the fruit industry, as the main stake holders, providing sustainability to the programme. The federal government would be responsible for planning and providing direction and the state governments together with the

fruit growers and exporters would be responsible for the operations. Full programme support from relevant research and academic institutions is also required. Establishing strong ties through cooperative agreements with international and regional organizations such as the IAEA, FAO, the United States Department of Agriculture (USDA), and the South American Regional Plant Protection Organizations (COSAVE) is essential. The programme would be managed by a *Central Committee* with representation of the federal and state authorities as well as the fruit industry and supported by a *National Technical Commission* with representation from the relevant research and academic institutions and an *International Technical Commission* that would be review the programme periodically upon request from the Central Committee. In relation to the mass rearing and sterilization facility its functional structure would be that of a private organization of public interest.

The preliminary economic analysis shows that the current economic returns of the fruit industry in the San Francisco Valley are substantial. However, these returns could be significantly affected if the current export volumes are reduced due to quarantine regulations applied by the presence of medfly populations at levels that exceed the quarantine security established by the plant protection authorities of the importing countries. In economic terms, the application of an areawide SIT programme would provide sustainability to the export business and would create opportunities for further expansion of the fruit production areas and export volumes.

Integrating The Sterile Insect Technique as a Key Component of Areawide Tsetse and Trypanosomosis Intervention

The Programme Against African Trypanosomosis (PAAT) has published the paper entitled "Integrating The Sterile Insect Technique as a Key Component of Areawide Tsetse and Trypanosomosis Intervention" under the Technical and Scientific Series 3 of FAO 66 pp. Below the abstract is reproduced.

The tsetse and trypanosomiasis problem is characterized by many inter-dependencies involving agro-economical, social and environmental issues. Any intervention (or non-intervention) will have a wide range of immediate and longer-term implications.

In most African countries, demographic developments demand that agricultural systems become more productive. Increased productivity is difficult to implement because of the tsetse and the trypanosomiasis problem, which appears to have worsened over the past years: the number of sleeping sickness cases is exceeding even the level recorded during the epidemics of the 1920s. In several African countries, tsetse flies reinfest formerly reclaimed areas, invade previously uninfested agricultural areas, cause escalating problems in areas suffering from civil unrest and further decrease the area of land available for high-productivity agricultural systems. Controlled or substantially reduced vector populations can still be very efficient transmitters of trypanosomes. Some intervention measures have undesirable side-effects. Trypanosomes have developed resistance and cross-resistance to various trypanocides. The extensive use of insecticides on cattle for tsetse control appears to have the potential to interfere with the zootic stability/immunity of cattle to several tick-borne diseases, so long-term tsetse control may exacerbate other secondary problems. The environmentally acceptable methods for tsetse and

trypanosomiasis management that are currently available all have specific limitations. In infested areas, only a combination of several methods in an integrated, phased and area-wide approach (Knipling, 1972; Chandler and Faust, 1998; Klassen, 2000) can effectively advance the establishment of viable agricultural systems that suit the needs of the rapidly growing human population.

The trypanosomiasis problem is not restricted to individual countries but is transnational and must be tackled on a regional, or at least a subregional, level. Although several donors currently favour integrated disease management through interventions in selected areas, an area-wide integrated pest management approach should be incorporated into such broader development concepts, and the option of creating tsetse fly-free zones should be pursued wherever this is feasible and sustainable. It is essential that a variety of options be retained, including the elimination of the tsetse and trypanosomiasis problem from large areas.

The potential for integrating several available intervention methods and for new supportive technologies has not been sufficiently explored. This is particularly the case for the SIT which, unlike other conventional methods of tsetse control, has a unique efficiency pattern: efficiency increases as target pest population density decreases. A sequence of conventional methods, with SIT as a final component, would have maximum efficiency throughout an intervention campaign.

The recent eradication of the tsetse fly in Zanzibar (Vreysen *et al*., 2000) by means of aerial releases of large numbers of sterile males has received considerable attention. The major difference between the Zanzibar operations and previous tsetse SIT projects is aerial release capability, which allows for the systematic and area-wide application of this environmentally friendly intervention method, especially in inaccessible areas.

FAO and IAEA have launched an initiative to upgrade SIT to make it an economically attractive alternative for integration into area-wide subregional tsetse and trypanosomiasis intervention campaigns. This is a focused component of an overall initiative in livestock disease and wildlife management and agricultural development. Methods are under development for the release of at least 500 000 sterile males per week in the near future, which would enable operation in areas as extensive as 5 000 to 10 000 km^2 at a time. The initiative consists of three components:

1) To research and develop tsetse rearing automation and more efficient aerial release systems on tsetse attractants and on tsetse genetics.

2) To make an effort to increase awareness and determination among Africa's top decision-makers and more concerted, impact-oriented technical assistance support from the UN family and other major stakeholders, including declared milestones and verifiable implementation indicators.

3) To identify by priority intervention areas along with the preparation, and eventual implementation of feasibility demonstrations of the SIT package as a component of area-wide, integrated tsetse and trypanosomiasis management efforts.

Substantial progress is being recorded on all three points, and one achievement relevant to point 2) deserves particular attention and represents a challenge for all the partners involved in tsetse/trypanosomiasis research and intervention: the African Heads of State and Government decision on tsetse eradication, AHG/Dec.156 (XXXVI)

(PAAT, 2000), passed at their 36th summit in Lomé, Togo. The summit "commends those African countries that have initiated the application of sterile insect technology (SIT) for their pioneering effort" and "urges Member States to act collectively to rise to the challenge of eliminating the problem through concerted efforts in mobilizing the necessary human, financial and material resources required to render Africa tsetse-free within the shortest time possible". As part of an integrated area-wide approach, SIT appears to be the most environmentally friendly component for implementing this decision. This publication addresses some of the challenges that remain and the major points of criticism raised in connection with SIT.

For the complete report please consult the following internet address:

http://www.fao.org/docrep/004/y2022e/y2022e00.htm

Informing the World About Tsetse Flies, and the Human and Animal Diseases they Vector: Media Specialists Give Insight into this Major Problem in Africa

Africans south of the Sahara Desert continue to suffer from the scourge of tsetse flies and the diseases they vector. For those who live outside of Africa, it is hard to appreciate the suffering endured by people who somehow have to cope with this major barrier to health and an adequate amount of nutritious food. To give insight into this major problem in Africa, in May 2002 the IAEA led a group of 7 media specialists (journalists and film producers) to Uganda to see patients with sleeping sickness, and to Ethiopia to see the impact of the cattle disease nagana. To complete the picture, the group visited Zanzibar in Tanzania to see the benefits of eradicating tsetse flies and nagana in livestock.

Sleeping sickness is a significant problem in many rural areas of sub-Saharan Africa, and the number of reported cases is rising. Many people are not diagnosed and remain untreated; eventually they die. In a village near Lake Victoria we visited a clinic where patients are being treated. Though expensive and often difficult to endure, treatment is usually effective, but may not reverse all symptoms. There is little hope for a better and cheaper treatment regime than is currently available.

In the south-western regions of Ethiopia, the presence of tsetse flies and nagana in the fertile lowlands prevents any significant use of livestock for meat, milk and draught power to cultivate the land. The result? On the one hand one sees almost empty valleys, but on the other, in the highlands at about 2000 m where it is too cold for tsetse, there are the crowded villages where agriculture is too intensive to be sustainable. If only the lowlands could be used for productive agriculture, the pressure on the highlands would be relieved, and more food would be produced. There is a plan by Ethiopian authorities to eradicate tsetse flies from the Southern Rift Valley. Traps and insecticide-treated targets are being deployed to reduce wild fly numbers. A fly-rearing and irradiation facility is now being constructed that will produce sterile flies. Eventually it is expected that a tsetse free area comprising several thousand square kilometres will be created.

In Addis Ababa we were informed that the Organization of African Unity has embarked on an ambitious but laudable long-term plan eliminate the human health and agricultural problems resulting from tsetse that have been such a burden to so many. The Pan African Tsetse and Trypanosomosis Eradication Campaign

(PATTEC) is leading this plan to eradicate the tsetse fly, often called the “poverty insect”.

The trip was concluded with visits to Zanzibar livestock owners who have benefited from the absence of tsetse and nagana. The fly was eradicated in 1996, and now no livestock living on the island can be found with the disease. Formerly virtually impossible to keep due to their disease susceptibility, highly productive and strong crossbred cattle can now be raised to provide much more milk and meat, and also draught power to cultivate the land and grow more food. The absence of the vector and the disease has resulted in a boost to the local economy and the ability of the poor rural people to feed themselves.

The media team members came from Canada, United Kingdom, Germany, Austria and Italy.

Four International Organizations Call for United Battle against Tsetse Fly Diseases (Joint Press Release by FAO, IAEA, OAU, and WHO)

Addis Ababa, Geneva, Rome, Vienna, 7 June 2002 - Four international organizations today called for more widespread application of integrated pest management principles to help combat the Tsetse fly and trypanosomiasis, commonly known as sleeping sickness in humans and Nagana in livestock.

The proposed intervention strategy brings together many different technologies and duly protects the environment. The UN Food and Agriculture Organization (FAO), the International Atomic Energy Agency (IAEA), the Organization of African Unity (OAU) and the World Health Organization (WHO) made the appeal in a report released on their web sites today.

Known to entomologists and to veterinary and medical experts as "area-wide integrated pest management," it is essentially a comprehensive approach, linking agricultural practices and tsetse fly intervention, in areas with mixed livestock and crop farming where there is strong potential for sustainable agricultural development. The approach brings together all active tsetse control tech-nologies, including the use of sterile flies to ultimately eliminate the tsetse population and the diseases they carry.

Tsetse-transmitted trypanosomiasis is a disease unique to Africa. The disease is found in 37 sub-Saharan countries and threatens 50 million people and 48 million cattle.

According to the joint report, "An estimated 500,000 people, the majority of whom may die due to lack of treatment, are already infected with sleeping sickness." Nagana, or African Animal Trypanosomiasis, has a severe impact on African agriculture with annual losses in cattle production alone valued at as much as $1.2 billion.

The disease influences where people decide to live, how they manage their livestock and the intensity of agriculture, the report says. "The combined effects result in changes in land use and impact on the environment and they affect human welfare and increase the vulnerability of agricultural activity."

In tsetse-infested areas of sub-Saharan Africa, the report says that half the population suffers from food insecurity. In sub-Saharan Africa, about 85 percent of the poor are located in rural areas and more than 80 percent of the population depends on agricultural production for their livelihood.

The report was produced at a two-day workshop held 2-3 May 2002 at the Rome Headquarters of FAO to harmonize the activities of the four international organizations as they relate to the Programme Against African Trypanosomiasis (PAAT) and the Pan-African Tsetse and Trypanosomiasis Eradication Campaigns (PATTEC). The workshop assessed two specific tsetse and trypanosomiasis intervention projects, one in Ethiopia and the other in a cross-border area of Burkina Faso and Mali. The two projects were reviewed within the framework of the area-wide integrated pest management approach and the workshop participants concluded that both projects deserve full implementation support. The workshop also looked at ways to ensure a sustainable approach towards improved human health and socio-economic development of tsetse-infested areas.

I. ANNOUNCEMENTS

STAFF CHANGES

Andrew Parker Joins The Entomology Unit At Seibersdorf

Andrew Parker has a Bachelor in Applied Biology from the University of Cambridge and an MSc in Animal Parasitology, from Bangor, University of Wales. He started his professional career in 1980 working in a mosquito control programme in Anguilla, British West Indies, where he tested a number of control techniques against *Aedes aegypti* including source reduction, larvivorous fish and larviciding. In 1985, working for the British government, he got for the first time involved with the tsetse fly in field activities including survey, aerial spraying, ground spraying, testing odour combinations and trap designs in Somalia. In 1990 he moved to BICOT, Nigeria, to be part of the IAEA supported tsetse SIT project where he was involved in mass rearing of tsetse. Two years latter he moved to Tanga, Tanzania, where he was in charge of the tsetse mass rearing and sterilization facility. He was part of the team that managed to eradicate the tsetse fly from Zanzibar, playing a key role in rearing of good quality sterile insects for field release. In 1998 he moved to the IAEA head quarters in Vienna as a Technical Officer providing support to the tsetse projects in Africa. Early this year he became the head of the tsetse rearing laboratory at the Entomology Unit in Seibersdorf, Austria. Andrew has had a very successful career working in tsetse research and control. The Entomology Unit and the IAEA is fortunate to have him back actively involved in the tsetse programme

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IN MEMORIAN

On February 3, 2002, David Ralph Rumsey, Senior Economic Entomologist, California Department of Food and Agriculture, suddenly passed away.

David leaves behind his wife, Angela and two daughters, Amelia, 3 and Sydney, 18 months. He was 37 years old. David supervised the successful California Mediterranean Fruit Fly Preventive Release Program located in the Los Angeles Basin in Southern California.

David was respected worldwide as a Sterile Insect Technique (SIT) expert and

David Ralph Rumsey November 18, 1964 – February 3, 2002.

served as a consultant for the United Nations' International Atomic Energy

Agency where he assisted countries of the Middle East and Central America implement Mediterranean fruit fly SIT programs.

(contribution by Gary Agosta)

David was a very talented individual in every respect, not only in the scientific world, but on the human level. He was a very giving and kind person and will be missed by all who were fortunate enough to have known him.

OTHER ITEMS

NEW CRP ON TSETSE QUALITY CONTROL

A Consultants Group Meeting on "Developing product quality control for standardization of tsetse mass production" was held in Vienna from 10 – 14 June 2002. The meeting concluded that there is an urgent need for standardized quality control procedures to support the proposed substantial expansion of tsetse production envisaged under the recent PATTEC initiative. They also concluded that an FAO/IAEA Coordinated Research Project would be effective in achieving this objective.

The IPCS will therefore propose a new CRP on the subject "Improved and Harmonized Quality Control for Expanded Tsetse Production, Sterilization and Field Application", and it is hoped that approval will be received later this year. If approved the CRP would start in 2003 and run for 5 years.

The topics identified by the Consultants Group Meeting were:

1. Quality control protocols to assess reproductive behaviour.
2. Quality control protocols for tsetse fly diet.
3. Quality control protocols for irradiation of tsetse flies.
4. Quality control protocols for field release studies.
5. Quality control protocols for colony maintenance.
6. Quality control for facilities, equipment, and materials.
7. Harmonization of quality control methods.

++Anyone interested in any of these fields is invited to indicate their interest to us, and we will send out information as and when the CRP is approved.

Proceedings of CRP on Medfly Mating Available

Final Proceedings of the FAO/IAEA CRP on Medfly Mating Behaviour are available upon request in hardcopy or online from the Florida Entomologist website at http://www.fcla.edu/FlaEnt/fe851.htm.

Poster Entitled: Fruit Fly Pests of the World Now Available

The poster has finally been finished and is available from: Richard Piper, Scientific Advisory Services Pty Ltd P.O. Box 1056, Cardstone Road, TULLY Qld

4854(richard@saspl.com.au; www.saspl.com.au). The Poster illustrates the life cycle of major fruit fly pests of economic importance and the damage they cause as well as featuring photographs of 64 mayor fruit fly pests from around the world. The photographs are mostly of live adults. For each species illustrated there is information on the major commercial hosts, lures and world distribution. The poster was Co-funded by the Joint FAO/IAEA Division and should provide a valuable information tool to create awareness among travellers of the potential risk of moving fruit fly pests in fresh fruits and for assisting quarantine agencies in their efforts to prevent introductions of exotic fruit flies to pest free areas.

Video on Tsetse available on the web

Bitting the fly – video on the success achieved in eradication of the tsetse fly from the island of Zanzibar. To see the video go to:

http://adminonline.iaea.org/videoclips/clip_gallery.htm

Recent SIT video now available in Spanish and French versions

The English teaching video "The Sterile Insect Technique. An environment friendly method of insect pest suppression and eradication" is now also available in Spanish (La Técnica del Insecto Estéril) and in French (La Technique de l'Insecte Stérile). Copies, in PAL, NTSC and SECAM formats, are available on request from the section. Contact one of the secretaries to obtain a free copy.

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

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