TO OUR READERS

We are delighted to bring you the second TEAM newsletter of 2014. Through the regular newsflashes and emails you have been informed about a number of new discoveries or happenings, but we always like to bring you a bit more in-depth information through the newsletter.

This time we could not get the invited paper ready in time; this will be included in the first newsletter of 2015. However, we have two young researchers who are presenting their latest research. First there is an ecological and behavioural study on Rhagoletis cerasi, the indigenous European cherry fruit fly, by Cleopatra Moraiti from Greece. Cleopatra compared genetic and environmental factors of populations of the fruit fly in Germany and in Greece. As both regions have different environmental conditions, she wanted to find out in what way the life history traits differ between the populations and whether populations are able to react plastically to changing conditions. Secondly, we have a contribution by Christian Ogaugwu on biotechnological approaches to control fruit flies. In particular he focuses on biotechnological improvements that would increase the efficiency of SIT, such as novel ways of developing genetic sexing strains. Developing an early-acting transgenic sexing system has the advantage that male-only strains can be obtained at the embryogenesis, thereby avoiding high costs in larval feeding of both sexes. Christian takes us on a journey in the wonderful world of biotechnology and explains how he developed a technique to do exactly this.

Several among us enjoyed the 9th International Symposium of Fruit Flies of Economic Importance, earlier this year in Bangkok, Thailand. The setting was spectacular, the organisation impeccable and the presentations of a very high standard. I think all participants greatly enjoyed the gathering. In the meantime we are fully preparing the next meeting which will be the 3rd TEAM Meeting. In one of the previous newsletters, you could read that Stellenbosch in South Africa was selected as the next venue. This lovely town in the Western Cape is also one of the major fruit producing areas in South Africa. The organizing committee has started making the necessary arrangements and are fully committed to make this a great event. You can read much more about this in this newsletter.

On the research front, we have some interesting news items as well. The foremost one is the recent study on the Bactrocera dorsalis species complex and the different species within the complex. The impact of the invasive fruit fly (Bactrocera invadens) in Africa is well known, both to local farmers and to researchers who have studied the species for the last 10 years. It is also considered a major potential risk for Europe and the Middle East should it become introduced and established. The exact taxonomic status, however, and especially its status versus the Oriental fruit fly (Bactrocera dorsalis) has been an issue of dispute for a long time. Recently a decision has been made on this with two important publications in Systematic Entomology. This is the result of a long term research collaboration, over the last years stimulated by the International Atomic Energy Agency, between several institutions and individuals including several of our TEAM members. Especially the integrative approach, using a wide range of disciplines and methodologies, has been important in this study. You can read more about this in the press release published by the Plant Biosecurity Cooperative Research Centre. We are convinced that this is a major stepping stone in the research on the Bactrocera dorsalis complex and that it will have far reaching consequences, both in research and in the fruit industry.

In addition there are some brief announcements on other forthcoming meetings and training opportunities. This leaves me only with wishing you, on behalf of the TEAM Steering Committee and the TEAM Newsletter Editorial Board, all the best for the New Year. May it be a productive year for all of you with many exciting and interesting activities. But especially: enjoy the festive days ahead of us!

Marc De Meyer
Chairman TEAM Steering Committee
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The European cherry fruit fly, *Rhagoletis cerasi* (Diptera: Tephritidae), is a univoltine, stenophagous species that is widely distributed in temperate regions of Europe and west Asia (Fiminiani, 1989; White & Elson-Harris, 1992; Mohamadzade Namin & Rasoulian, 2009). It infests fruits of several species of the genus *Prunus* (Rosaceae; *P. cerasus, P. avium, P. mahaleb*) and *Lonicera* (Caprifoliaceae; *L. xylosteum* and *L. tartarica*) and is considered a major pest of sweet and sour cherries (White & Elson-Harris, 1992).

*Rhagoletis cerasi* undergoes obligatory diapause at pupal stage for one or more years and adults emerge during the period of fruit-hosts availability (Boller & Prokop, 1976). Despite the economic significance of *R. cerasi* for the European cherry production, variation in life history and behavioral traits among its populations has not been studied.

In my PhD thesis, I first studied the geographic distribution of *R. cerasi* populations in Greece and the *Wolbachia* infection status of the Greek populations. Then, using several Greek as well as two German populations (Figure 1) from ecologically different habitats and with various levels of gene flow, I studied the genetic and environmental factors that affect: i) diapause termination and the expression of long life cycles, ii) post-diapause development, iii) life-history traits of adults, and iv) the expression of premating isolation mechanisms among populations.

*Prunus* grow (Figure 1). Fruit infestation levels differ among regions, hosts and years, regardless of the fruit maturation time (early-ripening vs late-ripening fruits). The presence of *Wolbachia* infection was confirmed in all populations tested (Augustinos et al., 2014).

*Rhagoletis cerasi* pupae were able to terminate diapause after being exposed for extended periods of time to low temperatures ranging from 0 to 10°C (Figure 2). Moderately low temperatures (3 – 8°C) seem to be optimal for diapause termination. Diapause intensity differed among populations located at habitats with different host fruit phenology (Dossenheim, Dafni, K. Nera), indicating local adaptation to climatic and geographical characteristics of their habitats. Long life cycles have been found to be a plastic response to the duration and level of chilling period. Interestingly, the chilling affects the proportions of overlying pupae in a dual mode: insufficient chilling for terminating annual dormancy, and extended chilling (lasting longer than required for terminating annual dormancy) make the pupae refractory to warm cues that terminate diapause and thus “return” to another (facultative) cycle of dormancy. As such it enables adults to emerge during the next appropriate ‘window of time’; a strategy reported for the first time for univoltine insects. These findings suggest that long life cycles of *R. cerasi* populations are expressed as a part of diapause dormancy bet-hedging strategies.

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**Figure 1.** Map of Greek and German locations from where *Rhagoletis cerasi* populations were obtained.

**Figure 2.** Effect of different temperature treatments on the proportions of *Rhagoletis cerasi* pupae that give adults, die and remain alive (overlying pupae) in populations obtained from (a) Dossenheim, (b) Dafni, and (c) Kala Nera.
In addition, we explored those factors affecting the post-diapause development of *R. cerasi* pupae and we demonstrated differences among individuals with annual diapause originated either from late-emerging populations with low gene flow rates or early-emerging populations with high gene flow rates. Geographic variation in post-diapause developmental time at three constant temperatures (15, 20 and 25°C) was also recorded. In contrast, there was no geographical variation in post-diapause developmental time (=22 days) of pupae with prolonged dormancy obtained from genetically isolated populations with different ecological characteristics. At population level, the duration of post-diapause development was generally decreased with decreasing diapause intensity. Nevertheless, post-diapause developmental time was longer in individuals emerging after the termination of prolonged diapause.

Adults from two Greek populations that emerged from pupae with prolonged diapause had larger body size than their counterparts emerged during the first year of diapause (Figure 3). Prolonged dormancy did not affect adult longevity but decreased female fecundity rates followed by an extended post-oviposition period (Figure 4).

![Figure 3](image3.png)

**Figure 3.** Adult body size (mean ± SE) of males and females originating from *R. cerasi* populations of Thessaloniki and Ker­nitsa. Adults obtained from pupae following different types of dormancy (annual dormancy, prolonged dormancy); solid circles denote adults from pupae with annual dormancy, and open circles denote adults from pupae with prolonged dormancy.

Life history traits and body size of *R. cerasi* adults emerging from pupae with annual diapause differed among populations from ecologically different habitats. Differences among allopatric populations were detected in lifetime fecundity and the duration of the oviposition period, whereas variation in adult longevity was controlled by the variation in body size. There were no differences in the duration of pre- and post-oviposition periods. In the face of gene flow, adult longevity, lifetime fecundity rates, as well as the duration of pre-oviposition, oviposition, and post-oviposition period varied significantly among populations.

As far as mating behavior is concerned, our results showed that there was neither geographical variation in daily mating rhythm nor sexual isolation among *R. cerasi* populations, regardless of their genetic distance and ecological characteristics (e.g. adult phenology). However, we found effects of sexual selection on both sexes (females and males) as well as differences in mating duration in some mating cross combinations.

In conclusion, these results suggest that: i) diapause and post-diapause developmental time of pupae, as well as life history traits of adults, differ among *R. cerasi* populations with habitat heterogeneity due to effects of local adaptation, ii) pupae within populations plastically respond to specific environmental cues and extend their life cycle, and iii) there is no reproductive incompatibility among *R. cerasi* populations based on sexual isolation. Thus, *R. cerasi* populations are adapted to local conditions of their habitats and respond plastically to unpredictable environmental (climatic) conditions.

**References**


**PEOPLE: CLEOPATRA MORAITI**

Cleopatra Moraiti holds a Bachelor degree (with honor) in Agricultural Biotechnology from the Agricultural University of Athens and a Master degree (with honor) in Plant Protection from the University of Thessaly. She initiated her PhD study in March 2008 under the supervision of Professor Nikolaos T. Papadopoulos, at the laboratory of Laboratory of Entomology and Agricultural Zoology, Department of Agriculture, Crop Production and Rural Environment, University of Thessaly (Greece). On December 2013, she successfully defended her PhD Thesis entitled ‘Study of bio-ecology and behavior of different populations of European cherry fruit fly *Rhagoletis cerasi* (Diptera: Tephritidae)’.

During her PhD she worked on a project related to spatial and seasonal distribution of Mediterranean fruit fly populations in Lechonia area (Magnesia, Greece), and collaborated with the Julius Kühn Institute in Dossenheim as a part of an IKYDA (Programme IKYDA, Greek State Scholarship Foundation and German Academic Exchange Service) action. Experiments related to Wolbachia infections of *R. cerasi* populations were conducted at Laboratory of Molecular Biology, Genetics and Biochemistry, Department of Environmental and Natural Resources Management, University of Patras (Greece).

**Dr. Cleopatra Moraiti**

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cmoraiti@gmail.com

**BIOTECHNOLOGICAL APPROACHES TO FIGHT FRUIT FLIES OF AGRICULTURAL IMPORTANCE**

**CHRISTIAN OGAUGWU**

Excerpt of Dissertation for a PhD in Biology
Supervisor: Prof. Ernst A. Wimmer
Georg-August University, Goettingen (Germany), 2012

Tephritid fruit flies infest fruits and vegetables, producing tremendous economic losses and causing barriers to trade in these commodities. The Sterile Insect Technique (SIT), a target-specific and environment-friendly pest control method, has been used to combat several insect pests for many decades and has proven to be quite effective against tephritids and other insects (Hendrichs et al., 2002; Klassen 2005; Franz 2005; Wimmer 2005). Basically, SIT requires mass-production and mass-release of sterile insects to reduce the wild population of the same species. Sex separation prior to release is important in SIT for many insects as male-only releases have been shown to achieve a more effective population control (Rendon et al., 2004). While SIT has achieved great success, improvements to the various technical aspects are constantly made as it will convert the method into a more efficient, safer and cheaper program to execute. Molecular biotechnology has a great potential to bring desired improvements to SIT in ways that may be difficult to achieve by other means.

**Figure 1.** Binary expression system for female-specific embryonic lethality. (A) Promoters/enhancers of cellularization genes limit the expression of *tTA* to early embryonic stages. *tTA* should bind to the tetracycline-response element (TRE) in the sexing effector plasmid
construct #1402 (B) and then drives the expression of downstream genes. Cctra-transformer-I intron (Cctra-I) is sex-specifically spliced within the coding region of Dm-hid<sup>Alus</sup> and restricts HID-induced lethality to only female individuals.

The Mediterranean fruit fly Ceratitis capitata is a devastating fruit fly pest that is present on many continents. Sex separation in operational SIT programs against this pest is currently achieved using a Genetic Sexing Strain (GSS) developed via classical genetics that allows elimination of female embryos on exposure to high temperatures (Franz et al., 1994; Franz 2005). However, males of this strain have reduced fertility and there is also reduced survival of progeny at later developmental stages (Robinson, 2002). In addition, the above GSS, which is desirable for many other tephritid pests, is difficult to be transferred to other species because of the chromosomal translocations involved and the lengthy processes of development. A possible transgenic alternative to the GSS in C. capitata, engineered by Fu et al. (2007) using a sex-specifically spliced Cctra-I intron (Pane et al., 2002) to confer lethality to only females, was shown to have lethality mostly in pupae. An early-acting female-specific lethality system that ensures elimination of food consuming larvae, as is the case in GSSs, would be better for SIT because it could achieve a more cost-effective sex separation and increase mass-rearing efficiency.

**Figure 2.** Activation of components of female-specific embryonic lethality system. Whole mount in situ hybridization of antisense RNA probes to embryos of strain #43B (0-48hrs) show the absence of tTA mRNA during early blastoderm (A), detection of its expression during cellularization (B) and non-detection during germ band elongation/retraction (C & D). tTA subsequently drives the expression of hid<sup>Alus</sup> and the Cctra-I intron within the coding region of hid<sup>Alus</sup>. mRNAs of both hid<sup>Alus</sup> and Cctra-I intron become weakly detectable during cellularization (F & J) and are very strongly expressed during germ band elongation and retraction (G & H, K & L).

The main aim of this research was to develop an early-acting transgenic sexing system based on female-specific embryonic lethality in C. capitata. To establish female-specific embryonic lethality and create a male-only strain, an embryonic lethality system (Horn and Wimmer, 2003; Schetelig et al., 2009) was combined with a female-specific lethality system employing the sex-specifically spliced C. capitata transformer-I intron, Cctra-I intron (Fu et al., 2007). A tetracycline-repressible binary expression system (Gossen and Bujard, 1992) was employed to this end. Specifically, promoters of embryogenesis-specific genes (for example Cc serendipity-α) were used to drive expression of a heterologous tetracycline-repressible transactivator tTA, which in turn regulates a sexing effector containing a Drosophila melanogaster pro-apoptotic gene Dm-hid<sup>Alus</sup> under the control of the tTA-response element (TRE). The sex-specifically spliced Cctra-I intron was inserted inside the open reading frame of the pro-apoptotic gene Dm-hid<sup>Alus</sup> to confer organismal death to only female embryos (Figure 1). Complete elimination of female progeny was obtained in four transgenic medfly lines having the female-specific embryonic lethality transgene combinations in double homozygous condition in the absence of tetracycline in parental adult diet (Table 1). The observed death of female progeny was confirmed to take place during the embryogenesis and sequential activation of components of the female-specific embryonic lethality was also shown to occur at embryogenesis (Table 2; Figure 2). In the presence of tetracycline in parental adult diet, both males and females survive and the strains can be propagated in the laboratory in this way (Tables 1 and 2). These results showed that the system functions as designed and established an early-acting transgenic sexing strain (TSS) for the Mediterranean fruit fly C. capitata (Ogaugwu et al., 2013). The strains developed in this study are currently undergoing large-scale trials and should offer improved and cost-effective management of medfly populations once introduced into operational SIT programs.

**References**

Franz G., Gencheva E., Kerremans P. 1994. Improved stability of genetic sex-separation strains for the

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**Table 1. Assessment of FSEL strains for female-specific lethality**

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**Table 2. Stage of female-specific lethality**

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**Table 3. Stage of female-specific lethality**

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Mediterranean fruit fly, Ceratitis capitata. Genome 37: 72-82.

3rd TEAM MEETING PLANNED IN SOUTH AFRICA

After the last successful TEAM meetings in Palma de Mallorca, Spain (2008) and Kolymbia, Greece (2012), it was decided to organize the next one in Africa. In TEAM Newsletter Nr 13 of October 2013, we announced that the TEAM steering committee selected the offer of our South African colleagues to organize the next meeting in Stellenbosch, South Africa. For those who have been around in the fruit fly research for a while, this place will call to mind fond memories of the ISFEI meeting that took place there in 2002.

Stellenbosch is situated in the Western Cape of South Africa, about 50 kilometers outside of Cape Town. It is an historical town (one of the oldest European settlements in Southern Africa, founded in 1679). Today it counts more than 100,000 inhabitants and houses one of South Africa’s leading universities, Stellenbosch University, which also dates back to 1863, and has more than 25,000 students. The town itself is situated in a valley (average elevation of 136m) at the foot of the Cape Fold mountain range and is surrounded by mountains reaching more than 1,500 m. Regarding agricultural activities it is best known for grape and wine production, being part of the Cape Winelands, as the Mediterranean climate with hot dry summers and cool winters is excellent for grape production. (More information can be found on websites like 

http://en.wikipedia.org/wiki/Stellenbosch

and

http://www.stellenbosch.travel/)

The Western Cape area itself is one of the most important horticultural regions in South Africa, with 52,300 ha of fruit trees under cultivation and the majority of the country’s apple, pear and stone fruit production being situated in this area. The region is a biodiversity hotspot, known as the Cape Floristic Region (CFR), with high conservation priority dominated by the highly endemic fynbos vegetation. This is where agriculture meets conservation head on, leading to several, very 'fruitful', initiatives into sustainable agricultural production.

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3RD INTERNATIONAL SYMPOSIUM OF TEAM

Tephritid Workers of Europe, Africa and the Middle East
3rd International Symposium
11 - 14 April 2016
Stellenbosch, South Africa
On September 25-26, the organizing committee of the 3rd TEAM meeting, had a gathering in Stellenbosch. The organizing committee comprises fruit fly researchers from Stellenbosch University, Citrus Research International, the University of Pretoria, the Agricultural Research Council and the Department of Agriculture, as well as the chairman of TEAM. The first considerations were ‘where and when’. Regarding ‘when’ it has been decided to have the meeting taking place between 11 and 14 April 2016. This takes into consideration the Easter holidays in 2016, the availability of facilities and the climate in Stellenbosch around that time (April is early austral autumn; mean minimum and maximum temperatures vary between 10°C and 23°C, while average monthly precipitation is 40mm and 6 rainy days). It also avoids the Ramadan period. The meeting will have the standard format, allowing people to arrive the weekend before the meeting, three days of presentations and poster reviews, and a final fourth day with optional excursion to places of horticultural interest.

Regarding ‘where’, a number of possible places where the venue could take place were visited to have a look at the facilities, and to evaluate the pros and cons of each of them. In the end, we opted for a venue where both accommodation and conference can be provided at the same site. This formula, initiated in the 2nd TEAM meeting at Kolymbari, has proven to be advantageous for a stronger interaction between the delegates, higher attendance of the presentations, and logistic advantages. The local organizing committee thinks it has found the perfect place for such a meeting: the Spier Wine Estate (http://www.spier.co.za/conference/home/). This estate is in an historical setting (it is one of the very first farms with the title deed dating back to 1692 and with some of the original buildings like the old wine cellar and the manor house still in place). The conference facilities include an auditorium that can seat more than 200 people, as well as a number of smaller break-away meeting rooms. The rooms are at short walking distance with rooms clustered around private courtyards, and the restaurant offers great food. It is conveniently close to Stellenbosch but provides sufficient isolation to have the participants focusing on the actual meeting.

The conference program will also be along the format of the previous TEAM meetings: no parallel sessions but one general meeting room where all presentations will be given. We estimate that about 52 oral presentations can be included in the program, covering the major topics such as taxonomy, genetics, ecology, population dynamics, detection, management, and control. There will also be ample room for poster presentations.

A professional conference organizer will be contracted to take care of all administrative issues, while the organizing committee will focus on the scientific program. Although it is too early to provide accurate registration fees, the first estimate shows that a package comparable to the one of Kolymbari can be offered at a similar price (taking into account the inflation that will occur over the four year timespan between both meetings). Students will have preferential rates and the organizing committee also hopes to attract sponsorship, so that attendance can be offered at an even more preferential rate.
Last but not least, any meeting needs a logo. Thanks to the original idea by Chris Weldon (University of Pretoria), the artistic skills of Peter Stephen (Citrus Research International) and the constructive remarks of all members of the organizing committee, we came up with the one you see at the top of this article. The logo is inspired by the unofficial name of Stellenbosch: the “city of Oaks”. Oak trees were planted in Stellenbosch by the founders and can still be seen gracing several avenues and homesteads of the town. Hence the oak leaf shaped wings of the fly on the logo and its acorn shaped abdomen. The colours used are those of the Stellenbosch University while the fruit represents the fruit production area of the town and region. You are sure to see this logo often over the next two years!

A global research effort has finally resolved a major biosecurity issue: four of the world’s most destructive agricultural pests are actually one and the same.

For twenty years some of the world’s most damaging pest fruit flies have been almost impossible to distinguish from each other. The ability to identify pests is central to quarantine, trade, pest management and basic research. In 2009, a coordinated research effort got underway to definitively answer this question by resolving the differences, if any, between five of the most destructive fruit flies: the Oriental fruit fly, the Philippine fruit fly, the Invasive fruit fly, the Carambola fruit fly, and the Asian Papaya fruit fly. These species cause incalculable damage to horticultural industries and food security across Asia, Africa, the Pacific and parts of South America.

The Philippine fruit fly was formally recognised as the same species as the Asian Papaya fruit fly in 2013. The latest study goes further, conclusively demonstrating that they are also the same biological species as the Oriental and Invasive fruit flies. These four species have now been combined under the single name: Bactrocera dorsalis, the Oriental fruit fly. The closely-related Carambola fruit fly remains distinct.

Lead author, Dr Mark Schutze from the Plant Biosecurity Cooperative Research Centre (PBCRC) and the Queensland University of Technology (QUT), believes the integrated multidisciplinary nature of the project leaves little doubt the species are identical.

“More than 40 researchers from 20 countries examined evidence across a range of disciplines, using morphological, molecular, cytogenetic, behavioural and chemoecological data to present a compelling case for this taxonomic change,” he said.

“This outcome has major implications for global plant biosecurity, especially for developing countries in Africa and Asia,” said Dr Schutze.

“For example, Invasive (now Oriental) fruit fly has devastated African fruit production with crop losses exceeding 80 per cent, widespread trade restrictions with refusal of shipments into Europe and Japan, and significant economic and social impacts to farming communities.”

Keeping exotic fruit fly out is a major concern for Australian biosecurity agencies. While an outbreak of Papaya fruit fly near Cairns in the mid-1990s inflicted $A100 million in eradication and industry costs, current estimates rate the Oriental fruit fly as the biggest threat to Australian plant biosecurity, with the total cost to the nation of an invasion estimated at $A1 billion. Combining the four species will mean a major reassessment of Australia’s exotic fruit fly risk.

“Globally, accepting these four pests as a single species will lead to improved international cooperation in pest management, more effective quarantine measures, reduced barriers to international trade, the wider application of established post-harvest treatments, improved fundamental research and, most importantly, enhanced food security for some of the world’s poorest nations,” said Dr Schutze.

The paper, B. papayae, B. invadens, and B. dorsalis synonymy, is published recently in the journal Systematic Entomology (abstracts through the following links):

WHAT’S IN A NAME? EVERYTHING – IF YOU ‘RE A FLY

On Tuesday October 28th, an official press release was issued by a number of agencies, announcing the long awaited publication of the paper in ‘Systematic Entomology’ where the taxonomic status of a number of members of the Bactrocera dorsalis species complex was re-evaluated. Below you will find the press release (compiled by Tony Steeper) as issued by the Plant Biosecurity Cooperative Research Centre of Australia. Other similar press releases were issued by other bodies like the International Atomic Energy Agency, and the Royal Museum for Central Africa.

So, we hope that this introduction is a good appetizer for the meeting and that all of you are keen to attend. Therefore, please note down the dates already and start planning. We all expect you in Stellenbosch in 2016.

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and is a collaboration between 33 research organisations in 20 countries, supported by the Food and Agriculture Organisation of the United Nations and the International Atomic Energy Agency.

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### REGIONAL TRAINING COURSE

**Taxonomy, Systematics and Ecology of African Fruit Flies**

In 2015, the bi-annual training course on African fruit flies will take place. Previous editions were organized by the Royal Museum for Central Africa in Tervuren (Belgium). From 2015 onwards, this course will now take place in Tanzania. The organization is taken over by the Sokoine University of Agriculture at Morogoro. Because of the long-term collaboration between Tervuren and Morogoro, the Sokoine University now has the necessary knowhow and logistic facilities to organize this course. Having the course taking place in Africa has the advantages that field experiments and demonstrations, such as trapping protocols and rearing set-ups, can be included in the program. In order to accommodate these extra components, the duration of the course will be slightly longer than the traditional two weeks. Other benefits of conducting the course on the African continent are shorter travel times for a number of the participants and a strengthening of South-South collaboration and knowledge transfer. The Royal Museum for Central Africa will still be involved in a number of the training aspects, and the course itself will still be financed by the Belgian Development Co-operation. No official call has been published yet but the course will most likely take place between 4-20 May 2015. Once the call is opened officially, the details will be circulated through the TEAM mailing list. Queries can be addressed to Prof Maulid Mwatawala of Sokoine University (mwatawala@yahoo.com) or Marc De Meyer of Tervuren (demeyer@afriamuseum.be)

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### FORTHCOMING MEETINGS

- **XVIII INTERNATIONAL PLANT PROTECTION CONGRESS (IPPC 2015)**  
24—27 August 2015  
Berlin, Germany  
http://www.ippc2015.de

- **3RD INTERNATIONAL SYMPOSIUM OF TEPHRITID WORKERS OF EUROPE, AFRICA AND THE MIDDLE EAST (TEAM)**  
11—14 April 2016  
Stellenbosch, South Africa  
marc.de.meyer@afriamuseum.be  
pia@sun.ac.za

- **1ST MEETING OF THE TEPHRITID WORKERS OF ASIA, AUSTRALIA AND OCEANIA (TAAO)**  
25—29 April 2016  
Kuala Lumpur, Malaysia

- **XXV INTERNATIONAL CONGRESS OF ENTOMOLOGY (ICE 2016)**  
25—30 September 2016  
Orlando, Florida, USA  
http://www.ice2016orlando.org/

- **9TH MEETING OF THE TEPHRITID WORKERS OF THE WESTERN HEMISPHERE (TWWH)**  
Exact dates to be announced  
Chiapas, Mexico  
MEETINGS AND ACTIVITIES RELATED TO INTERNATIONAL ORGANISATION FOR BIOLOGICAL AND INTEGRATED CONTROL (IOBC)  
http://www.iobc-wprs.org/events/
This newsletter is intended for the publication of subjects of interest to the members of TEAM. All content is solicited from the membership and should be addressed to the members of the editorial board.

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