HIGHLIGHTS
OF 2015
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Cover: In Lake Naivasha, Kenya, water hyacinth is an invasive species. Weevils from South America (also the origin of the water hyacinth) has been introduced to limit the spread, something that would be possible to do in Lake Naivasha as well.

Layout: Caja Lithell
It is a privilege to work as director of CBC, as integrated pest management gets increasingly important and it is vital to find environmentally sustainable methods for pest control. The researchers connected with CBC have an important mission to provide solutions for the agriculture, forestry and horticulture.

In December 2015, Sweden signed the “4/1000 Initiative: Soils for Food Security and Climate” at COP21, the United nations conference on climate change in Paris, that aims to ensure that agriculture plays its part in combating climate change. Hopefully, this will lead to an increased use of biological control methods and can give a boost towards a better integrated pest management in agriculture.

In this report, we present a brief overview of our activities in 2015, our fourth full year. CBC has, for example, participated in arranging the National plant protection conference at Ultuna. In this report, we especially highlight a trip to Kenya that was done to start new research collaborations and teach at a University College. Among the research results, a paper on how a bacteria can combat malaria has received a lot of attention, both on Swedish television and in international media.

I am very much looking forward to the coming years!

Margareta Hökeberg,
Director of CBC
New pests, climate change, resistance emergence and an EU directive on integrated pest management. These are the important reasons that a national plant protection conference was arranged at Ultuna, the first of its kind in nearly 20 years. The opening speech was given by Sven-Erik Bucht, the minister of rural affairs.

Margareta Hökeberg was moderator in sessions discussing biological control, ecosystem services and design of farming system. CBC researcher Hanna Friberg gave two talks in different sessions on crop rotations and biological control of tomato pathogens.

More information about the conference is available in a news post from SLU and on the conference webpage (both in Swedish). There is also a short movie available on the CBC YouTube Channel.

The conference brought together stakeholders, researchers and the industry in a very nice way. We all need to collaborate to be able to solve the future problems in plant protection!

- Helena Bylund
Toxin producing fungi in cereals mapped

Significant quantities of cereals have, in recent years, contained so much fungal toxins that they can not be used as food or feed. Now Ida Karlsson has evaluated a method that makes it possible to identify the toxin-producing Fusarium fungi on species level. Read more here.

Ida later received a grant from Formas to continue her career in research. In her new project she will investigate protozoa as drivers for soil disease suppressiveness.

Ants can stop pine weevils

When ants are present at young conifer seedlings, pine weevils do not destroy the plants to the same extent, reports Vítězslav Manak. Read more here.

Biological control in Swedish radio

SLU researchers discuss pest management in Vetenskrapsradion

Klotet i P1, an environmental radio show dealing with the major environmental questions, sent a half-hour program on plant protection in June. Riccardo Bommarco and Margareta Hökeberg participated. Listen to the radio show in Swedish here.

Ida Karlsson talks about Fusarium in Vetenskrapsradion

Ida talks about her doctoral thesis and how she has mapped toxin producing molds in grain with a new method. Listen to the radio show in Swedish here.
CBC invites researchers working in the biological control area to SLU in order to strengthen collaborations and start interesting discussions. This year, the CBC seminar series has been visited by many interesting speakers. For example, Dr Marc Ongena and Dr. Brigitte Mauch-Mani from Liège Universitet in Belgium talked about microbial lipopeptides and their role for plants tolerance to abiotic and biotic stress. In addition, they discussed induced resistance in plants.

Dr Niels Bohse Hendriksen (on the photo above) from Aarhus University (Roskilde, Denmark) gave a very appreciated seminar titled “Bacillus thuringiensis – the most successful microbial pest control agent. Ecology and potential risks associated to its use”.

Mattias Jonsson held a workshop on how to measure predation pressure on insects at the Ecology Centre in Uppsala on January 21.

This was the first step in a CBC-funded pilot project to develop a general method to estimate predation pressure on insects across agricultural and forestry systems. Such a method can be used to explore how predation pressure varies in time and space and to better understand factors influencing the efficacy of generalist predators as biological control agents.
New method to investigate biological control bacteria and related strains in the field
As the bacterium *Bacillus thuringiensis* produces insect toxins that kills larvae, it has found extensive use as a biological control agent. *Bacillus thuringiensis* serovar israelensis can now be distinguished from other, closely related bacteria in soil with a new method. This information is very valuable for policy making and risk assessment for use of this biological control agent in the environment. Read more about these research findings here.

Agroforestry practices results in less pests, plant diseases and weeds
The use of agroforestry has been extensively promoted in many developing countries in Africa and in South and Central America and it is commonly used by traditional farmers. In a recent meta-study, agroforestry practices have been shown to be beneficial in terms of pest, disease and weed management. Read more about it here.

Flower strips most effective in moderately complex agricultural landscapes
To be able to feed an increasing human population it is necessary to intensify agricultural production. However, this is often done at the expense of biodiversity and the delivery of ecosystem services, through e.g. natural enemies of crop pests and pollinating insects. It is in moderately complex landscapes that it is most effective to deploy local conservation management measures to enhance biodiversity. Read more about this study here.

Increased faunal and floral diversity does not always result in better biological control of pests
A new study, carried out in field cages (on the picture above) investigated if an increase of diversity of insect predators results in a better biological control of cereal aphids. In addition, the researchers studied if the presence of agricultural weeds mitigated the effect. The results show that a more diverse predator community had similar impact than the one-species community. The presence or absence of weeds did not alter the patterns observed. Read more about the study here.

A more natural method of biocontrol
A paper on the effectiveness of conservation biological control, by CBC researcher Mattias Jonsson and colleagues, was recently discussed in a blog post. Associate Editor Yann Clough comments “The authors find that landscapes with up to 75% non-crop habitat – a high value – are impoverished enough for buckwheat strips to have a significant impact on the biological control and plant size. This is quite different from other numbers put forward in other parts of the world.” Read more about it here.
The Ag-Bio Congress provided a meeting platform for biocontrol, seed and agrochemical industries as well as scientists from academia. Ingvar Sundh from CBC participated in the meeting that took place 2-4 December in Amsterdam. “For me, the most interesting things were discussions on how to combine different methods for more efficient control and implementation of IPM”, says Ingvar.

The international symposium “MicroPe - Microbial-assisted crop production - opportunities, challenges and needs” took place 23-25 November 2015 in Vienna, Austria. Sebastian Håkansson presented an invited talk with the title “Trials and tribulations of microbial formulation”.

The meeting “Population dynamics and integrated control of forest defoliating and other insects” was arranged at the end of September in Sopot, Poland by IUFRO (International Union of Forest Research Organization). Helena Bylund presented a talk with the title “Is the risk of seedling damage by pine weevils in forest regenerations related to forest management in the surrounding landscape?”. 

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It is very important for CBC to participate in meetings with the industry in order to maintain and establish new contacts and start collaborative projects.

- Ingvar Sundh

As a part of CBC’s work on risk assessment of biological control agents, Ingvar Sundh was invited to give a presentation at OECD in Paris. OECD stands for “The Organisation for Economic Co-operation and Development” and is an international economic organisation of 34 countries founded in 1961 to stimulate economic progress and world trade. Ingvar’s talk was called “Evaluation of relevant metabolites from microbial control agents: What do we need to know?” and was held at the 6th OECD BioPesticides Steering Group Seminar in May, on “Hazard and Risk Assessment of Secondary Metabolites produced by Microbial Pesticides".
CBC participated with an exhibition on biological control. By using moldy oranges, aphids, ground beetles and slugs, the researchers explained what biological control is and how it can help us reduce the use of chemical pesticides. Many interested children and grown-ups visited our exhibition! This was a very nice opportunity to talk about biological control with the public.

SLU’s new campus at Ultuna was shown to the public on September 26th. The program, in addition to lectures, do-it-yourself activities and demonstrations of the new buildings, also featured different tours of the Ultuna buildings, art, history and of the Knowledge Garden.
To make information about biological control more available and to make CBC’s activities better known to growers, stakeholders, the industry and to the general public, we work with different internet channels.

We have updated Wikipedia pages connected to biological control with relevant and updated information. CBC work with social media, mostly with Facebook, but also Twitter.

At the CBC kickoff in September, we had a movie making workshop as an introduction to movie making. On the photo above, the actors in a movie explaining biological control to school children, are created. We have, during the year, produced several short movies about CBC’s research. During 2016, we aim to continue this project with many new exiting ideas!

Making movies is a great way to reach a larger audience with research results. I find it especially efficient when targeting end-users and the public.
- Hanna Friberg

On the CBC YouTube channel, videos on research about biological control and happenings can be found.

On Facebook, CBC post regular updates on research results, meetings, photos from events and available job positions. Via this channel we have communicated with both international researchers and stakeholders.

On the CBC Twitter account, we post photos, express opinions about biological control and link to current news.

We have expanded the Swedish page about Biological control and related subjects on Wikipedia. Check out the entry “Biologisk bekämpning”.

Making movies is a great way to reach a larger audience with research results. I find it especially efficient when targeting end-users and the public.
- Hanna Friberg
On the 1-9 October CBC visited Kenya to discuss ongoing and future collaborations with universities and research institutes. In addition, we taught students at the Embu University College as part of the Linnaeus-Palme program. We had the opportunity to visit a flower farm outside Naivasha and a bee-keeper association outside Embu.

CBC made many new contacts which are likely to result in new research collaborations. Visits to Embu University College generated many ideas for minor field studies. This was a highly interesting study trip which will strengthen CBC’s international research collaborations!

I arranged this study trip to further develop CBC’s collaborations with low and medium income countries. We were able to extend our current collaborations and have many chances for new ones.

- Mattias Jonsson

CBC was invited to hold a seminar about our activities at the University of Nairobi and discuss collaborations. On the photo below, Hanna Friberg talks about fungi and bacteria as biological control agents. We had an interesting discussion afterwards about possible collaborations. For more information and photos from the visit to University of Nairobi click here.
The World Agroforestry Centre (ICRAF) is a CGIAR Consortium Research Centre.

ICRAF’s headquarters are situated in Nairobi, Kenya, with six regional offices located in Cameroon, China, India, Indonesia, Kenya and Peru. The Centre’s mission is to generate science-based knowledge about the diverse roles that trees play in agricultural landscapes, and to use its research to advance policies and practices, and their implementation, that benefit the poor and the environment.

At ICRAF, CBC held a seminar on CBC’s communication work and how we work with science communication within the research schools. In addition, we had a discussion about science communication in a changing world and how social media best can be used to get information through to end users.

Daisy Ouya, communications specialist and science writer, presented ICRAF’s communication work. Students shared their view on how to capture the audience when communicating science. The discussions were very interesting and experiences on science communications were shared. Read more about the visit here.

A Facebook page in Kenya called Digital Farmers have 40,000 followers, but not one of them is an agricultural researcher. This is not unusual, but happens all over the world. We must communicate where the end users are!

- Cajsa Lithell
Longonot Horticulture Fairtrade is a part of Kongoni river farm limited and employ around 800 workers that produce more than 240 different varieties of roses on 23 hectares.

The largest pest problem experienced at this farm is the two-spotted spider mite, but other mites, trips, powdery mildew and botrytis can also cause problems. In order to sell the roses, they need to be in perfect condition. To achieve this, advanced IPM methods are used. Chemical pesticides are combined with different biological control methods to achieve an efficient pest control.

The visitors from CBC were impressed by the very sophisticated IPM methods used at this farm. Read more about this study visit here.

The roses are picked and transported to a cold-room before transport to Europe (mainly Germany and Great Britain) with airplane. The hanging blue objects are sticky traps for flying insects.
CBC visited a beekeeper association outside Embu in Kenya. We met farmers and discussed possible control measures to prevent the problems with pests and parasites in their beekeeping. One major problem for beekeepers in this area are wax moth larvae. The wax moth larvae feed mainly on the wax and destroy the honeycombs. High levels of infestation may cause the collapse of small or weak bee colonies, eventually leading to reduced honey production.

Read more about the visit here.

As part of the Linnaeus-Palme program, CBC taught students at the Embu University College in Kenya. In addition, CBC held a lecture on our research activities, and a PhD project on a tomato pest was discussed.

Embú University College, is located about 2.5 hours drive from Nairobi. The students were 4-year students, and they will be the first class that graduates from the university.

The teaching began with lectures on biological control and then students were divided into groups to work with fictional problems and think about how they could be solved with different biological control methods. Finally, the students listened to a lecture on how to present scientific results. Read more about CBC’s visit to Embu University College here.
A newly discovered bacterial family may become a weapon in the fight against malaria

We are looking for bacteria that live in the mosquito gut and which grow quickly when the mosquito has taken a blood meal. The idea is to genetically modify these bacteria to produce substances that stop malaria parasite development.

- Sebastian Håkansson

A new family of bacteria that are common in malaria mosquitoes has been described by researchers SLU, Uppsala University, Justus-Liebig-Universität Giessen, Germany, and the Veterinärmedizinische Universität, Austria. Now, attempts are made to use these bacteria in the fight against malaria.

The discovery of the new bacterial family is strongly linked to research on malaria mosquitoes and development of tools to combat this disease. The first Thorsellia species were isolated from malaria mosquitoes in Kenya; now, species of the genus Thorsellia have been found in malaria mosquitoes from Africa, India, Iran, Brazil and USA. This suggests that Thorsellia has evolved along with disease-carrying mosquitoes for a very long time and that properties facilitating survival in mosquitoes may have evolved.

- It is exciting that these bacteria so far are only found in disease-carrying mosquitoes and their hatching waters, says project leader Olle Terenius, from the Department of Ecology, SLU. We and other research groups are now trying to understand the interaction between Thorsellia and mosquitoes. Among other things, Thorsellia have properties facilitating mosquito-larvae uptake and survival.

Read more about how these bacteria can be a weapon against malaria.

The bacterial family Thorselliaceae, as well as the genus Thorsellia, is named after the now 96-year old Professor Walborg Thorsell - a legendary mosquito researcher who began her research in the 1970s and then for several decades developed mosquito repellents at the Swedish Defense Research Establishment to be used by Swedish soldiers in wartime.