

## IOBC/wprs Bulletin Vol. 75, 2012

Working Group "Landscape Management for Functional biodiversity".  
Proceedings of the meeting at Lleida (Spain), 07 – 10 May, 2012. Edited by:  
John Holland, Bärbel Gerowitt, Oscar Alomar, Felix Bianchi, Lisa Eggenschwiler,  
Maarten van Helden, Camilla Moonen, Hans-Michael Poehling and Walter  
Rossing. ISBN 978-92-9067-252-4 [VI + 245 pp.].

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### Arthropod complexes inhabiting different levels of grassy vegetation

*Valentina Afonina, Wladimir Tshernyshev, Alexandr Semenov, Andrey Semenov* ..... 1-4

**Abstract:** Arthropods were collected separately on upper, middle and low levels of grassy vegetation. Upper complex of arthropods was sampled by sweep-netting, arthropods falling down from the middle part of plants were collected by small plastic containers (a new method) and arthropods active on the soil surface were collected with the help of standard pitfall traps. Container-traps with preservative liquid were put on the soil surface between plant stems. These plastic traps only seldom contained inhabitants of the upper level and were inaccessible for arthropods of soil surfaces. The number of arthropods falling down into 100 containers per 24 hrs could reach 300 specimens per 1m<sup>2</sup> of liquid surface. The complex of species and number of specimens on the middle level differed from such data on upper and low levels at the same place. Moreover, some species in containers were 10-200 times more abundant. Some species were found only in containers. It is important to note that pitfall traps without any roof, collect not only arthropods active on the soil surface but also individuals falling down from plants. We suppose that this method of arthropod collecting will be used both in scientific research and in plant protection monitoring.

### The spatial distribution and the composition of wild bee species

available for pollination of early strawberry varieties in four different countries

*Erica Juel Ahrenfeldt, Björn Kristian Klatt, Julie Arildsen, Nina Trandem,*

*Georg Andersson, Teja Tschardtke, Lene Sigsgaard* ..... 5-8

**Abstract:** Field margins can serve as habitat for beneficial insects. In conservation of beneficials an understanding of the spatial distribution and range is crucial. Few studies have investigated how wild bee species richness, abundance and species size is distributed spatially in crop fields and how response may be affected by geographical location. We assessed the composition of wild bee species available for pollination of early strawberry varieties as affected by field margin type and geographical location. Bees were sampled at the field middle and two types of field margins in 14 early flowering strawberry fields in five different geographical locations: Mid-Norway, South-Norway, Denmark, Sweden, and Germany giving a North-South gradient of approximately 1100km. Preliminary results show that catch per day was higher in Denmark and Germany than in the two study areas in Norway. The soil-nesting genus *Andrena* (Hymenoptera: Andrenidae) was generally very common in all geographical regions and dominated the samples in the southern regions, whereas *Bombus* (Hymenoptera: Apidae) were more frequent than *Andrena* in the Northern study areas and virtually absent from Danish and German samples. It remains to be tested how bee species richness, abundance and species size is distributed spatially in the strawberry fields across the study locations.

### Can entomophagous Heteroptera take a role in suppressing herbivorous insect pests?

*Mohamed A. Amro and Farouk A. Abdel-Galil* ..... 9-12

**Abstract:** A faunistic survey of Hemiptera-Heteroptera (True-Bugs) inhabiting selected crop plants and weeds was performed in Assiut Governorate 375km north of Cairo, Upper Egypt,

during summer seasons of 2009 and 2010. Twenty-two Heteropteran species belonging to 8 families were recorded. Host plant range and preferred host plants were identified. Relative abundance was calculated by dividing the number of samples in which each species occurred by the total number of samples (abundance percentage). The predaceous species *Orius* spp. and *Deraeocoris serenus* Douglas & Scott showed the highest levels of abundance. However, the predators *Geocoris megacephalus* (Rossi) and *Coranus aegyptius* (Fabricius) reached only moderate densities. Moreover the potential of the mirid *D. serenus* in consuming the aphid species *Therioaphis trifolii* (Monell) was determined in laboratory studies.

#### Hymenoptera abundance on candidate plants for conservation biological control

*Judit Arnó, Rosa Gabarra, Òscar Alomar* ..... 13-16

**Abstract:** As part of the general goal of identifying plants useful for conservation biological control this study aimed to assess the role of different species as habitat for Hymenoptera. Twenty-four monospecific plots of selected plants were sampled during winter, early and late spring. *Sinapis alba* hosted the highest numbers of Hymenoptera throughout the sampling period, even when it was not blooming. Large numbers of Hymenoptera were also collected on *Brassica nigra*, much related to the flowering period, and on *Medicago sativa*, especially in late spring. Regarding woody plants, *Viburnum tinus* may be of some interest in spring.

#### Density dependent seed removal in dryland cereals by harvester ants

*Valentina Atanackovic, Joel Torra, Barbara Baraibar & Paula R. Westerman* ..... 17-20

**Abstract:** In dryland cereals in NE Spain, the harvester ant, *Messor barbarus* L., is responsible for a high percentage of seed removal. A direct density dependent response of seed predators to seed patches may help regulate weed populations. In this study, we investigated if seed removal rate by harvester ants is influenced by weed seed density. For this reason, 60 circular areas of 1m<sup>2</sup> were created inside four 50x50m blocks after cereal harvest *Lolium multiflorum* L. seeds were applied at 1000, 2000, 5000, 10000 or 20000 seeds/m<sup>2</sup>, in ten randomly selected areas each; the remaining 10 were used to test the methodology used to retrieve the seeds. After 24h, the remaining seeds were collected using vacuum cleaners or a D-vac and seed removal rates were estimated. In three of the four blocks, seed removal was extremely high (99-100%), and the response was therefore density independent. Here, nests densities ranged from 468 to 900 nests/ha. In the fourth block seed removal was 91%, and here nest density was lower (284 nests/ha).

#### Effect of a flowering trap crop on insect pests and their natural enemies

*Francisco Rubén Badenes-Pérez and Beatriz Parrado Márquez* ..... 21-23

**Abstract:** Yellow rocket, *Barbarea vulgaris* R. Br. (Brassicaceae), is a biennial plant that has been proposed as a trap crop for the diamondback moth, *Plutella xylostella* L. (Lepidoptera: Plutellidae). Since *P. xylostella* is the most damaging insect pest of cruciferous crops throughout the world and it can easily develop resistance to insecticides, trap cropping is a desirable technique for *P. xylostella* management as an alternative to insecticide use. Here we study the potential of flowering *B. vulgaris* to attract aphidophagous syrphid flies and to increase the populations of parasitoids associated with *P. xylostella* in Spain.

#### Attractiveness of flowers of different plant species to bees (Hymenoptera: Apoidea) and hoverflies (Diptera: Syrphidae) of central Spain

*Jelena Barbir, José Manuel Martín, David Campos, César Fernández-Quintanilla, Francisco Rubén Badenes-Pérez, José Dorado* ..... 25-28

**Abstract:** Over the last century, rapid expansion of intensive agricultural practices has contributed to modify and destroy the natural habitat of many species, including beneficial insects (i.e. bees and hoverflies). In order to conserve beneficial insects and improve their habitats, it is important to find out what plant species are attractive for those insects, and at the same time suitable to be implemented in habitat management of agro-ecosystems. This research investigates the attractiveness of nine annual plant species and two mixtures of plant species for

beneficial insects under field conditions. The results show that there were differences in beneficial insects' preference for different flower species. Bees preferred *Borago officinalis*, *Diplotaxis muralis*, *Echium plantagineum* and *Phacelia tanacetifolia*, while hoverflies favored *Calendula arvensis*, *Coriandrum sativum*, *Diplotaxis muralis* and *Lobularia maritima*. Furthermore, *Diplotaxis muralis* was the only plant preferred by both groups of beneficial insects, while *Tagetes patula* was the least attractive for all beneficial insects included in the study.

#### Effects of companion plants on the behavior of the green peach aphid reared on pepper plants

*Refka Ben Issa, Laurent Gomez, Marie-Hélène Sauge and Hélène Gautier ..... 29-33*

**Abstract:** Mixing horticultural plants with companion plants (CP) was proposed as an alternative method to control green peach aphid populations. Basil, lavender and rosemary were assessed as CP associated with pepper plants subjected to aphid infestation: i) on mesocosms in growth chambers and ii) in olfactometers. When pepper was associated with rosemary, lavender or basil, female fecundity was significantly reduced. In addition female flight was the most important in the presence of rosemary compared to other CP. Olfactory tests revealed that basil plants had a repellent effect on aphids. Our results sustain the hypothesis that associating CP with horticultural crops may be useful in reducing aphid populations.

#### Spatial variability in ecosystem services: which predator does best where?

*Felix Bianchi, Nancy Schellhorn, Yvonne Buckley and Hugh Possingham ..... 35-38*

**Abstract:** Agricultural pest control often relies on the ecosystem services provided by the predators of pests. Appropriate landscape and habitat management for pest control services requires an understanding of insect dispersal abilities and the spatial arrangement of source habitats for pests and their predators. Here we explore how dispersal and habitat configuration determine the locations where management actions are likely to have the biggest impact on natural pest control using a spatially explicit simulation model for four typical, but different, predator groups. Predator groups represented trait combinations of poor and good dispersal ability, and density independent and density dependent aggregation responses towards pests.

We show that the spatial arrangement of source habitats for natural enemies of agricultural pest species can have profound effects on their potential to colonize crops and suppress pest populations. Nevertheless, mobile and strongly aggregating predators provide the best pest suppression in the majority of landscape types.

#### A molecular analysis of predation by generalist predators on the codling moth and the oriental fruit moth in organic apple orchards

*Catherine Boreau de Roince, Claire Lavigne, Jean-Michel Ricard, Pierre Franck, Jean-Charles Bouvier, Alain Garcin and W. O. C. Symondson ..... 39-43*

**Abstract:** Biological control by conservation of native natural enemies can help to reduce the need for pesticides and prevent their detrimental effects upon the environment. Here we assess the role of ground-active generalist predators as natural enemies of two tortricid pests in apple orchards. Using diagnostic PCR on the gut of field-caught ground-active predators, we found no difference in predation rates on these two pests. Spiders were the most efficient predators of moths in spring while the carabid beetles, feeding on diapausing larvae, were important in autumn. The temporal complementarity between spiders and carabid beetles highlights the need for diverse predator assemblages to optimize conservation biological control.

#### Natural enemies in organic citrus orchards: trees and ground cover distribution

*Altea Calabuig, Alfonso Domínguez-Gento, Ricardo Ballester, Sandra González, Rosa Vercher ..... 45-49*

**Abstract:** This study reports on the distribution of natural enemies (predators and parasitoids) in two vegetation layers, citrus trees and ground cover, in a commercial ecological citrus orchard in Valencia (Spain). Both layers contained a high abundance of natural enemies and parasitoids

were the most abundant group. Depending on the layer, some species are more abundant in citrus trees, ground cover or both.

#### Biodiversity of plants and arthropods in key ecological structures of vineyards of the Alto Douro region

*Carlos, C., Afonso, S.; Crespi, A.; Aranha, J.; Thistlewood, H., Torres, L. .... 51-55*

**Abstract:** Vineyards in many parts of the world can be regarded as monocultures with little remaining native vegetation, often with a suite of introduced weeds, and having ecosystem services at a low level. By contrast, the UNESCO designated Alto Douro Vinhateiro Area has legally protected landscapes and contains a significant area of non-crop habitats (e.g. woodland remnants, grassy slopes, or terraces with natural vegetation and dry stone walls). In this study, we are measuring the interactions of landscape elements and biodiversity, with particular emphasis on natural enemies of the grape berry moth, *Lobesia botrana*. The study began in May 2010, in three pilot farms, mostly vineyards with olive groves, under different growing practices. A detailed inventory was made of the plant communities in key ecological infrastructures, such as woodland remnants, grassy slopes and borders. In 2010, arthropod populations were sampled by D-VAC suction sampling, yellow sticky traps and pit-fall traps, at various distances into the vineyard from natural vegetation, three times during the year. We present the results of measures of abundance and biodiversity indices, at 14-18 locations within the farms. These results will lead to improved understanding of the value of different vegetation types, and of cultural practices, interacting in biodiversity and pest management.

#### Flowering forbs for field margins: selecting species that optimize ecosystem services

*Romain J. G. Carrié, David R. George, Felix L. Wäckers ..... 57-60*

**Abstract:** The aim of this study was to assess the attractiveness of flowers to target groups of beneficial insects. Water trap samples were taken throughout the entire period of inflorescence and were accompanied by sweep net sampling in early summer. Samples were assessed for target insect groups (predatory beetles, true bugs, aphids, hoverflies and Parasitica) that are known to provide ecosystem services in farm landscapes (such as pollination, conservation and pest control). Yarrow and Oxeye daisy were the most promising flowering plants, attracting multiple beneficial target groups. These species seem to be the most promising for use in flowering field margins.

#### An attempt to identify the factors influencing weed seed predation in an area with large field sizes

*Daniel Daedlow, Paula R. Westerman, Bärbel Gerowitt ..... 61-64*

**Abstract:** Granivores can contribute to long-term weed control by consuming substantial proportions of newly produced weed seeds in crop fields. In N-Germany, however, seed losses and granivore densities tend to be lower than elsewhere. To investigate possible driving factors, seed predation rates were measured in six cereal fields. Factors under consideration were farming system (organic or conventional), distances from the field edge (0-100m) and the relative contributions of vertebrates and invertebrates to seed consumption. As expected, seed predation rates increased from early spring to early summer, after which they decreased again. Farming system had little or no effect on seed predation rates. Seed predation by invertebrates was comparable to that in other studies, but seed predation by vertebrates, mainly rodents, was much lower. The effect of distance to the field edge on predation rates was variable and may be linked to predator identity. Apart from the low vertebrate activity, no reasons could be identified for the low seed predation rates. Some untested detrimental factor has to be involved, affecting both conventional and organic fields. Alternatively, the impoverished landscape as a whole is to blame.

## Enhancing wild bees in agricultural landscapes

*Silvia Dorn, Antonia Zurbuchen, Andreas Müller* ..... 65-68

**Abstract:** The movement of insects in agricultural landscapes has been a major research topic of the Applied Entomology group at ETH Zurich for two decades. This paper provides a synopsis of the key findings from our recent field experiments with wild (solitary) pollen specialist bees on farmland. To provide their brood cells with pollen and nectar, these bees have to commute between their nesting site and the flowering host plant, but critical distances as well as the potential impact of landscape barriers were largely unknown yet. To understand the effect of landscape barriers on foraging activities, we released marked bees from the nest to forage across landscape structures. Our findings indicate that landscape structures such as forests or rivers are not insurmountable barriers for the bee species tested. To evaluate the effect of small vs. large distances between the crucial resources on wild bees and their reproduction, we used a new experimental approach in which patches of host plants were moved progressively further away from the nest over time. Results document conclusively that solitary bees can travel unexpectedly long distances between nest and flower resources. However, only few individuals of a species forage over long distances, whereas most individuals cover only few hundred metres. Furthermore, long foraging flights come at the cost of substantially fewer offspring. Hence a close neighbourhood of foraging habitats and nesting sites within few hundred metres are imperative to ensure the persistence of these pollinator populations. Switzerland reimburses farmers that leave a small proportion of their land uncropped or covered with sown flowering plants, and we conclude that the spatial arrangement of these areas will provide important opportunities for maintaining pollinator diversity.

## Suitability of two different trap types for catching aphid antagonists and pollinators

*Lisa Eggenschwiler, Eve Roubinet, Christine Tisch, Paula Rodriguez, Katja Jacot* ..... 69-72

**Abstract:** We tested two trap types with regard to their suitability for collecting aphid antagonists (hoverflies, ladybirds and lacewings) and important pollinators (wild bees and honey bees). In three habitat types – hedgerow margins, extensively managed meadows and winter wheat fields – , one window trap and two cornet traps (one with an eastward and one with a westward opening) were exposed between mid-April and mid-June 2011 and the collecting bottles emptied weekly. Data collection was replicated ten times in one region in Northern Switzerland.

Insect groups responded differently to habitat types. Moreover, trap type had a significant influence on insects caught, with significantly more insects being collected with the cornet traps than with the window traps. According to our findings, cornet traps appear to be suitable for collecting various insect groups, whilst window traps cannot be recommended for the insects studied.

## The selection of native insectary plants for landscaping in greenhouse areas of SE Spain

*Estefanía Rodríguez, Vicky Schwarzer, Jan van der Blom, Tomás Cabello, Mónica González* ..... 73-76

**Abstract:** A multi-criteria analysis was carried out to select the most suitable native insectary plants that could be used for planting around horticultural crops in Almeria (SE Spain). Species were chosen from autochthonous flora of Almeria, the most important criteria being the specific resources (food, shelter and mating sites) that plants offer to different groups of natural enemies. We selected 29 species belonging to 18 botanic families that satisfied all the requirements. After selecting these species, we designed and planted a xerophytic garden of 800m<sup>2</sup> that simulates the way that this vegetation exists naturally. This experimental plot will serve for further surveys of the dynamics of beneficial arthropods living in and around these plants and to decide which ones are the best for landscape restoration.

## Perennial field margins for functional biodiversity in UK vegetable rotation schemes:

### Establishment and resource provision

*David R. George, Patricia Croft, Maureen Wakefield, Felix L. Wäckers* ..... 77-81

**Abstract:** A five year project, introduced at the last IOBC Landscape Management for Functional Biodiversity meeting, is underway in the UK to build upon previous research to combine the biodiversity and pest-control benefits of perennial field margins. Key to the success of this project is the selection of a seed mix that provides multiple benefits in terms of promoting functional agro-biodiversity. This paper provides details of how the selected seed mix has performed over successive seasons in the UK with regard to plant establishment, flowering times and provision of aphids on flowering ‘banker plants’.

## Can surrounding landscapes be predictive of in-field pest infestation?

*Peter B. Goodell, Kris Lynn-Patterson, Robert J. Johnson* ..... 83-86

**Abstract:** *Lygus hesperus* is a key pest in the cotton Integrated Pest Management system of the San Joaquin Valley of California, USA. By legal regulation, fields must remain free of any cotton plants from December until planting in March which prohibits arthropods from using cotton as an overwinter site. *L. hesperus* is required to annually immigrate and a cotton field must rebuild its entire arthropod food web during the production season, March until September. We propose using community mapping approaches to understand the risk of *L. hesperus* infestation to an individual cotton field based on surrounding crop mosaic. In 2011, we sampled arthropod populations from selected cotton fields and mapped surrounding crops to a distance of 3.2km. Using spatial tools, we sliced concentric rings of 0.8, 1.2 and 3.2km around the cotton field and calculated the frequency of crops within each ring. Comparing the abundance of known crops which act as sources or sinks of *L. hesperus* to the maximum infestation in and number of insecticide applications to a field, patterns emerged to indicate relative risk of crop assemblages. Understanding such patterns in the landscape creates the opportunity for a community to develop planned landscapes to mitigate this key pest.

## Carabid beetles as bioindicators in Environmental Risk Assessment of GMO's

*Marcin Grabowski, Zbigniew T. Dąbrowski* ..... 87-91

**Abstract:** The international discussions on Environmental Risk Assessment (ERA) for genetically modified plants (GMP) (EFSA 2008) selected the carabid communities of maize fields as bio-indicators. The GM varieties expressing toxin Cry1 and Cry3 differently affect the biology of carnivorous and phytophagous carabids and the transfer of the toxin through the trophic levels. A main problem is the diversity of pathways by which the toxin can be move from transgenic plants to non-target organisms. Ground-dwelling beetles are the most abundant predatory arthropods living in agroecosystems of maize. Carabid larvae and adults are polyphagous predators that may come into contact with toxins (Cry1, Cry3) expressed by genetically modified maize in several ways: feeding on plants, target or non-target herbivores, via the environment (root exudates plant biomass, pollen, dead insects). The problem of the GMO's impact on the environment should be discussed with other researchers involved in ERA to choose the correct carabid beetles as a ‘surrogate’ species for risk assessment.

## Do the heterogeneity and composition of agricultural landscapes in Central Chile influence native and exotic coccinellids in alfalfa fields?

*Audrey A. Grez, Tania Zaviezo, Annia Rodríguez-San Pedro, Jaime Hernández, Paz Acuña* ..... 93-97

**Abstract:** We evaluated the effect of the compositional and configurational heterogeneity of landscapes and of the most common cover types surrounding alfalfa fields on the abundance and diversity of native and exotic coccinellids in alfalfa. Coccinellid assemblages in alfalfa did not relate with compositional and cofigurational heterogeneity, but they were affected by the abundance of different cover types, with abandoned fields being the only cover type that differentially affected native and exotic species.

## Promoting agri-environment schemes for conservation biocontrol

*John M. Holland* ..... 99-103

**Abstract:** Three literature reviews were conducted to identify the level of key resources for natural enemies provided by agri-environment scheme habitats and subsequent impact within crops. Hedgerows, flower-rich habitats and uncultivated areas such as occur between fields or along hedgerows provided the most resources for natural enemies. On the whole the natural enemy fauna occurring in agri-environment scheme habitats had been studied and described at least to family, however, there was less evidence of an impact on natural enemy or pests levels within the crop. The SAFE acronym (Shelter, Alternative prey, Floral resources and appropriate Environment) is proposed as a way to raise awareness among farmers and their advisors of natural enemies and their resource requirements.

## Effects of landscape complexity on parasitoid diversity and parasitism rates

in alfalfa aphids: preliminary results

*Marina Janković, Srđan Stamenković, Milan Plećaš, Aleksandar Četković,*

*Željko Tomanović* ..... 105-108

**Abstract:** Here, we studied the effects of landscape complexity on the host plant-aphid-parasitoid system, parasitoid species diversity and parasitism rates in 12 alfalfa fields in the surroundings of Belgrade, Serbia. Sampling was done during two different plant phenophases (the stage of early and late bud) throughout the alfalfa vegetative season (April to October) in 2010. Landscape complexity was measured as the percentage of non-crop area in 1.5km diameter circular landscape sectors around the sampling plots. Our results demonstrate that landscape complexity had no effect on aphid parasitoid species diversity and rates of parasitism decreased significantly in complex landscapes. This finding suggests that complex landscapes supported higher aphid densities, but not higher parasitoid densities, resulting in overall higher parasitism rates in simple vs. complex landscapes.

## The impact of companion planting on the parasitism rate

of the small white butterfly *Pieris rapae* (Lepidoptera: Pieridae)

*Riina Kaasik, Gabriella Kovács, Anne Luik, Eve Veromann* ..... 109-113

**Abstract:** This study investigated the effect of using companion plants on the occurrence of a major pest in cabbage cultivation, *Pieris rapae* and its parasitism rate. Companion plants did not have a significant effect on the occurrence of *P. rapae* over the study period of two years, although they were significantly lower in one year when grown in association with *Anethum graveolens*. Parasitism rate of *P. rapae* was highest on cabbages grown together with this plant when the two year average was considered.

## Preliminary study of predatory insects fauna in ecological infrastructure

of Ravni kotari (Croatia) vineyards

*Franin Kristijan, Ražov Josip, Barić Božena* ..... 115-118

**Abstract:** One of the most important elements of ecological and integrated grape production are stabile ecological infrastructures. It is necessary to know which species of beneficial insects are represented in ecological infrastructures in vineyards. Result of a one year preliminary investigation are shown in this paper. During one vegetational season a total of 127 predatory insects belonging to 9 families (Anthocoridae, Cantharidae, Carabidae, Chrysopidae, Coccinellidae, Lygaeidae, Miridae, Nabidae and Syrphidae) were collected at three localities with different production technologies. The highest number of 77 insect individuals belonging to 8 families were collected at Baštica which operates an integrated production technology, probably because the vegetational richness was higher than the other two sites.

Preliminary study on the suitability of Hymenoptera: Braconidae  
as bioindicators of the pest management system in the vineyards

*Augusto Loni, Andrea Lucchi* ..... 119-122

**Abstract:** A preliminary study on the Braconid population present in two vineyards, conducted with different pest management systems was carried out in 2011. Insects were captured by malaise traps and grouped at the subfamily level for the elaboration with Anosym and MDS multivariate statistical analysis. Results show significant differences in the two contexts, and suggest a strong impact of the pest management system on Braconid populations. We suggest that Braconids can be used as potential bioindicators to evaluate different strategies of vineyard management.

Diversity and abundance of spiders in the flora  
of the fruit area around Lleida (NE Spain)

*Jaume Lordan, Georgina Alins and María José Sarasúa* ..... 123-126

**Abstract:** The identification of flora that is useful to provide shelter and food for spiders and thereby increasing the biological control of pests was studied in the fruit tree region of Lleida (Spain). The study was carried out in different areas, according to the presence of fruit tree orchards and edapho-climatic conditions. Herbaceous plants were sampled by an insect suction sampler. All the individuals captured in each sample were identified at family level. The main plants hosting spiders during spring were *Anacyclus clavatus* (Desf.), *Dorycnium pentaphyllum* (Scop.), *Erucastrum nasturtifolium* (Poiret), *Euphorbia serrata* (L.), *Hedysarum confertum* (Desf.), *Papaver rhoeas* (L.) and *Trifolium pratense* (L.). For the autumn period, most important species were *Atriplex* sp., *Dittrichia viscosa* (L.), *Medicago sativa* (L.), *Moricandia arvensis* (L.), *Salsola kali* (L.), *Sorghum halepense* (L.), *Suaeda spicata* (Willd.) and *Verbena* sp. The spiders' families most abundant on the plants were Thomisidae, Linyphiidae and Oxyopidae.

Italian rice agroecosystems: a threat to insect biodiversity?

*Daniela Lupi, Sara Savoldelli, Anna Rocco, Bruno Rossaro* ..... 127-131

**Abstract:** Italy is the most important rice producer in Europe and rice agroecosystems occupy a large area in the Po river lowland. The relationship between insect biodiversity and rice cultivated land is evaluated on the basis of the pre-existing literature.

Effect of management strategies on rove and ground beetles  
in a hilly area in Northern Italy

*Daniela Lupi, F. Romana Eördegh, Nicolò Corsi, Michele Rebecchi,  
Adriano Zanetti, Sergio Facchini, Mario Colombo* ..... 133-136

**Abstract:** Results of research on two important Coleoptera family, Staphylinidae (rove beetle) and Carabidae (ground beetle), in a park landscape near Brescia (Northern Italy, Lombardy) are given. This study investigated the impact of management strategies applied in woods and meadows in this area on the two Coleoptera families. Noteworthy is the capture of the rove beetle *Atheta pseudoelongatula* Bernhauer, 1907, an alien species never detected in Italy before.

Preliminary evaluation of sugars from flowering plants as food resources  
for *Chrysoperla carnea* (Stephens) (Neuroptera: Chrysopidae)  
in an olive agroecosystem

*Anabela Nave, Fátima Gonçalves, Maria da Conceição Rodrigues,  
Fernando Nunes, Mercedes Campos, Laura Torres* ..... 137-141

**Abstract:** Natural enemies play a major role in sustainable olive production through their ability to regulate populations of insect pests. Many depend as adults on carbohydrate-rich food as the main source of energy for longevity, fecundity, and mobility. Conservation of naturally occurring sugar sources in agricultural fields, such as suitable flowering plants, may enhance beneficial populations, thereby leading to improved pest control. Besides three dominant sugars (sucrose, glucose, and fructose), nectar can contain various other sugars, sometimes in significant concentrations. Also, insect species can vary considerably with respect to the spectrum of nectar-

sugars they use. The goal of this study is to evaluate the potential of a range of native plant species from the olive agroecosystem to provide nectar resources for *Chrysoperla carnea* (Stephens), a major predator of important pests from this ecosystem. We examined the effect of ten naturally occurring sugars on reproduction and adult survival in the laboratory. The sugar composition of the nectar in flowers was determined by high performance anion exchange chromatography with pulsed amperometric detection (HPAEC-PAD) analysis. We discuss the results in the context of selecting floral resources to maximize conservation biological control in the olive grove ecosystem.

#### The effect of buffer zone width on biodiversity

*Søren Navntoft, Lene Sigsgaard, Kristian Kristensen, Peter Esbjerg* ..... 143-146

**Abstract:** Field margin management for conservation purposes is a way to protect both functional biodiversity and biodiversity per se without considerable economical loss as field margins are less productive. However, the effect of width of the buffer zone on achievable biodiversity gains has received little attention in previous studies. In this paper we report on findings for syrphids, spiders and carabids, three taxonomic groups with different mobility, all important for conservation biological control. For all groups we found an effect of buffer zone width on their density. A buffer width of 6m was the narrowest that consistently promoted a higher abundance or activity of arthropods within the field area (outside the hedge bottom). However, a further increase in buffer width always increased the abundance and activity of arthropods a little more.

#### Influence of the surrounding landscape on olive fruit fly populations

*Marta Ortega, Susana Pascual* ..... 147-150

**Abstract:** This work reports on the relationship between landscape composition and configuration of land uses and the population density of the olive fruit fly, *Bactrocera oleae*, a worldwide key pest of olive trees. The relationship was tested at different distances from the olive fruit fly sampling points, in circular areas with radii ranging from 500 to 2000 m. A significant relationship was found at short distances for the following indices: total number of patches, mean patch size, total length of patch edges, edge density and mean patch edge length. These results indicate that landscape features can affect populations of this phytophagous insect. However, more detailed understanding of the processes underlying this phenomenon is needed to implement measures to manage this important species.

#### Effects of landscape complexity on parasitoid diversity and biological control of cereal aphids

*Milan Plečaš, Srđan Stamenković, Marina Janković, Aleksandar Četković, Željko Tomanović* ..... 151-154

**Abstract:** We studied aphid-parasitoid complex in wheat agroecosystems in two consequent years in two contrasting landscape types, simple and complex (defined on the basis of percentage of non-arable land within each 1.5km diameter circular landscape sector). Complex landscapes supported higher parasitoid density and species richness, but also higher density of aphids, thus possibly counterbalancing the positive effects of biological control. Therefore, both aphids and parasitoids benefited from increased landscape complexity. Parasitism rates gave even less clear conclusion: direction of the effect of landscape complexity on the parasitism rate was opposite in two consequent years.

#### GIS for planning conservation actions in viticulture landscapes

*Benjamin Porte, Joël Rochard, Maarten van Helden, Josépha Guenser, Emma Fulchin* ..... 155-159

**Abstract:** GIS is increasingly used for the implementation of conservation programs. Before setting up concrete conservation actions, stakeholders use GIS to analyze the landscape that regulates main ecological processes. The Life + BioDiVine project relies on a large use of GIS for the implementation of conservation actions into European vineyards. GIS is used for the

analysis of the landscape's composition, structure and diversity at several scales. It allows calculating landscape variables that are correlated to biodiversity values in order to highlight a possible link between landscape and biodiversity. Specific maps help locating areas of interest for conservation actions and represent a useful tool for communication with farmers or general public.

#### Effect of additional resources on aphidophagous parasitoid wasp activity on field margins in arable landscapes

*Mark Ramsden, Rosa Menendez, Simon Leather and Felix Wäckers* ..... 161-165

**Abstract:** Insect predators and parasitoids act as biological pest control agents in agro-ecosystems, and have the potential to provide valuable ecosystem services. The natural enemies of pest species often require a greater diversity of resources than the crops themselves can provide, and in monocultural farm management the numbers of these beneficial species may be reduced through lack of alternative prey, floral resources or suitable overwintering sites. While previous studies have indicated that field margin management will influence the population dynamics of beneficial insects, the particular mechanisms involved and potential for practical use in modern farming remain unclear. This study aims to highlight the key resources influencing the activity of aphidophagous parasitoid wasps, and provide quantitative data to assist in the design of optimum field margin and landscape management prescriptions.

#### Monitoring arthropod diversity in Douro wine region vineyards

*Alexis Rataux, Cristina Carlos, Fátima Gonçalves, José Aranha, Josépha Guenser, Fernando Alves, Maarten Van Helden* ..... 167-171

**Abstract:** Nowadays, many actions aim to enhance the biological control in agro ecosystems in order to improve their resilience and sustainability. To what extent does the landscape structure improve biodiversity? Is it possible to adapt vineyard management or surrounding landscape to improve the presence of ecological infrastructures and thus increase biodiversity? Those two questions are the basis of the European project LIFE+ "BioDiVine: Demonstrating functional biodiversity in viticulture landscapes".

In Portugal, ADVID is in charge of the implementation of conservation actions and for monitoring their impact in three experimental sites located in the Douro Valley, with a global surface of nearly 500 hectares. In 2011, two types of traps (combi and pitfall) have been set up in five main habitats: vineyard, scrubland, urban, olive groves and olive hedgerows. The arthropods caught during seven weeks of assessment (April-June) were sorted out using the Rapid Biodiversity Assessment (RBA) method. Biological indexes were calculated and correlated with landscape characteristics (Shannon's landscape index) calculated through a GIS database to investigate the way habitats influence arthropods' biodiversity and, in the particular functional biodiversity (Coccinellidae and Staphylinidae, Araneae and Opilionidae). More than 52000 arthropods were counted and 789 morphospecies identified, belonging to 18 orders of Insecta and five orders of Arachnida. Arthropods caught by combi traps were more abundant on scrublands. Some positive correlations have been established between landscape components and arthropods presence. Staphylinidae abundance and richness were higher in more diverse landscape. Concerning other taxa, each order appears to be differently influenced by the landscape's structure.

#### Towards integrated assessment of natural pest control as part of a set of ecosystem services: the Landscape IMAGES approach

*Walter A. H. Rossing, Jeroen C. J. Groot* ..... 173-177

**Abstract:** Natural pest control is an ecosystem service that appears to be affected by ecosystem characteristics at spatial scales from field to landscape. Changes in land use and land management at the field level to enhance pest control depend on a small number of decision makers. In contrast, changes at the landscape level involve multiple stakeholders, multiple objectives and biophysical interactions among multiple scales. Natural pest control is then one of a set of ecosystem services that needs to be addressed simultaneously, often in a negotiation

setting. Science has a role to play by bringing together knowledge that informs decision making based on insight in trade-offs and win-win situations, and the associated land use patterns. To enable such an integrated assessment of ecosystem services an approach is needed that can deal with multiple scales, multiple objectives and multi-stakeholder settings. Here we describe an integrated, spatially explicit land use assessment approach named Landscape IMAGES. We illustrate the approach for a case study with spatially implicit and spatially explicit indicators and describe how natural pest control can be accommodated.

#### Seasonal dynamics of the vertical distribution of arthropods in a wheat field

*Alexandr Semenov* ..... 179-182

**Abstract:** We conducted regular collections of arthropods from three vertically separated levels of grassy vegetation (upper, middle, low) during a growing season. For each level different sampling methods were used. Entomological nets allowed capturing of arthropods from the apical parts of plants. Collection of arthropod communities from the middle level was performed with special plastic containers. For the capture of arthropods active in the lower grassy level we used pitfall traps. Species composition and number of insects in each of the levels changed during the growing season. In the middle and upper levels an increase in the total number of arthropods was noticed which was probably associated with an increase in the size of the plants and the development of generative organs. At the low level the total number of arthropods collected did not significantly change during the season.

#### Variation partitioning of landscape structure on arable plant communities at field scale

*X. Solé-Senan, A. Juárez, J. Recasens, J. Torra, A. Royo, J. A. Conesa* ..... 183-186

**Abstract:** Arable plants communities suffered dramatic declines in the last decades due to the intensification in farming practices. Impacts of changes in arable management and land-use increases generally involved a local simplification of landscape structure. We investigated the effect of landscape structure and complexity on the species composition of arable plant communities. We characterized landscape structure in a circle with 1km radius by the percentage of natural vegetation, the shape index of the patches and the perimeter-area ratio and its influence on species assemblages at field scale. Species composition was related to the landscape metrics using Redundancy Analysis (RDA). Variation partitioning was used to characterize the partial effects of landscape structure on the arable community.

According to our findings, landscape structure effects on arable plants communities at field scale are limited to the field boundaries whereas in the field edges and field centres agricultural management hides landscape structure effects.

#### Effect of organic farming and reduced tillage activity on functional diversity and density of spiders

*Hafiz Muhammad Tahir, Muhammad Khalid Mukhtar* ..... 187-190

**Abstract:** Spiders (Arachnida: Araneae) are one of the most abundant natural predators in agro-ecosystems throughout the world. They have great potential to suppress insect pests of agricultural crops. In the present study the effect of two different management practices (i.e., organic farming and reduce tillage activity) on the functional diversity and density of spiders was investigated during the wheat cropping seasons 2009-2010. There was no difference in species diversity in organic and untilled fields compared to the tilled fields. However, density of spiders was significantly higher in organic and untilled fields compared to tilled fields. Number of aphids/tiller in the organic and untilled fields was significantly lower compared to the tilled field. It is concluded that organic farming and reduced tillage practices are successful techniques to promote high spider density and is helpful in the natural biological control of aphids.

Is there a landscape effect on moth pest (*H. armigera*) abundance and infestation rate in cotton fields in North Benin?

Noelline Tsafack Menessong, Philippe Menozzi, Thierry Brevault, Marc Deconchat, Annie Ouin .....

191-195

**Abstract:** *Helicoverpa armigera* (Hübner), a polyphagous moth, is the major cotton pest in Africa. Larvae feed on bolls, flowers and squares, seriously reducing yield. To reduce the use of insecticides and to improve the management of this cotton pest, there is a growing interest in reinforcing the landscape's suppressive properties. The aim of this study was to determine if moth abundance and larval infestation differs among landscapes with different composition (diversity of crops, proportion of bush) to test for a landscape effect on *Helicoverpa armigera* abundance during peak infestation. In five cotton fields in four landscapes differing in land cover (cotton, cotton + maize, cotton + tomatoes, cotton + bush), measurements of larval infestation were made four times from September 23<sup>th</sup> to October 18<sup>th</sup> 2011. Additionally, adult moth abundance was established using light trapping from September 24 to 1<sup>st</sup> November in the four landscapes plus one landscape without any cotton field in the area of the W National Park. Larval infestation was significantly higher in the fields previously cultivated with tomatoes. Results of light trapping of moths did not reveal differences among the landscapes except in the landscape in the W National Park where no moths were trapped. This finding suggests that cotton infestation by *Helicoverpa armigera* could be related to the proximity of market gardening. Subsequent analyses (analytical chemistry and molecular biology) are underway to investigate this hypothesis.

Interactions in agroecosystems: a short review

Wladimir B. Tshernyshev, Valentina M. Afonina .....

197-200

**Abstract:** The interactions in agroecosystems are very complex. Knowledge of these interactions may be useful for development of new ecological farming methods and for improvement of the traditional ones. Such approaches would allow crops to be protected without any detriment to human health and prevent environmental deterioration in contrast to the current situation. Ecological methods can support the stability of agroecosystems thereby preventing pest outbreaks development. Regretfully many studies on the interactions in agroecosystems are preliminary.

Evaluation of different ground covers to maintain botanical biodiversity in viticulture

Maarten van Helden, Josépha Guenser, Emma Fulchin .....

201-205

**Abstract:** The plant species richness of vineyard inter-row groundcover can maintain biodiversity of plants and arthropods, and could improve conservation biocontrol by reducing pest insect pressure. Five different seed mixtures were tested during two years on a Bordeaux vineyard plot Château Les Vergnes (Gironde, France). The initial plant composition and its evolution over time were studied in 2009 (first year after 2008 autumn sowing) and 2010 through exhaustive botanical monitoring during the growing season (April-July). Large differences were observed in plant species composition and abundance, even though the existing seed bank seems of major influence on the species richness. The farmers' management of the plot (mowing, machine passing) shows a strong selection pressure on the plant species present in the seed mixtures.

Viticulture, landscape and functional biodiversity: agronomy, ecology, sociology and economy!

Maarten van Helden, Josépha Guenser, Emma Fulchin, Joël Rochard, Benjamin Porte .....

207-211

**Abstract:** The European Life+ program BIODIVINE focuses on the conservation of general biodiversity in viticulture landscapes across Europe. Many such landscapes have a long history and strong dominance of viticulture that has created remarkable landscapes. The conservation of biodiversity in such landscapes, without impacting the landscape aesthetics and without constraints for farmers (costs, loss of surface) is challenging. Efficient communication is needed

to convince farmers to adapt new practices. Ecosystem services such as conservation biological control can be used to convince farmers but supporting data are not always convincing. Better results can be achieved by focusing primarily on agronomic and economic reasons for landscape management.

The use of ground cover inside and around plots, hedgerow planting, sowing fallow plots with fodder crops all have clear agronomic amenities that should stay the primary objective for the farmer.

Training farmers and personnel, and involving local stakeholders, help to increase awareness. Finally efficient external communication on landscape actions can be included in marketing strategies, but care should be taken to avoid greenwashing.

#### The suitability of field margin flowers as food source for *Chrysoperla* lacewings

*Paul C. J. van Rijn* ..... 213-216

**Abstract:** Lacewings are among the most common natural enemies of pests in arable fields. Whereas the larvae are voracious predators of aphids and other insects, the adults are depending on nectar and pollen for survival and reproduction. In this study the suitability of flowers of 16 plant species is examined as food source for the common *Chrysoperla carnea* with non-choice survival tests. The results indicate that only umbellifers and other flowers with well exposed nectaries are suitable as sugar sources, allowing the lacewings to survive for more than 20 days and to produce eggs. On composites, even those with very short florets, survival and reproduction was clearly reduced. This indicates that their nectar was probably beyond reach, but that the pollen allowed the insects to survive longer than without food. Exceptions were composites with extrafloral nectar, as they allowed lacewings to survive much longer. The results are discussed in comparison with the results for hoverflies. These laboratory bioassays can, when performed for key natural enemies, be used to optimize the composition of field margins for the support of natural pest control.

#### Current status and potential future impact of invasive vespid wasps

(*Vespula germanica* and *Polistes dominulus*) in South Africa

*Ruan Veldtman, Pia Addison, Geoff D. Tribe* ..... 217-221

**Abstract:** Two social vespid wasps, *Vespula germanica* and *Polistes dominulus*, have now become naturalised in the Western Cape Province of South Africa, adding to the number of exotic social insects that now occur in the Fynbos biome. Although both species are known to be invasive in other countries, up until now the rate of spread of both species has been rather slow. Previous work in matching *V. germanica*'s climatic suitability within South Africa, revealed its current extent occurs in marginal habitat. However the Coastal Belt of South Africa starting from about George is much more suitable and could provide a route of invasion into Eastern seaboard of Africa. Based on the invasive record of both species in other countries, they are both candidates for eradication. Before the feasibility of eradication can be determined, detailed current distribution records are required. Here we report on available data on the past and current distribution of both vespid species, mostly derived from museum records. We also comment on the likely impact of both species if they were to realize their potential range in South Africa.

#### *Coleostephus myconis* (L.) Rchb.f. role in conservation biological control

in an olive grove from Trás-os-Montes (Portugal)

*Maria Villa, Valentim Coelho, José Alberto Pereira, Sónia A. P. Santos*

*and Albino Bento* ..... 223-227

**Abstract:** Currently, the management of agricultural habitats to optimize the action of natural enemies is a form of conservation biological control. In this strategy, the reinforcement of ecological infrastructures can act as reservoirs for natural enemies, source of alternative foods/hosts, and can provide shelter. In the olive grove, natural vegetation coverage is traditionally removed by tillage in order to avoid competition for water between olive trees and weeds. Nevertheless those plants could have an important role in natural control of crop pests. In this context, the objective of this work was to study the abundance of arthropods on a

representative herbaceous plant, *Coleostephus myconis* (L.) Rchb.f., in two olive groves from Trás-os-Montes (Northeast of Portugal). Fifty *C. myconis* specimens were weekly and randomly collected during its flowering period. Afterwards, all arthropods found in the aerial part of the plant were sorted and identified under binocular microscopes to order or family level. Thirteen arthropod taxa were found on *C. myconis*. Abundance and diversity were higher in the Paradela grove. The most abundant taxa were Aphididae and Thysanoptera. Coleoptera (larvae), Diptera (larvae) and Lepidoptera (larvae and pupae) orders were also found. Some of the recovered groups are important predators of olive pests which may have importance essentially during the development of the anthophagous generation of the olive moth, *Prays oleae* Bern.

#### Provision of ecological infrastructures to increase pollinators

and other beneficial organisms in rainfed crops in Central Spain

*Elisa Viñuela, Ángeles Adán, Joaquín Rodríguez, Sara Hernando,*

*José Dorado, César Fernandez-Quintanilla, Germán Canomanuel*

*& Alberto Fereres* ..... 229-233

**Abstract:** In sustainable intensive agriculture, the biodiversity of monoculture fields can be increased by managing the field margins to provide ecological infrastructures that serve as refuges and resources for beneficial organisms (pollinators and natural enemies). In the present work we summarize two years of field trials following the goal to increase biodiversity of beneficial fauna in a barley field in Central Spain by sowing different herbaceous mixtures in the field margins. The presence of arthropods visiting flowers on plots sown with different types of seed mixtures and unsown natural flora (control plot) was compared by visual sampling every week between April and June. The results showed that a combination of herbaceous big-size seeds was the most successful mixture emerging under our experimental conditions and achieved a higher number of visits of beneficial arthropods than the unsown natural vegetation.

#### Protocol for assessing bird abundance and richness in vineyards:

a case study in Penedès area

*Francesco Xavier, Macià Valverde, Ignasi Torre, Josep R. Torrentó Marselles* ... 235-239

**Abstract:** Bird abundance and richness were evaluate during the breeding period of 2011 in Penedès wine appellation of origin area, Barcelona (Spain) using an adapted point counts method in different vineyard landscapes matrix with different habitat composition and complexity. It was found that bird communities were mainly affected by habitat composition. Species richness was higher in vineyards with a more complex structure landscape.

#### The field margin vegetation as a bridge for the predatory mite (Phytoseiidae)

migration into strawberry plantations

*Zbigniew T. Dąbrowski, Jakub Garnis* ..... 241-245

**Abstract:** The aim of the research was to describe the species composition of plant groups on field margins of selected strawberry plantations, and to record which species have influence on the preservation of beneficial mites. The samples from selected herbaceous plants, shrubs and trees were collected from June to the beginning of September. Field observations carried out on 15 plantations in four regions of Poland showed variation in the abundance of predatory phytoseiid mites on various plant species grown in the surroundings of strawberry crop. Some edge effect was observed. Enhancing the role of natural enemies should fill the gap created by present restrictive use of pesticides in strawberry crops. The management of pests on soft fruit plantations affected phytoseiid diversity both in the field and on surrounding plants.