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F.M.W. de Jong | F.M. Bakker | K. Brown | C.J.T.J. Jilesen | C.J.A.M. Posthuma-Doodeman |
C.E. Smit | J.J.M. van der Steen | G.M.A. van Eekelen

# Guidance for summarising and evaluating field studies with non-target arthropods

A guidance document of the Dutch Platform for the Assessment of Higher Tier Studies

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# Guidance for summarising and evaluating field studies with non-target arthropods

F.M.W. de Jong[1], F.M. Bakker[2], K. Brown[3], C.J.T.J. Jilesen[4],
C.J.A.M. Posthuma-Doodeman[1], C.E. Smit[1], J.J.M. van der Steen[5], G.M.A. van Eekelen[6]

[1] RIVM, [2] MITOX, [3] Independent Consultant
[4] Plant Protection Service, [5] Plant Research International, [6] Ctgb

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# ABSTRACT


***Guidance for summarising and evaluating field studies with non-target arthropods***

Plant protection products can cause harmful effects on non-target organisms. A guidance document has been developed for ensuring that the test results required for the registration of pesticides be supplied in a uniform and transparent manner. This document is specifically directed at experiments with non-target arthropods, living on the soil surface or on the vegetation, for example on arable land or in orchards. The guidance was developed by the Dutch platform for the assessment of higher tier studies, of which RIVM is the secretary.

Field studies can be part of the dossier for crop protection products. Field studies are being conducted when a laboratory study indicates a potential risk of the intended use of the product.

For the registration procedure, applicants, such as plant protection product producers, offer a dossier to the Dutch Board for the Authorisation of Plant Protection Products and Biocides (Ctgb). With this dossier Ctgb assesses whether a certain use of a plant protection product is allowed in the Netherlands. Complex and extensive information concerning field studies with non-target arthropods can be part of the dossier. In the Netherlands, these reports are evaluated by different evaluating institutes. Potential differences in the evaluator's methodology may lead to a lack of uniformity in the form and content of the summaries and evaluations and – occasionally – in the conclusions. This was the reason for Ctgb to ask for standardisation of the summaries and evaluation of field studies with non-target arthropods.

Apart from the guidance, the report contains two elaborated examples of evaluating reports and recommendations for the use of the results of a particular field study for the risk assessment. This concerns, for example, the extrapolation of the results of a particular field study in a particular crop and region to the crop and region relevant for the registration.


Key words: pesticides, plant protection products, registration, non-target arthropods, field studies

# RAPPORT IN HET KORT


***Richtsnoer voor het samenvatten en evalueren van veldstudies met niet-doelwit arthropoden***

Gewasbeschermingsmiddelen kunnen schadelijke effecten hebben op organismen waarvoor ze niet zijn bedoeld. Er is een richtsnoer ontwikkeld om testresultaten voor de toelatingsprocedure voor gewasbeschermingsmiddelen eenvormig en transparant aan te reiken. Het richtsnoer geldt specifiek voor veldstudies met niet-doelwit arthropoden (geleedpotigen) die boven de grond en op planten leven, bijvoorbeeld in akkers of boomgaarden. Het richtsnoer is ontwikkeld door het Nederlandse Platform voor de Beoordeling van Higher Tier Studies, waarvan het RIVM het secretariaat voert.

Veldstudies kunnen een onderdeel zijn van het dossier met gegevens voor gewasbeschermingsmiddelen. Ze worden uitgevoerd als een laboratoriumstudie een risico voor het gebruik van een gewasbeschermingsmiddel aangeeft.

Bij de toelatingsprocedure voor gewasbeschermingsmiddelen leveren aanvragers (meestal de bestrijdingsmiddelenfabrikanten) informatie aan het College voor de toelating van gewasbeschermingsmiddelen en biociden (Ctgb). Aan de hand hiervan beoordeelt het Ctgb of een specifiek gebruik van een middel toelaatbaar is in Nederland. De geleverde informatie betreft onder andere complexe en vaak omvangrijke informatie over niet-doelwit arthropoden. Het Ctgb laat deze studies vervolgens door verschillende externe partijen samenvatten en evalueren. Door verschillen in werkwijze kunnen de vorm van deze samenvattingen en evaluaties, en soms zelfs de conclusies, verschillen. Vandaar de wens van het Ctgb om de evaluaties en samenvattingen van veldstudies met niet-doelwit arthropoden te standaardiseren.

Behalve de handleiding bevat dit rapport twee uitgewerkte voorbeelden en aanbevelingen voor het gebruik van de resultaten bij de risicobeoordeling. De risicobeoordeling houdt rekening met omstandigheden, zoals het klimaat en het gewas, die van invloed kunnen zijn op het resultaat.


Trefwoorden: bestrijdingsmiddelen, gewasbeschermingsmiddelen, toelating,
niet-doelwit arthropoden, veldstudies

# PREFACE

The present guidance document is an initiative of the Dutch Platform for the Assessment of Higher Tier Studies. The aim of the Platform is to improve and harmonise the assessment of higher tier studies. The guidance document was drafted by a working group of the Platform. The draft report has been discussed and approved in plenary platform meetings and was finally sent out for public consultation to European experts and stakeholders. We would like to acknowledge Anne Alix, Carsten Brühl, Cora Drijver, Silvio Knäbe, Karen Liepold, Kostas Markakis, Mark Miles, Paul Neuman and the members of the 'BART' group and José Luis Alonso Prados for their comments on the draft report. The guidance document has been approved for publication by the plenary platform meeting of 30 March 2010.

The secretary of the Platform and the working group has been commissioned and funded by the Dutch Ministry of Housing, Spatial Planning and the Environment in response to a request of the Board for the Authorisation of Plant Protection Products and Biocides (Ctgb). The working group was further funded by the Dutch Ministry of Agriculture, Nature and Food Quality, Plant Research International (PRI) and MITOX-consultants. The members of the group have many years experience with actual conducting of field studies with non-target arthropods (Frank Bakker, Kevin Brown), or with evaluating higher tier studies (Frank de Jong, Claudia Jilesen, Connie Posthuma-Doodeman, Els Smit and Sjef van der Steen). Renske van Eekelen was part of the group as representative of the Dutch Board for the Authorisation of Plant Protection Products and Biocides (Ctgb).

In this guidance document validity criteria are used, based on recent field studies and insights about how to conduct and evaluate field studies. Older studies, conducted according to guidance available at that time, cannot be expected to fulfil the more recent criteria. How these studies can be used for future risk assessment should be assessed on a case by case basis.

From 8-11 March 2010 the ESCORT 3 workshop 'Linking non-target arthropod testing and risk assessment with protection goals' took place. The usefulness of the present guidance was generally acknowledged at this workshop. The outcome of the workshop mainly interacts with chapter 3 of this guidance document, and at that place reference will be made to the items, discussed at the workshop.

The Dutch Platform for the Assessment of Higher Tier Studies publishes practical and easy to use guidance documents for the evaluation of field effect studies and other higher tier studies. Guidance documents for summarising earthworm field studies and aquatic micro- and mesocosm studies were published before.

Bilthoven, April 2010

Dr. Mark H.M.M. Montforts
Chair

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# 1. INTRODUCTION

## 1.1 Background and motivation

In the framework of the authorisation of plant protection products, higher tier studies on non-target arthropods (NTAs) may be part of the dossier. These studies may be required if the lower tier risk assessment indicates that the use of the product may lead to an unacceptable risk for non-target arthropods.

The Uniform Principles of EU Directive 91/414/EEC on the registration of plant protection products, Annex VI, part C section 2.5.2.5 (EU, 1997) states that ‘Where there is a possibility of beneficial arthropods other than honeybees being exposed, no authorisation shall be granted if more than 30% of the test organisms are affected in lethal or sublethal laboratory tests conducted at the maximum proposed application rate, unless it is clearly established through an appropriate risk assessment that under field conditions there is no unacceptable impact on those organisms after the uses of the plant protection product according to the proposed conditions of use’. Later on, the HQ-approach as proposed by ESCORT 2 (Candolfi et al., 2000, 2001) was adopted in the EU guidance document for Terrestrial Ecotoxicology (SANCO, 2002).

Higher tier studies on NTAs comprise mainly field studies in agricultural crops that investigate abundance and diversity of NTAs. The EU guidance document for Terrestrial Ecotoxicology (SANCO, 2002) refers to the ESCORT 2 workshop (Candolfi et al., 2000) for guidance on study methods. For field studies, the ESCORT 2 documents describe the experimental conditions, treatment, application and sampling for this specific type of test. Data analysis and reporting are discussed as well. Guidance for evaluation is, however, not given. The guidance document of UK PSD Part 3 Appendix 2 gives guidance and methodology for cereal studies, but this guidance document does not advise how to interpret such studies.

Reports of field studies, submitted as part of an authorisation dossier to a regulatory authority, are summarised, and the information relevant for use in risk assessment is presented. This stage of dossier evaluation is performed both by industry during preparation of a monograph as part of the registration procedure under Directive 91/414/EEC, and by national authorities for national authorisation. This guidance document primarily aims to provide guidance for summarising and evaluating test reports on field studies with non-target arthropods, as an integral part of the dossier evaluation process.

The purpose of the guidance is to develop a common language for summarising field studies with non-target arthropods and for reporting those pieces of information that are relevant to decision making. This common language can be used by the scientific community dispersed over industry, academia, and authorities. The guidance also provides comments on the usefulness of these field studies for risk assessment. A clear distinction is made between the assessment of the reliability (chapter 2) of the field study and the usefulness for risk assessment (chapter 3). On request of the Dutch Board for the Authorisation of Plant Protection Products and Biocides (Ctgb), some guidance was developed for the extrapolation of the field study to the situation of concern (as part of chapter 3).

Testing methodology for non-target arthropods is under development. Increasingly a larger part of the non-target arthropod community is studied as compared to studies aimed at specific organism groups. For such studies no ready to use guidance is available, and therefore it is not possible to mirror the study reports with a guidance document. As a consequence, this guidance is based on expert judgement, on guidance available for e.g. predatory mites, and on guidance for other organism groups, e.g. aquatic mesocosm studies.

In the EU guidance document on Terrestrial Ecotoxicology (EU, 2002) four types of higher tier test methods are listed:
- Extended laboratory tests.
- Aged-residue tests.
- Semi-field tests.
- Field tests.

For the first two types of higher tier studies, the difference with the standard laboratory methods is mainly in the exposure. Therefore for these types of tests the standard laboratory methods will apply and the evaluation of these types of tests can be performed according to the available guidance. These tests are not handled in the present guidance document. For semi-field and field studies, some recommendations for the conduct of these studies is given in Candolfi et al. (2000a). Especially in the case of field studies, this guidance is less specific. Therefore the need for guidance for summarising and evaluating of field studies is most urgent, and the present guidance document has its focus on these field studies. In addition, it is recommendable that a detailed guidance for the conduct of in-crop and off-crop field studies should be developed.

The guidance specifically aims at non-target arthropod (NTA) community studies, e.g. studies in orchards, arable fields or off-crop areas in which a range of above-ground living taxa is studied. Elements of the guidance are also applicable to studies focussed on one particular species (group). The example studies both involve spray applications, but the guidance can also be used for other application types.

Within the regulatory context, a distinction has been made between in-crop area and off-crop areas. In the first tier of the risk assessment a lower exposure is taken into account for off-crop areas, compared to the in-crop area assessment, and a correction factor (default 10) is used to cover uncertainty with regard to species sensitivity (EU, 2002). For the higher tier, no further guidance is given in the EU document regarding the assessment of the in-crop or the off-crop situation. In Candolfi et al., (2000a) it is suggested that in-crop recovery should take place within one year. For the off-crop situation, it is only stated that the duration of the effect and the range of taxa affected should be taken into consideration. According to Candolfi et al., (2000a), the detection of effects in the latter case, however, should not necessarily result in the denial of the registration, but instead, result in risk management options. These risk management options are specified in Candolfi et al., (2001). In section 3.2 the problems related to the use of in-crop studies for off-crop risk assessment are discussed.

## 1.2 Process of guidance development

The procedure followed for guidance development is described below. Members of a working group of experts assigned by the Dutch Platform for the Assessment of Higher Tier Studies (PHTS) started by summarising one particular non-target arthropod field study. The working group consisted of the authors of this report. The summaries were compared, and the working group drafted a guidance document for summarising and evaluating test reports. Use was made of existing guidance, e.g. (Candolfi et al., 2000a), and of members' own experience with conducting and evaluating higher tier studies with non-target arthropods (NTA). This draft guidance document then was tested with a further NTA off-crop field study, and a final draft (including the summary of the off-crop study) was produced. The final draft was then applied to an in-crop field study, which was added to the document as an example. The guidance document was discussed in the different stages in the PHTS, and the final draft was sent out to European experts for consultation. The reactions of the experts were elaborated, resulting in this final document.

The primary aim of this document is to provide guidance on summarising and evaluating test reports on NTA field studies as an integral part of the dossier evaluation process. In this document we distinguish three regulatory aspects:
1. the evaluation of the study;
2. the actual risk assessment; and
3. risk management.

Although in practice more than one aspect can be done by the same person, in this document we make a distinction between
1. the evaluator, who is the person summarising and evaluating the particular study;
2. the regulator, who uses the endpoint from the particular study in the risk assessment, taking into account all other information in the dossier;
3. the risk manager, who defines the boundary criteria for the risk assessment, thereby deciding on the extent of effects that are deemed to be acceptable.

The guidance is presented in chapter 2. Comments on the usefulness of (semi-)field studies for risk assessment within the registration procedure of pesticides are given in chapter 3.

As an example, two NTA field studies (in-crop and off-crop) are summarised and added to the document (Annex 1 and 2), with the kind permission of the owners of the studies. The studies are anonymised and some data are removed, added or manipulated for the sake of the clarity of the example. For this reason and because the evaluation still involves expert judgement, the discussion of the validity is not to be taken as such, but as an example on how the validity of a particular study should be evaluated in a transparent way.

# 2. GUIDANCE ON SUMMARISING AND EVALUATING TEST REPORTS

When a NTA field study is provided, the evaluator must verify the information presented and display the data used to reach a decision in a transparent, concise and consistent way. The evaluation report has the following structure:

I. Header table and/or abstract, containing the decision making information on the test result and the conclusions.
II. Extended summary of the study, including test design, results and the conclusions of the authors of the report to be evaluated.
III. Evaluation, critical comments on the test by the evaluator, consisting of
  IIIa. the evaluation of the reliability of the field study and
  IIIb. the evaluation of the results of the study.
IV. Suggestions for use in risk assessment.

The different items are elaborated below.

## I Header table and abstract

The header table and abstract should provide the key endpoints and conclusions of the study and describe its reliability (see below) in order to give the regulator an impression of the study at one glance. The header table consists of two parts: a general part which contains the study identification in line with present requirements of EFSA, and a second part, summarising specific information concerning the particular study. An example of a header table and abstract are given in Box 1. The reliability index (Ri) and the effect classes used are worked out further on.

***Reliability index***

For the evaluation of the reliability of the field study, a reliability index has been used (*cf*. Mensink et al., 2002, 2008). The definition of reliability is: the intrinsic quality of a test with respect to the methodology and the description (EC, 2004). The reliability is assessed by assigning a reliability index (Ri) to a particular test: Ri 1 stands for a reliable test, Ri 2 for a less reliable, and Ri 3 for an unreliable test (see Table 1). The reliability, among others, determines whether a study is acceptable for use in risk assessment. Both Ri 1 and Ri 2 tests can be used for risk assessment, but it depends on the overall data availability, whether only Ri 1 tests should be used, or whether Ri 2 tests can be used as well. Ri 3 tests are not used for risk assessment. In biocide evaluation, a classification system using four classes is used, of which

**Box 1 Example of header table and abstract**

*Header table*

| | | | |
|---|---|---|---|
| Reference | : Smith, 2004 | GLP statement | : Yes |
| Type of study | : Terrestrial arthropod community field study | Guideline | : IOBC, BART, EPPO, ESCORT |
| | | Acceptability | : Acceptable |
| Year of execution | : 2002 | | |
| Test substance | : XXXX, purity yy g/L | | |

| Substance | Taxa | Method | Location, Crop | Exposure regime | Date of application | Duration | Effect class | Value [g a.s./ha] | Ri |
|---|---|---|---|---|---|---|---|---|---|
| XXXX | arthropod community | in crop field study | Valencia, S citrus | Two applications, dose range: 0, 5, 50 g a.s./ha | 10 and 24 May 2002 | 1 year | Community | | 1 |
| | | | | | | | 8 | 50 | |
| | | | | | | | Population | | |
| | | | | | | | 2 | 5 | |
| | | | | | | | 8 | 50 | |

*Abstract*

In a reliable field study to assess the short and long term within season side-effects of the insecticide XXXX in-crop on non-target arthropods in a citrus orchard in Spain, a dose of 5 g a.s./ha showed class 2 effects and a dose of 50 g a.s./ha showed class 8 effects.
For the majority of affected taxa, and for the community response, the recovery within an acceptable period of time was demonstrated by the increase in abundance to control levels within 4 months after last application during the experiment. For two Hymenoptera taxa (Cales spp. and Apterencyrtus spp.), full recovery within 4 months after last application could not be demonstrated, but one year after last application no statistically significant differences between treatment and control were found.

*Table 1 Definition of the three values of the reliability index.*

| Reliability index (ri) | Definition | Description |
|---|---|---|
| 1 | Reliable | All data are reported, the methodology and the description are in accordance with internationally accepted test guidelines and/or the instructions in this report, all other requirements fulfilled. |
| 2 | Less reliable | Not all data reported, the methodology and/or the description are less in accordance with internationally accepted test guidelines and/or the instructions, not all other requirements fulfilled. |
| 3 | Not reliable | Essential data missing, the methodology and/or the description are not in accordance with internationally accepted test guidelines and/or the instructions, or not reported, or important other requirements are not fulfilled. |

the fourth class principally concerns studies that lack data to make a judgement of the reliability possible (Klimisch et al., 1997). This mainly concerns studies from public literature. Studies in the dossier will generally fulfil the minimum requirements, and for that reason, and for reasons of uniformity with the guidance documents for earthworms (De Jong et al., 2006) and aquatic micro- and mesocosm studies (De Jong et al., 2008), the system is used.
To facilitate the assignment of a reliability index, a checklist is used (see IIIa) in which all relevant items that are considered to influence the reliability of a study are listed. If items reported are less or not in accordance with the checklist, the reliability of a study is expected to decrease. There is a core set of test items that *must* comply with the checklist. If a test does not comply with this core set, the test is considered unreliable and tagged with Ri 3. For the other items, it is up to expert judgement to decide to what extent the lower reliability leads to tagging a Ri 2 or 3 to the entire test. The checklist for non-target arthropods field studies is further specified in section IIIa. A reliable field study is not per definition useful for risk assessment. The usefulness depends on a number of other aspects, mainly concerning the similarity between the test situation and the situation of the proposed use (see chapter 3).

## II Extended Summary

In the context of Directive 91/414/EEC, it is required that the rapporteur member state prepares study summaries that should be adequate to allow other member states to take regulatory decisions, without consulting the original study report. Therefore, an extended summary should be produced that gives a factual representation of the study and the results, describing the views of the authors of the study report. This extended summary includes a description of the test design, test endpoints and results and should encompass all essential information that was used to reach to the conclusion of the author(s). The conclusions of the authors should be presented in the extended summary. The conclusions of the evaluator are given in part III, evaluation. For the extended summary it is recommended to present the design and the results as concisely as possible, i.e. preferably in the form of tables and figures. For this aim tables and figures should preferably be copied from the study report. Only if necessary, tables and figures are constructed by the evaluator. In the extended summary, it should be clearly indicated, which parts are copied from the study report, and which tables or figures are constructed by the evaluator. Tables aggregating the raw data preferably are included in the summary (see e.g. Appendix 2 of example study 1), and a table summarising these data is favourable. For an example of such a summarising table see Table 2, and the example summaries (Annex 1 and 2).

In Table 2 the results are presented, ordered according to the taxonomy of Table 4. When only higher taxonomic levels are shown, the results are not aggregated, but e.g. an arrow indicates that at least one of the taxa below the level shown indicated a significant response. In Table 2 effects with a significance of $P \leq 0.05$ are indicated, whereas effects with $0.05 < P \leq 0.1$ are included too, to provide an insight into trends. By using the P value as a criterion, there is no need to choose further arbitrary criteria such as certain percentages difference from the control. Furthermore Table 2 can combine sampling types; again an arrow means that an effect is found in one of the sampling types. When these data are not available from the study report, and/or it is not possible to recalculate the data, the notifier could be asked to supply these data.

A summary of the results as proposed in Table 2, enables the user of the evaluation to get an impression of the main effects in one glance. By aggregating the results as such, however, it is not possible to get an impression of the effects for individual taxa, sampling types or the magnitude of any effects. Therefore it is recommended to add a table (see e.g. Appendix 2 of example 2) in which the actual percentages are given per sampling type and for the relevant taxa.

*Table 2 Example of a table summarising the results of an arthropod field study; Comparison of inventory samples on order and family level one week before treatment and after 1, 5, 10, 20 and 50 weeks. ↑ or ↓ : higher or lower numbers of individuals as compared to control, grey cells (P ≤ 0.05), white cells (0.05 < P ≤ 0.1); empty cells P > 0.1.*

| | **0.1 g/ha** | | | | | | **1 g/ha** | | | | | | **10 g/ha** | | | | | | **ref.** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -1 | 1 | 5 | 10 | 20 | 50 | -1 | 1 | 5 | 10 | 20 | 50 | -1 | 1 | 5 | 10 | 20 | 50 | -1 | 1 | 5 | 10 | 20 | 50 |
| **INSECTA** | | | | | | | | | | | | | | | | | | | | | | | | |
| Heteroptera | | | ↓ | | | | | | ↓ | | | | | | ↓ | ↓ | ↓ | | | | ↓ | ↓ | ↓ | ↓ |
| Aphidoidae | | | | | | | | | | | | | | | | | | | | | | | | |
| Others | | | | | | | | | | | | | | | | | | | | | | | | |
| Sternorrhyncha other | | ↑ | | | | | | | ↓ | | | | | ↑ | ↓ | | | | | | | | | |
| Hymenoptera | | | | | | | | | | | | | | | | | | | | | | | | |
| Aculeata | ↑ | | | | | | | | | | | | | | | | | | | | | | | |
| Formicidae | | | | | | ↓ | | | | ↓ | ↓ | ↓ | | | | ↓ | ↓ | ↓ | | | | ↓ | ↓ | ↓ |
| Chalcidoidea | | | | ↓ | ↓ | | | | ↑ | ↓ | ↓ | | | | | ↓ | ↓ | | | | | | | |
| Coleoptera | | ↓ | ↓ | ↓ | | | | ↓ | ↓ | ↓ | | | | ↓ | ↓ | ↓ | ↓ | | | | ↓ | ↓ | ↓ | |
| Carabidae | | | | | | | | | | | | | | | | | | | | | | | | |
| Staphylinidae | | ↓ | ↓ | | | | | | | | | | | | | | ↓ | | | | | | | |
| Coccinellidae | ↓ | ↓ | ↑ | | | | ↓ | ↑ | | | | | ↓ | ↑ | | ↑ | | | | | ↓ | ↓ | ↓ | ↓ |
| Lathridiidae | | | | | | | | | | | | | | | | | | | | | | | | |
| Collembola | | ↓ | ↓ | ↓ | ↓ | | | ↓ | ↓ | ↓ | ↓ | | | ↓ | ↓ | ↓ | ↓ | ↓ | | ↓ | ↓ | ↓ | ↓ | ↓ |
| Dermaptera | | | | | | | | | | | | | | | | | | | | | | | | |
| Diptera | | | | | | | | | | | | | | | | | | | | | | | | |
| Phoridae | | ↓ | ↓ | ↓ | | | | ↓ | ↓ | ↓ | | | | | ↓ | ↓ | | | | | ↓ | ↓ | ↓ | ↓ |
| Lepidoptera | | ↓ | ↓ | ↓ | | | | ↓ | ↓ | ↓ | ↑ | | | ↓ | ↓ | ↓ | ↑ | | | | ↓ | ↓ | | |
| Neuroptera | | | | | | | | | ↓ | ↓ | ↑ | | | ↓ | ↓ | ↓ | ↑ | | | | | | | |
| Chysopidae | | ↓ | | | | | | ↓ | ↓ | | ↑ | | | ↓ | ↓ | | ↑ | | | | | | | |
| Odonata | | | ↓ | ↓ | | | | | ↓ | ↓ | | | | ↓ | ↓ | ↓ | | | | | ↓ | ↓ | ↓ | ↓ |
| Orthoptera | | | | | | | | | | | | | | | | | | | | | | | | |
| Psocoptera | | | | | | | | | | | | | | | | | | ↓ | | | | | | |
| Thysanoptera (adults) | | | | | | | | | ↓ | ↓ | ↓ | | ↓ | | | | ↓ | | | | | ↓ | ↓ | |
| **ARANEA** | | | | | | | | | | | | | | | | | | | | | | | | |
| Hunting spiders | | | | | | | | | | | | | | | | | | | | | | | | |
| Lycosidae | | | | | | | | | | | ↓ | | | | | ↓ | | | | | | ↓ | | |
| Thomisidae | | | | | | | | | | | | | | | | | | | | | | | | |
| Web spiders | | | | | | | | | | | | | | | | | | | | | | | | |
| Linyphiidae | | | | ↓ | | | | | | | | | | | | | | | | | | | | |
| Dictynidae | | | ↑ | | | | | | | | ↓ | | | | | | | | | | | | | |
| Araneidae | | | | | | | | | | | | | | | | | | | | | ↓ | | | |
| **Acari** | | | | | | | | | | | | | | | | | | | | | | | | |
| Gamasida | | | | | ↓ | | | | | | | | | | | | | | | | | | | |
| Phytoseiidae | | | | | | | | | | | | | | | | | | | | | | | | |
| Actinedida | | | | | | | | | | ↓ | | | | | | | | | | | | | | |
| Oribatida | | | ↑ | ↑ | | | | | | | | | | | | ↓ | | | | | | | | |

Only taxa with a minimum total abundance of ten in the control for the sum in all replicates per sampling date (or a sufficient number needed for an adequate univariate analyses) are taken into account.

Since the extended summary forms the basis of the evaluation, all items needed for assigning reliability indices have to be included in the extended summary. Therefore Table 3 can be used as a checklist for the extended summary. Not all items required for a good summary need to be present in the study report. They can also be obtained from other parts of the dossier, such as information concerning the proposed use of the substance.

The results should not only be presented in a quantitative way, but also the ecological context should be discussed in the extended summary.

## IIIa Evaluation of the reliability

As described above, the reliability of the field study is evaluated using a reliability index (Table 1) and a checklist in which the reliability is assigned to the different items. The checklist for field studies with NTA is given in Table 3, followed by an explanation and specification. When items listed in Table 3 are not or not well enough reported in the study report, this lowers the reliability of the study. In Table 3, an 'E' indicates that expert judgement should be applied to judge the impact of the shortcoming on the reliability. A 'Y' indicates that the shortcoming renders the test less reliable (Ri 2). A combination of several Ri 2 qualifications may give rise to an overall qualification as Ri 3, 'unreliable'. Some items are deemed so important for the interpretation of the test results, that a lack of one such an item alone renders the test not reliable (Ri 3). These items are indicated in Table 3 by 'Y' [→ Ri 3].
An 'E' can result in Ri 1, Ri 2 or Ri 3. E.g. in the case that in the description of the location elements are lacking, the evaluator has to decide whether these elements are essential for the reliability of the study. Furthermore a distinction should be made between the reliability of the study and the usefulness of the results for risk assessment. Extreme weather conditions could for instance result in low abundances in the control, making it impossible to detect effects of a treatment. Of course this cannot be foreseen when starting a field experiment; it will, however, not be possible to obtain reliable results from such a study. The value of the results of such an experiment for risk assessment, will be seriously hampered by such circumstances.
Design and methodology of field studies with non-target arthropods are evolving, and can be tailor made for specific problems identified in the lower tiers. It is possible that in specific cases the results of a study, lacking such items, can be used for risk assessment. In this case, this should be argued in the evaluation report. A number of items (e.g. 2.1, 2.4) in Table 3 refer to the usefulness for risk assessment rather than to the reliability of a field study. These items are not included in the checklist with the aim to judge the usefulness at this stage of summarising and evaluating, but to indicate that the information is essential to judge the usefulness for the risk assessment later on and should therefore be included in the study report.

**Item 1.** The identity of the substance applied (active substance and formulation) has to be reported in detail. Batch number and expiry date should be provided, linked to a certificate of analysis, confirming that the test item was what was applied and that it contained the active substance in the stated quantity. The same goes for the toxic reference (if used). For the toxic reference chemical analyses is not required. For the substance under study the use class (e.g. insecticide, herbicide) and mode of action (e.g. contact, systemic, cholinesterase inhibitor) has to be known. Part of this information could also be obtained from other parts of the dossier.

**Item 2.** The history of the test site should be known for at least two years preceding the experiment (e.g. previous cropping history, application of pesticides, mineral fertilisers, establishment of orchards, crop rotation for arable crops etc.). From at least three days before to three days after application of the test compound, no other pesticides should be applied at all. This allows for an eventually agricultural necessary weekly application of e.g. a fungicide. During the test, pesticides from the same use class (insecticide; herbicide etc.) as the pesticide studied should not be used at all. When other pesticides are applied, they should be applied to the untreated control and the toxic reference plots as well. In case the side-effects of a herbicide are studied, the question is whether direct toxic effects or indirect (habitat) effects are studied. If the untreated control is left untreated, it cannot be determined whether the effects found are caused by direct or indirect effects. When a study with herbicides is intended to evaluate direct effects, the untreated control should have a similar habitat structure, e.g. by mechanical weeding on all plots.
Any treatments applied to maintain the health of the crop, e.g. fungicides, must be applied to the whole test site. When the results of a field study should be used for assessment of the potential impact on the off-crop fauna, the use of other pesticides is not acceptable. The off-crop area is considered to be an undisturbed area; if other pesticides are used in an off-crop field study, this field study is not representative for off-crop; for discussions about the use of in-crop studies to assess effects on the off-crop communities, see chapter 3. For example, soft fungicides may have a negative impact on predatory mites that rely on mildew as alternative food.

**Item 3.** In terms of usefulness of the study, it is important that the timing, levels and routes of exposure reflect, as far as possible, those applicable to the proposed use of the product. Data about application are necessary for indications about exposure and extrapolation to other situations. Climatic conditions in the period before, during and after application are of importance to assess the exposure of the non-target arthropods. Related to this, also information about artificial irrigation should be presented. The field study should preferably be conducted in the season of the proposed use of the substance. When a product is proposed to be used in autumn, the product should also be applied in autumn in the test.

*Table 3 Checklist to be used for the assessment of the reliability index for non-target arthropod field studies.*

| Test item | Notes | Reliability lower? |
|---|---|---|
| Description | | |
| 1. Substance | | |
| 1.1 Purity | identity and % of a.s. not reported? | Y [→ Ri 3] |
| 1.2 Formulation | formulation not reported? | Y [→ Ri 3] |
| 1.3 Use class / mode of action | not reported | Y |
| 2. Test site | | |
| 2.1 Location | information inadequate to judge representativeness for area of intended use? | E |
| 2.2 Field history | pesticide use until application, cropping system, tillage, fertilisation etc. not reported? | E |
| 2.3 Soil type | not reported? | E |
| 2.4 Characterisation of the crop | information inadequate to judge representativeness for crop of intended use? | Y |
| 2.5 General weather conditions | not reported? not within limits of long term weather data averages? helpful to assess whether the specific test is relevant for the intended use | E |
| 2.6 Site maintenance | properties during test not monitored? e.g. pesticides treatment, tillage, fertilising, climate, irrigation | Y |
| 3. Application | | |
| 3.1 Method of application | not reported | Y [→ Ri 3] |
| 3.2 Application rate and volume applied per ha | e.g. kg/ha, not reported? | Y [→ Ri 3] |
| 3.3 Verification of application | no satisfactory application control? | Y |
| 3.4 Application scheme | dates and frequency not properly reported? | Y [→ Ri 3] |
| 3.5 (Micro) climate | weather conditions before, during, and after application, rain, temperature, irrigation, not reported? | Y |
| 4. Test design | | |
| 4.1 Type & size | improperly reported? | Y |
| 4.2 Test date and duration | duration not long enough to assess recovery | Y |
| 4.3 Untreated control | if invalid | Y [→ Ri 3] |
| 4.4 Toxic reference | toxic reference not included | E |
| 4.5 Replications | improper for statistical analyses | E |
| 4.6 Statistics | improper for interpretation of results; impossible to recalculate the results | Y [→ Ri 3] |
| 4.7 GLP | no GLP statement? | Y |
| 5. Biological system | | |
| 5.1 Test organisms | insufficient number of taxa present or not reported, numbers too low for statistical analysis? | Y |
| 5.2 Community | community not representative for the in-crop or off-crop community for the intended use? | Y |
| 6. Sampling | | |
| 6.1 Biological sampling | improper method, taxa, sub-sampling, pre-treatment, number, frequency, replicates, monitoring data | E |
| 6.2 (Micro) climate | weather conditions before and during sampling, rain, temperature? irrigation? not reported? | Y |
| Results | | |
| 7. Application | | |
| 7.1 Actual application rate | application rate not checked? | Y |
| 7.2 Condition of application | additional technical data, route under consideration; not reported? | Y |
| 7.3 (Micro) climate | large deviations of weather conditions of the intended use such as long periods of drought after application | E |
| 8. Endpoint | | |
| 8.1 Type | list of taxa and aggregations not given? | Y |
| 8.2 Value | numbers incl. s.d.; all per year c.q. sampling date not listed? | Y |
| 8.3 Verification of endpoint | not possible? | E |
| 8.4 Pre-treatment | pre-treatment variation between plots, not reported? | Y |
| 8.5 Untreated control | low numbers? extinction? | E |
| 8.6 Toxic reference | no or unclear effects? validity criterion: at least 50% effect on at least one sample date for at least 10% of the analysed taxa | Y [→ Ri 3] |

*Table 3 Checklist to be used for the assessment of the reliability index for non-target arthropod field studies (continued).*

| Test item | Notes | Reliability lower? |
|---|---|---|
| 9. Elaboration of results | | |
| 9.1 Statistical comparison | improper method? multivariate analyses not included? confidence level < 95%, significance? statistical power compared to results not reported? | Y |
| 9.2 Presentation of results | a graphical presentation of the results of the multivariate analyses is preferred | E |
| 9.3 Community level impact | if given; improper method? | Y |
| 10. Classification of effects | not properly derivable? | Y |
| Remarks | | |
| The biological meaning of the effects seen in the test should be addressed in relation to the statistical significance of the effects. | | |

In that case the sampling scheme has to be adapted (see 4). The proposed use which is applied for, should be known (either from the dossier or reported in the field study report).

**Item 4.** Details should be reported as: e.g. random plot design, Latin square, plot size (a minimum plot size of 1 ha for arable land and 0.2 ha for orchards are recommended), number of replicates, number of samples; for more details see: Candolfi et al., (2000a). It should be noted that the plot sizes and designs of studies as given in Candolfi et al., (2000a), were indicative for studies with a limited duration. When studies address recovery of populations for up to one year, these plot sizes may be too small for certain taxa (e.g. carabid beetles), although adequate for others (e.g. Collembolans, Phytoseiidae). In this case it cannot be determined whether recovery occurred from inside the plot or from outside the plot, which may be representative for recovery at the landscape scale. In that case, the scale of the study should be considered when comparing it to the scale of the field under the proposed use.
On the other hand, e.g. short term studies with a NOER (No Observed Effect Rate) endpoint that have no recovery component, can have smaller plots. This may also apply to off-crop field studies.
The duration of the study should be long enough in order to assess the recovery within the test period. Recovery is assessed for different taxonomical levels, from population to community.
There are examples where recovery by the end of the study is demonstrated, where effects still appear in the next season (e.g. Annex 2). This may be due to the fact that sensitive life stages were not present during the test period, or because of a delayed reaction to the elimination of prey. Therefore, this subject should be addressed in the study report, and if next season sampling of the community is not conducted, it should be clearly argued why not.
A toxic reference is required to show that exposure of the non-target arthropod community occurred and to show that the sampling was adequate to show effects. The use of a reference substance thus is a validation tool rather than a reference. At present there is not enough knowledge to use the effect found in the toxic reference as a reference to the magnitude of the effects. Therefore, the toxic reference could be a (high) rate of the test substance, provided that the criteria for the toxic reference are fulfilled (see item 8.6). In practice, a study without a reference compound, which shows clear effects, may thus be accepted. However, a study without a reference compound and not showing clear effects of the test item cannot be used.
An increasing number of field studies are conducted under the principles of Good Laboratory Practice (GLP). The application of GLP puts high demands on especially the procedural aspects, and the way of reporting. In field studies with non-target arthropods a large number of data is generated. The chance of all kinds of (quotation or copying) errors is smaller when GLP is applied, because of extra control steps in the quality system. Of course this does not mean that studies under GLP can always be used, because other aspects, as described further on in the report, can render the study not reliable. Studies without GLP have a lower reliability (Ri 2). Whether these (older) studies can be used for risk assessment, depends on the possibilities to check data handling and the availability of the original data during the risk assessment process. For new studies GLP is a requirement.

**Item 5.** In a suitable test area a representative community of non target arthropods should be present. A typical field study has about 50-80 taxa available for statistical analysis (total of 150-200 counted taxa); identification of all these taxa to the species level is not technically feasible nor desirable; therefore Table 4 gives the desired level of identification, which roughly equals the 50-80 taxa mentioned above. Table 4 gives a list of taxa that should be identified and present at the specified minimum level of taxonomic precision in the different crop types in order to render the test representative for the type of agro-ecosystem. Non-target arthropods field studies include vegetation and soil surface dwelling (epigeic) organisms. Organisms living in the soil are not considered in this type of studies. The table has two functions:

1. to show that the sampling methods applied in the study were adequate to sample the relevant species; and
2. to show that the community is representative for the specified type of agro-ecosystem, which is relevant for the purpose of extrapolation of the results of the study.

The taxa mentioned in Table 4 should be present in sufficient numbers to allow univariate analyses with a sufficient power to allow for a comparison with the relevant regulatory threshold. Table 4 is based on a large number of samples collected in the types of agro-ecosystems as distinguished (Bakker and Brown, pers. comm.). This overview is considered generally applicable to field studies in Europe. When certain taxa are lacking, this does not mean that the study is unreliable per se, but the evaluator should be triggered to ask questions about the reasons for the lack of certain taxa, and it should be argued in the study report why these taxa were not sampled, or why they are lacking. The other way around, under local conditions for some taxa a more precise level than indicated in Table 4 would be of importance. When this is known, these taxa could be included in the study.
It should be clear from the study report that the sampling effort is focused locally (i.e. at the level of the plot centre). Trapping techniques that draw insects from a larger distance, such as water traps, light traps or Malaise traps, are not considered appropriate for this type of study. The minimum number of individuals should be at least such, that the requirements for statistical analysis are fulfilled.

The biological system should be discussed, including dominant groups etc. A table of the frequency of species found can be added to the summary (see e.g. Appendix 3 of example 1). In practice a very good study will be assigned Ri 2 because one or two of these taxa are scarce. A combination of more than one study with a product could collectively achieve Ri 1 with respect to taxonomic diversity.
Historical studies might not comply with this, because they were performed according to the guidance that was developed at that time. Similarly, higher tier studies may be focused on a particular part of the NTA-community. When these studies are offered for risk assessment, the evaluator has to decide whether or not the missing information is crucial. A conclusion may be that the study is not applicable to all risk assessment issues.
In the last column examples of the taxa which are likely to be present are given.

**Item 6.** Sampling method, scheme, area etc. Some general guidance is given in Candolfi et al., (2000a). In the study report it should be clearly indicated which sampling method is used for each group of species. Below an example of a sampling scheme is shown.
Given the (sometimes) large variability of a population over time, the pre-treatment monitoring of the community should be conducted not too long before treatment. Pre-treatment sampling, preferably shortly (< 5 days) before the first application, is desired in order to assess the variation between plots and the taxa exposed. In some cases (e.g. application early in the growing season or in the winter) this is not useful or possible, because certain organisms are not present yet in sufficient numbers.
Weather conditions in the period before sampling should be recorded.
For off-crop risk assessment the populations of organisms living on the soil surface should be recorded as well.

| Date 2006 | Activity | Sample type | Days after application |
|---|---|---|---|
| 1 June | | pitfall, PE, weeds, | -1 |
| 2 June | | asp | 0 |
| 2 June | Application | | 0 |
| 10 June | | all | 8 |
| 19 June | | all | 17 |
| 21 June | place pitfall, PE | | 19 |
| 23 June | | pitfall | 21 |
| 24 June | | PE, weeds asp | 22 |
| 2 July | | all | 30 |
| 22 July | place pitfall | weeds, asp | 50 |
| 25 July | place PE | | 53 |
| 30 July | | pitfall, PE | 58 |

PE = photo eclector sample, Asp = aspirator sample

*Table 4 List of taxa that should be evaluated in representative agro-ecosystems in Europe.*

| | Minimum desired level of taxonomic precision | Arable (both cereals and leafy crops) | Orchard (including citrus) | Off-crop | Remark/examples |
|---|---|---|---|---|---|
| **INSECTA** | | | | | |
| Heteroptera | | | | | |
| Sternorrhyncha | superfamily | +/- | + | + | Generally target taxa. Aphidoidea, Aleyrodoidea, Coccoidea, Psylloidea |
| Other | family | +/- | + | + | Anthocoridae, Miridae, Lygaeidae, Cicadellidae |
| Hymenoptera | | | | | |
| Apocrita | superfamily | + | + | + | Ichneumonoidea, Chalcidoidea, Proctotrupoidea, Vespoidea |
| | family | + | + | + | Depending on abundance (e.g. Braconidae, Ichneumonidae, Chalcidoidea families, Scelionidae. Formicidae) |
| | lower level | 0 | 0 | 0 | depending on abundance up to genus or species level (e.g. *Aphidius* sp., *Aphelinus* mali) |
| Coleoptera | | | | | |
| | family | + | + | + | distinguish juveniles for families below |
| Carabidae | species | + | - | + | for abundant taxa |
| Staphylinidae | genus/species | + | + | + | for abundant taxa |
| Coccinellidae | subfamily | +* | + | + | for abundant taxa |
| | genus/species | +* | + | + | for abundant taxa |
| Lathridiidae | juv./adults | - | + | + | at family level |
| Collembola | suborder | + | + | + | subsamples should be identified to a lower level (family/genus) to enable a characterization of collembolan community composition |
| Dermaptera | order | - | 0 | - | |
| Diptera | suborder | + | + | + | |
| | family | 0 | 0 | 0 | for abundant taxa |
| | juv./adults | + | + | + | Syrphidae and others |
| Lepidoptera | juv./adults | - | + | + | |
| Neuroptera | family | - | + | - | Chrysopidae, (Conyopterigidae), others |
| | juv./adults | - | + | - | |
| Orthoptera | order | - | - | + | |
| Psocoptera | order | - | + | - | no experience at lower level of identification |
| Thysanoptera (adults) | order | 0 | + | + | |
| **ARANEA** | | | | | |
| Hunting spiders | family | + | + | + | |
| Lycosidae | genus/species | + | - | + | for abundant taxa |
| Thomisidae | genus/species | - | + | + | for abundant taxa |
| Web spiders | family | + | + | + | |
| Linyphiidae | genus/species | + | - | + | for abundant taxa |
| Dictynidae | genus | - | + | - | for abundant taxa |
| Araneidae | genus | - | + | - | for abundant taxa (i.e. Araneus) |
| **Acari** | | | | | |
| Gamasida | family | - | + | + | for abundant families (Phytoseiidae) subsamples should be identified to species level to enable a characterization of gamasid community composition |
| Actinedida | family | - | + | + | subsamples |
| Oribatida | suborder | + | + | + | |

**Item 7.** ***7.1*** It should be possible to check whether the right amount of the substance studied was applied in the test. This could for instance be done by measurements of the compound in the spray solution and controls of the spray pattern by e.g. water sensitive paper or collection of residues on Petri dishes.
***7.3*** At this point the weather conditions during the test should be considered, and attention should be paid to aberrations from the average conditions of the test site. E.g. heavy rainfall or unusually low or high temperatures on the day of application could influence exposure of the NTA fauna.

**Item 8.** ***8.1-8.3*** The results of the field study should be reported in sufficient detail to allow a proper assessment of the study. Tables reflecting the raw data should be available as well to allow recalculation of the results (e.g. Appendix A1.2 in Annex 1 and Appendix A2.2 in Annex 2).
***8.5*** Results of the untreated control should always be regarded in detail. Due to other influences, numbers can be very low during certain periods. In that case it will hardly be possible to find significant differences between the untreated and the treated plots. This phenomenon should not be confused with recovery, however.
***8.6*** Clear effects should be found in the toxic reference, at least a 50% effect on at least one sampling date, for at least 10% of the taxa for which statistical evaluation is possible. When these criteria are not met the test is not reliable (Ri 3). When no reference item is included, the highest application rate of the test item could act as such, and in that case the same criteria are used for the highest treatment rate as for the reference item.

**Item 9.** A natural variation between plots will always occur in field studies. The extent of this variation will vary from taxon to taxon and depend on the season. The possible occurrence of pre-treatment variation and/or large variations in time renders it necessary to present the results in different ways. As a first option, the relative differences compared to the control can be presented, and presentation of relative differences compared to pre-treatment can clarify the influence of pre-treatment differences. In the statistical interpretation a correction could be made for significant pre-treatment differences, for instance by taking the pre-treatment situation into account as co-variate, or by comparing the increase (or decrease) of the measured parameters between treatments relative to their respective starting situation. A graphical presentation of the results will help to interpret the results.
In the test report the minimum detectable difference that could be observed with acceptable statistical certainty should be specified, given the variation in the control. In the optimum situation, it should be clear on forehand what differences are deemed relevant, and the test should be designed so that these differences can be detected in the test. Only when this is the case, and the critical effect values are known, it can be decided whether an observed effect is acceptable or not. In practice, an experiment has to be planned carefully and it is not possible to change the design at short notice. The results should be handled with care. This means that in some cases statistically significant differences will only be found when differences between treatment and control are relatively large. In order to allow the evaluator to assess the value of the differences found, it is important that the minimum detectable difference is given in the study report. The minimum detectable difference can vary in time.
The described type of analysis is relatively labour-intensive. Therefore, it has to be done in an 'intelligent' way, focusing on the observations that lead to conclusions (effect or no effect). If an effect is detected as significant, a power analysis is not necessary, however, if a no-effect is used to base the conclusions on, this should be accompanied by such an analysis. An automated procedure for the performance of this kind of test will be very helpful, methods are under development (see Miles et al., in prep.).
The NTA community consists of highly dynamic populations. Some species might occur only in the post treatment period, while others disappear, due to migration. In autumn numbers generally decline for most of the species. This puts high demands on the interpretation of these data, especially concerning recovery. Multivariate techniques (see below) are a great help in interpreting the results of studies with a large number of effect parameters.
Different statistical techniques can be applied to evaluate the effects found in the field study. Univariate techniques (like ANOVA) can be used to analyse the effects on single populations. Multivariate techniques presented in the form of principal response curves (PRC) are particularly suitable to obtain insight in the effects on the community level (Van der Brink and Ter Braak, 1999). Especially in the case of a diverse community with taxa differing in abundance, life cycle and reaction to the compound, these multivariate methods are helpful to structure the complex data set. For the interpretation of the results however, ecological knowledge is still needed. For all statistical techniques it is possible that effects are missed, for instance due to the sampling scheme, sampling method etc. Taxa that show a large contribution to the PRC should be analysed in detail. This does not mean however, that a small weight of a taxon in the PRC can translated automatically into a low susceptibility of the taxon to the stressor. It is possible that a certain taxon displays a specific response to the treatment that differs from the general response pattern shown in the first PRC. Minimum requirements such as the number of individuals per taxon cannot be given. However, the variance of

the PRC results and the (in)significance of the effects shown should be observed carefully and may put questions to the suitability of the dataset. An example of such responses for both univariate and PRC analyses is given in (Brown and Miles, 2002). In practice PRC is at present the most used technique, and evaluators are more experienced with this method; however, this does not mean that other methods might not be acceptable as well.
**Item 10.** For the effects a classification of effects is proposed (see IIIb).

Remarks: In the study report an ecological evaluation of the differences observed should be present. It needs to be argued whether and why statistically significant differences are ecologically relevant or not. E.g. effects on the predators of the target organisms probably are indirect ecological effects rather than toxic effects. Numbers of ants in pitfalls might be caused by the attraction of ants by dead invertebrates in the traps, and are not representative for the number of ants in a certain plot.
In principle the assessment is based on statistical significant effects. However, the evaluator should be aware that the absence of significant effects could be caused e.g. by a poor test design.

## IIIb Evaluation of the results

In order to evaluate the impact of the treatment, the effects are described per rate tested and the observed effects are ordered applying an effect classification (see Table 5). The occurrence of an effect on more than one time point is likely to be more related to substantial damage to the ecosystem than an effect that is observed once. NOTE: non-effect at in between sampling points might be due to experimental power, rather than to a real absence of effects. In principle the assessment is based on statistically significant effects. However, the evaluator should be aware that the absence of significant effects could be caused e.g. by a poor test design. For this reason, the endpoint will not be based on non-significant effects, but the reliability of the study can be lowered when the test has a low power. Also it cannot be concluded, e.g., that recovery occurred, when this is caused by an increase of the variation rather than by actual recovery. The duration of the ecologically relevant period depends on the ecosystem c.q. population involved.
Intended effects on target species are no assessment endpoint for side-effects on non-target arthropods. This does not mean that target arthropods cannot be part of a non-target arthropod field study, e.g. to explain indirect effects on predatory species. The classification applies to different levels of organisation, i.e. classification on PRC or univariate analysis. This should be presented in the header table or abstract too.
For field studies with non-target arthropods, a duration of two months after first occurrence of effects is chosen as an ecologically relevant period for recovery of short term effects by organisms with a short generation time or a strong potential for external recovery. In practice, several factors such as the mode of action of the compound, the DT50 on leaves or in soil and the effects found, determine whether such an interval is sufficient to describe the effects in a proper way, especially in the period directly following the application(s). In the case of class four the total duration of effects is four months. In the case of class five the same goes for an eight month recovery period. Full recovery should be observed by recovery on at least two consecutive sampling instances. The evaluator should take care to assure that actual recovery occurred, and that the lack of significant differences between treatment and control is not just caused by increased variation or low numbers in the control. Recovery sampling should not be restricted to affected taxa. Actual recovery is demonstrated when the patterns in control and treatment are similar, and abundance is similar. Only similar patterns may in the end result in a lower abundance in the treatment, without reaching the state of the control. In the case of longer lasting effects, one year after first occurrence of effects (class six) is more relevant. Also in the case of repeated exposure an endpoint in the next season is more relevant, given the high dynamics of a number of NTA populations. In the case of applications in autumn, it might be hard to measure short term recovery, since abundance of taxa may decrease in the untreated control as well. In that case at least effects should be measured in the next spring. With class seven the requirement of ESCORT 2 about recovery within one year is marked. A field study can thus last up to one year plus a period in which two additional samplings can take place, in order to show recovery on two subsequent sampling moments. In the case of arable land, the arthropod community is determined by the use as arable land, but not so much by the specific crop (see Table 4, one column for arable land). The study should represent normal conditions, which can be crop rotation, but can also be temporary fallow land. Class eight is added to cope with all studies which show no recovery within the study period.

It is proposed to refer to the first application date, because effects that occur later on might be already present before, but not detectable yet. In the case of repeated application, recovery should be related to the first application, because

*Table 5 Proposed classification of the effects in non-target arthropod field studies.*

| Effect class | Description | Criteria |
|---|---|---|
| 1 | Effects could not be demonstrated (NOER) | • No (statistically significant) effects observed as a result of the treatment<br>• Observed differences between treatment and controls show no clear causal relationship |
| 2 | Slight and transient effects | • Quantitatively restricted response of one or a few taxa and only observed on one sampling occasion |
| 3 | Pronounced short term effects; recovery within two months after first application | • Clear response of taxa, but full recovery within two months after the first application<br>• Effects observed at two or more sampling instances |
| 4 | Pronounced effects; recovery within four months after first application | • Clear response of taxa, effects last longer than two months but full recovery within four months after the first application<br>• Effects observed at two or more sampling instances |
| 5 | Pronounced effects; recovery within eight months after first application | • Clear response of taxa, effects last longer than four months but full recovery within eight months after the first application<br>• Effects observed at two or more sampling instances |
| 6 | Pronounced effects; full recovery one year after first application | • Clear response of taxa, effects last longer than eight months but full recovery within one year after first application<br>• Effects observed at two or more sampling instances |
| 7 | Pronounced effects; full recovery more than one year after first application | • Clear response of taxa, effects last longer than twelve months after the first application but full recovery found within the study period<br>• Effects observed at two or more sampling instances |
| 8 | Pronounced effects; no recovery within the study period | • Clear response of taxa, no recovery within the duration of the study<br>• Effects observed at two or more sampling instances |

it cannot be excluded whether effects of more applications are already induced by the first application. This only can be excluded by providing study results after one application.
When e.g. a taxon only appears in October, while treatment is in April, and an effect is found, this effect shows a longer lasting disturbance of the non-target arthropod community, than for a species directly responding to the exposure, leading to a higher effect class. When no recovery is found in the period the taxon is present, it makes no sense to assess recovery one year after application, but assessment should be done in October next year, which could be assessed as recovery within the study period.

Below are a number of instructions for assigning effect classes (see also the example studies in Annex 1 and 2).

- Assess a statistically significant increase as an effect, but indicate the increase with an arrow.
- Any isolated effect (whether an increase or a decrease) is assessed as class two. For both treatment related and not treatment related effects class two is assigned. From the classification table it is directly clear whether an effect is treatment related or not.
- Only statistically significant effects of $P \leq 0.05$ are considered for the classification.
- In case an increase is found after a decrease, expert judgment is needed in order to assess whether recovery occurred or not.
- Dependent on the date of first application and the sampling scheme, some effect classes might not be relevant for the particular study, e.g. because, as in Annex 2, during the winter season no sampling has taken place. When in such an occasion effects are found on the last sampling data in the first year, and not in the second year, the duration of the recovery period cannot be established in more detail than that recovery on the first sampling date in the second year has occurred. Classification should be applied accordingly by assigning effect class six.

In Table 6 an example of the classification of the effects in a particular study is given, based on the effects reported in Table 4.

From the results, depending on the study design, a NOER for the whole study could be derived (see e.g. Annex 1). For the whole study the classification for the taxon level is based on the most sensitive taxon, and a separate classification can be applied for the community analyses (see Annex 1 and 2). Trend analyses of effects, significant at the $P \leq 0.10$ level, can be used to support the overall classification.
The evaluator has to refer to the original data in the study report when describing treatment-related responses and assigning these responses to effect classes.
The evaluation of the study should result in a clear conclusion of the evaluator, summarising the arguments, and when these conclusions differ from the conclusions of the authors of the study report, these differences should be discussed.

*Table 6 Example of assigning effect classes in a particular study; ↑ = numbers higher than control; ↓ = numbers lower than control; N.B. not based on real data.*

| Species/group | 0.1 g/ha | 1 g/ha | 10 g/ha |
|---|---|---|---|
| **INSECTA** | | | |
| Heteroptera | 1 | 1 | 6↓ |
| Sternorrhyncha | 1 | 1 | 1 |
| Other | 1 | 1 | 2↑ |
| Hymenoptera | | | |
| Aculeata | 1 | 1 | 1 |
| Formicidae | 1 | 8↓ | 8↓ |
| Chalcidoidea | 1 | 1 | 1 |
| Coleoptera | 1 | 2↓ | 4↓ |
| Carabidae | | | |
| Staphylinidae | 2↓ | 1 | 2↓ |
| Coccinellidae | 1 | 1 | 1 |
| Lathridiidae | 1 | 1 | 1 |
| Collembola | 5↓ | 5↓ | 6↓ |
| Dermaptera | 1 | 1 | 1 |
| Diptera | | | |
| Phoridae | 1 | 2↓ | 5↓ |
| Lepidoptera | 4↓ | 4↓ | 5↓ |
| Neuroptera | 1 | 2↑ | 1 |
| Chysopidae | 1 | 1 | 1 |
| Odonata | 1 | 5↓ | 5↓ |
| Orthoptera | 1 | 1 | 1 |
| Psocoptera | 1 | 1 | 1 |
| Thysanoptera (adults) | 1 | 2↓ | 2↓ |
| **ARANEA** | | | |
| Hunting spiders | | | 1 |
| Lycosidae | 1 | 1 | 1 |
| Thomisidae | 1 | 1 | 1 |
| Web spiders | | | |
| Linyphiidae | 1 | 1 | 1 |
| Dictynidae | 1 | 1 | 1 |
| Araneidae | 1 | 1 | 1 |
| **Acari** | | | |
| Gamasida | 2↓ | 1 | 1 |
| Phytoseiidae | 1 | 1 | 1 |
| Actinedida | 1 | 1 | 1 |
| Oribatida | 1 | 1 | 1 |

## IV Suggestions for use in risk assessment

The evaluation of a particular study ends with the classification of the effects. From that, depending on the test design, an assessment endpoint could be derived (NOER, NOEAER (no observed ecological adverse effects rate), LOEAER (lowest observed ecological adverse effect rate)). In parallel to the aquatic risk assessment scheme, the NOEAER can be used by the regulatory authorities to distinguish the levels of effect in the particular study that are deemed acceptable, e.g. statistically significant effects, that are not deemed biological relevant, or followed by recovery within a certain time period (e.g. De Jong et al., 2008). The regulatory authorities thus could decide that the NOEAER is set at the level of a certain effect class.

The evaluator may give, in a separate Annex to the evaluation report, some suggestions for the use of the results in the risk assessment (meaning of the result of the higher tier study in relation to other test results and in relation to the intended use, etc.). See for further considerations concerning the use of the results in the risk assessment chapter 3 of this document.

In the end, for the derivation of a regulatory endpoint for non-target arthropods for the particular compound, all available information should be taken into account, including e.g. information from the lower tier or from other parts of the dossier.

# 3. COMMENTS TO THE USE OF TEST RESULTS IN RISK ASSESSMENT[1]

Where reliability generally refers to an individual study, usefulness refers much more to a study in relation to other comparable studies and to the choice which study or studies match the best with a particular purpose. Reliability is a prerequisite for a test to be used for registration purposes. The next step is to decide whether a valid endpoint (*i.e.* reliable or less reliable, Ri 1 or 2, but not unreliable, Ri 3) can be used in environmental risk assessment. A reliable field study is not by definition useful for risk assessment. The usefulness depends on a number of other aspects, mainly concerning the similarity between the test situation and the situation of the proposed use. Below some guidance is provided on this aspect. Besides these aspects, it is possible that a perfectly reliable field study does not answer the concerns raised in the lower tiers.

## 3.1 Extrapolation from the field study to the situation of concern

- product
- dosage
- method of application
- time, frequency and interval of application
- type of ecosystem (depends on abiotic factors as soil, climate and on composition of non-target groups)
- location and isolation of the test system
- history of the test system
- crop and crop-stage
- ...

→

The more aspects are similar the more useful a field test is likely to be. Expert judgement remains decisive: one cannot judge without the other data (other field tests, lab tests, other evaluations, if available)

*Figure 1 The similarity aspects that determine the usefulness of a field test.*

As a rule of thumb, it can be expected that the more of these test aspects are similar between the field test and the proposed agricultural use, the more useful the field test is expected to be for environmental risk assessment.

***Product and rate***

The test should be preferably carried out with the product under consideration. Field studies conducted with other products may be used provided that the rate in terms of the active ingredient is the same. Whether other formulations are acceptable should be decided case by case. Spray solutions cannot be used to assess the risks of granules or pellets to terrestrial organisms.

***Method of application and exposure***

The method of application is one of the factors that determine exposure. In principle, the product should be applied to the test system in a way that simulates the real situation. However, simulating drift in a terrestrial experiment by spraying the systems from a certain distance, would lead to uncontrolled exposure. Therefore, spraying the systems with a fraction of the intended field rate simulating drift can be used as a surrogate for assessing the effects of drift in an experimental situation.

***Time, frequency and interval of application***

In general, the time, frequency and interval of application in the field test should follow the label instruction. This means that in principle a test with a single application cannot be used to assess the effects of a product that is applied multiple times. At the ESCORT 3 workshop it was proposed to choose within the instruction of the GAP, the 'worst case'

[1] A number of items relevant to this chapter were discussed during the ESCORT 3 workshop, 8-11 March 2010 in Egmond aan Zee, The Netherlands. Therefore in this chapter a number of considerations from this workshop are added, but it should be noted that the final workshop report might give slightly different conclusions.

situation, e.g. when the GAP describes exposure during three months, to choose the period with the most abundant non-target arthropod community present. For non-target arthropods, however, the first SETAC/ESCORT workshop (Barrett et al., 1994) recommended to test a product at two times the recommended field rate when it is used two or three times per crop season. It should be noted that a single application at the double rate is not the same as a double application at a lower rate. Especially in a field study with rapidly changing compositions of the community this is not desirable.

At the moment the guidance for field tests for in-crop effects describes an application of the highest recommended rate, a toxic standard and a control treatment. A dose-response design is not recommended at present. (See for recommendation concerning dose-response design studies e.g. (OECD, 2006b) and (OECD, 2006a)). For the extrapolation of one field test to other situations, with other exposure, a dose-response design would increase the usefulness of a field study considerably. Of course there are practical limitations concerning the magnitude of a field study in respect to e.g. number of treatments, replicates and area of the field study. In fact it might be difficult to find locations that fulfil all requirements. An optimal balance should be looked for between an extended field study with the possibility to extrapolate the results and a more targeted study, with the risk that for other application schemes and dosages new field studies will be required. At ESCORT 3 for the in-crop it was concluded that a dose-response design is not possible, but a multiple rate design might be possible. For the off-crop situation it is probably necessary to estimate a NOER or EC10 value, for which a dose-effect design is needed. Such a design would render it possible to compare the results of different exposure scenarios.

Considering the time of application, the moment of administration of the compound in practice should be considered as well. A field trial performed in autumn, for instance, is less useful to assess the effect of an application in spring. In Candolfi et al. (2000a) it is recommended to use a ‘worst case date of application’, and it is stated that “usually spring/summer applications are most suitable, but care should be taken for products being very temperature dependent or with significant uses during special periods”. In general, it can be stated that a field study in autumn is needed to assess an autumn application and that sampling may need to continue into the following spring to detect effects on juvenile life stages.

***Type of ecosystem***
The ecosystem in the test should be relevant for the situation to be assessed. As exposure is greatly determined by the physical environment that surrounds the individual non-target organisms, this should reflect the situation to be assessed.

With respect to the *biotic* part of the system, the Health Council of the Netherlands gives as a ground rule that test organisms must include taxa from different taxonomic groups, from different trophic levels, with different ecological functions and with a different life history (Health Council of the Netherlands, 2000). For registration in the Netherlands, for instance, De Jong (1995) recommends that the chosen test taxon should include taxa that are common in the Netherlands or taxa that are representative/protective for the local taxa. Also susceptible life-stages should be included (Barrett et al., 1994). In general, the standard test organisms for the first tier are chosen because they are assumed to be indicators in terms of their sensitivity for the whole variety of non-target arthropods, therefore an effect on mites in the first tier does not mean that the higher tier study can be limited to mites.

Considering the type of crop, Candolfi et al., (2000a) recommend a two model approach: field studies should be conducted either in an arable crop or in an orchard. This field study is then considered to be representative for that type of crop. Another item of interest is the changing cropping system for orchards, moving from low input to high input systems, with considerable fewer non-target arthropods. In general, it is up to the applicant to show that the field study provided is representative for the purpose of the registration. For discussion of the use of in-crop field tests for testing effects on off-crop populations see below.

***Location and isolation of the test system***
The degree of isolation of a site partly determines the potential for recovery after treatment. In an EFSA opinion (EFSA, 2003), aspects mentioned as relevant for the immigration rate are:

- unaffected populations of sufficient density should be present nearby;
- b) the mobility and home range of the species should be large enough to cover the distance from the unaffected areas to the edge of the treated field; and

- c) the timing of application in relation to the life-cycle is similarly important for off-crop populations, when recovery is primarily dependent on immigration.

Recolonisation of affected taxa may be reduced in practice because of the treatment of adjacent fields in the same period or because the distance to reach the site cannot be covered between two applications. Plot size is an important parameter with respect to recovery as is the arrangement of plots within fields. In typical arable studies in the UK square 4 ha blocks or fields are divided into quarters and one of four treatments is assigned to each of four plots (control, drift rate, test item, reference item). Four separate blocks are used to give replication in the analysis. In France/ Spain field studies of in total 16-20 ha have been used.
The test item and reference item usually have major effects and the control and drift rate have no or limited effects respectively. Over time the animals resident in the control and drift plots could recolonise the test and reference item plots, depending on the dispersal capacity of the species. Recovery thus could be an artefact of the experiment. The evaluator should be aware of this kind of complicating factors.

Furthermore Candolfi et al. (2000a) indicate that field studies cannot be extrapolated from Southern European countries to Northern European countries and the other way round. This is especially valid concerning recovery. Due to higher temperatures other species occur, a number of organisms have shorter life cycles in Southern Europe, or more generations per year as compared to Northern Europe. A study by Aldershof and Bakker (2010, Poster presented at ESCORT 3) however shows that the differences in the effects of insecticides might be limited. It is also indicated that more research is needed before a clear recommendation about the possibilities for extrapolation, and differences between crop types can be given. What the upcoming zonal registration means for the extrapolation of field study results remains to be studied. Concerning the NOER, or the rate at which the most sensitive endpoint starts to react, it might be possible to use a similar approach as for the use of aquatic mesocosms in risks assessment for aquatic aspects (cf. Brock et al., 2006) after proper scientific evaluation.

***History of the test system***
An applicant may choose to perform a field test on an existing (agricultural) site instead of using an experimentally constructed field. This is often the case for in-crop studies with non-target arthropods. When this is the case, knowledge about previous treatments and resistance should be taken into account when using the study results for situations with other histories.

***Crop and crop-stage***
This item is particularly relevant for the assessment of effects on non-target taxa within a crop. The crop type determines the taxa that live in the area. In chapter 2 a list of taxa is given that is considered representative for different crop types. The crop-stage determines the interception of the applied rate and thus is a determining factor for the exposure of ground-dwelling arthropods. The test should therefore preferably be performed on the intended crop, but other crops can be used when it can be made clear that the test system covers the exposure and the taxa that are expected in the field.

## 3.2 In-crop – off-crop

The type of habitat or ecosystem that should be protected determines the location of the test. Within this context, the EPPO (European and Mediterranean Plan Protection Organization) Panel on Environmental Risk Assessment has proposed to distinguish between the various in-field and off-field areas. The off-field risk assessment is concerned with non-target arthropods inhabiting natural and semi-natural off-field habitats, in particular hedgerows and woodland (EPPO, 2003).

In practice field studies with non-target arthropods are very costly, and therefore it would be favourable when the results of in-crop field studies could be used for assessment of off-crop effects. Several problems occur, however, while extrapolating the in-crop situation to the off-crop situation:

**Exposure.** Most field studies are conducted with a limited number of exposure rates. This means that it will be difficult to derive a NOER or safe rate from these studies, and it will not be possible to define safe drift rates. It will therefore also be difficult to define what drift mitigating measures could be applied in order to prevent off-crop damage. Another aspect concerning exposure is that the vegetation structure of a crop and an off-crop vegetation might differ considerably, which will result in a different exposure of non-target arthropods in the field and in the off-crop area.

**Community.** It is not clear whether the in-crop community is representative for the off-crop community. In-crop studies with permanent crops, like citrus, are focused on organisms on the vegetation, and the attention for soil dwelling organisms often is limited. For assessment of the off-crop situation these organisms (like beetles) can be an important part of the community. Depending on the crop, the in-crop community could be adapted to crop related measures, including the use of crop protection products, which could result in a dominance of e.g. taxa with a short life cycle. Application of a safety factor could be a practical solution; however, this only makes sense when an endpoint like a NOER could be derived from the study. At the ESCORT 3 workshops it was concluded that an inventory of existing data is needed in order to be able to assess whether extrapolation from in-crop to off-crop would be possible, and whether a safety factor could be applied.

**Recovery.** Recovery could be different for in-crop and off-crop areas. Agricultural landscapes can be large homogenous areas, in which species are adapted to agricultural practice, which could enhance the ability to recover from impacts. In this respect it is questionable whether the in-crop area can be seen as worst case for the off-crop area. Furthermore in the in-crop, herbivores are the target organisms, but off-crop they are non-target organisms, potentially exposed to high dosages, since they consume a large amount of exposed material per unit body weight.

Candolfi et al. (2000a) argue that due to the high variability of off-crop habitats, these habitats cannot currently be addressed with field studies, and Candolfi et al. (2000a) suggest using in-crop field tests with the off-crop drift rates. Following from the above, and the large variability of the off-crop habitats, it is questionable, however, whether such a field study might show the absence of unacceptable effects for the off-crop situation, and it is recommended to develop off-crop higher tier methods for studies from which a NOER can be derived.

## 3.3 Acceptability of effects and recovery

It is up to the risk manager to decide which effect class is deemed acceptable. For the acceptability of an effect and the duration of a recovery period it is relevant to distinguish between permanent and non-permanent crops. In-crop, as a parallel with e.g. earthworm field studies, it could be argued that recovery should have taken place at the start of the next growing or cropping season, or in the case of permanent crops or applications in autumn, one year after application (see also IIIB).

It is clear that in the off-crop situation less effect is acceptable, and/or a much shorter recovery period is used. In the limited available guidance (EU, 2002; EPPO, 2003), it is stated that for off-field effects the duration and the type and range of taxa affected should be taken into account. The first option in risk assessment is the demand of risk mitigation measures.

At the ESCORT 3 workshop protection goals, recovery, off-crop and field studies were further discussed. For further details of the discussions of these aspects the reader is referred to the report of the ESCORT 3 workshop.

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# ANNEX 1 EXAMPLE OF A SUMMARY OF AN OFF-CROP FIELD STUDY

**A 'terrestrial mesocosm study' to assess the effects of XYZ (123 g ABC/L) on the non-target, surface- and plant-dwelling, arthropod fauna of a grassland habitat, when exposed to low concentrations during spring/summer.**

## Header Table and Abstract

| | | | |
|---|---|---|---|
| Reference | : Anonymous, 2008 | GLP statement | : Yes |
| Type of study | : Terrestrial arthropod community field study | Guideline | : IOBC, BART, EPPO, ESCORT |
| | | Acceptability | : Acceptable |
| Year of execution | : 2006 | | |

| Substance | Taxa | Method | Location, Crop | Exposure regime | Date of application | Duration | Effect class | Value [g a.s./ha] | Ri |
|---|---|---|---|---|---|---|---|---|---|
| XYZ, 123 g ABC/L, batch A-1234-56-78 | *arthropod community grassland* | off crop field study | Dame Marie les Bios, North-West France | Single exposure, exposure range: 1, 2, 3, 4 and 5 times X g 123/ha | 2 June 2006 | 30 days after application | Community | | 2 |
| | | | | | | | 3 | 4x | |
| | | | | | | | 8 | 5x | |
| | | | | | | | Population | | |
| | | | | | | | 2 | 1x | |
| | | | | | | | 2 | 4x | |
| | | | | | | | 8 | 5x | |

*Abstract*
In a Ri 2 field study the off-crop effects of ABC, applied in the rates 1, 2 3, 4 and 5 times X g ABC/ha were determined on natural occurring communities on grassland in NW France. The following conclusions can be used for risk assessment:
Simulated drift of ABC at rates of 1x, 2x, 3x a.s./ha did not influence the arthropod community or individual populations. These rates are classified as community and population NOER.
The simulated drift of ABC at the rate 4 x a.s./ha reduced statistically significant the taxon Cicadellidae. The simulated drift of ABC at the rate of 5x a.s./ha induced significant community responses. Many arthropod communities recovered quickly but for some it took more than a month.

*Reference*
Anonymous. 2008. A "terrestrial mesocosm study" to assess the effects of XYZ (123 g/L ABC ) on the non-target, surface- and plant-dwelling, arthropod fauna of a grassland habitat, when exposed to low concentrations during spring/summer.

## Extended summary

## Description

***Reference***
Anonymous, 2008

***Guidelines***
General guidance documents on field studies published by IOBC, ESCORT, BART and EPPO.

***GLP statement***
Yes

***Test substance***
XYZ (123 g ABC/L), batch A-1234-56-78, insecticide, toxic reference: lambda-cyhalothrin.

***Location, description of test site***
Field test was carried out on grassland near Amboise, North-West France. Soil type not specified. Test site commercial grassland with low agricultural input; agricultural practice not specified. The vegetation of the field was dominated by tall grasses and herbs on nutrient-rich soils, and Arrhenatherum elatius (tall oat grass) and Rumex acetosa (Sorrel) had a large coverage. During the last five years no pesticide treatments have been applied.

*Table A1.1 Sampling scheme (copied from research report)*

| Date 2006 | Activity | Sample type | Days after application |
|---|---|---|---|
| 1 June | | pitfall, PE, weeds, | -1 |
| 2 June | | asp | 0 |
| 2 June | Application | | 0 |
| 10 June | | all | 8 |
| 19 June | | all | 17 |
| 21 June | place pitfall, PE | | 19 |
| 23 June | | pitfall | 21 |
| 24 June | | PE, weeds asp | 22 |
| 2 July | | all | 30 |
| 22 July | place pitfall | weeds, asp | 50 |
| 25 July | place PE | | 53 |
| 30 July | | pitfall, PE | 58 |

PE = photo eclector sample, Asp = aspirator sample

***Test design, application, concentrations and replicates***

Test compound was applied on 2 June 2006 with a tractor mounted sprayer with two 3 m horizontal spray booms, with 6 fan nozzles, 50 cm apart, 100 L/ha. Four replicates, application regimes: 1, 2, 3, 4 and 5 times X g ABC/ha, control treated with water only, and a toxic reference: 1 L/ha karate (a.s. lambda-cyhalothrin).

A checkerboard design with 24 x 24 m plots was used, in duplo. Both fields were surrounded by agricultural land and a road in the one field and a forest in the other field. Samples were taken from the centre of each plot, except for the aspirator samples (24 m long strips near one side of a plot). Application took place between 15.00 and 22.15 h; during application no rainfall occurred, temperature ranged from 9.5 $^{o}$C to 18.3 $^{o}$C and relative air humidity ranged from 46% till 86%; details about wind speed/direction during application not given. Sampling of effect parameters occurred until 58 days after application.

***Verification of rates***

Spraying equipment and tractor speed were calibrated, outflow during application was monitored. Spray deposit and droplet size was monitored using water sensitive papers attached to pickets at 10 cm from the ground.

***Test conditions***

Meteorological data were obtained from the nearest weather station (10 km). Not indicated whether temperature and relative humidity were within normal ranges. Rain events did not take place shortly before sampling.

***Sampling***

The sampling scheme is shown in Table A1.1. Sampling points of 22, 25 and 30 July are not reported nor used for the assessment.

**Tractor mounted aspirator sampling**, aimed at small arthropods with a (hemi-)edaphic life style. An 11 cm aspirator was moved alongside the total length of the plot. All individuals were sampled and kept in ethanol.

**Berlese-Tullgren sampling**, aimed at quantifying leaf-dwelling invertebrate population levels. The vegetation was sampled in two 100 x 25 cm sub-samples, in the centre of the plots, not overlapping with other sampling methods. The leaf dwelling organisms were forced to move down from the weeds with a Berlese set-up, and collected in ethanol.

**Photo-eclector sampling**, aimed at soil dwellers and to monitor the emergence of arthropod prey items. One circular trap (2,500 $cm^2$), 95 cm height, was set up in the centre of each plot for 3-9 days. Three plots of the toxic reference were left without a trap.

Pitfall trap sampling, aimed at soil and surface dwelling arthropods. Four sets of four traps per plot, in the central 1.5 x 1.5 m of each plot, for 3-8 days. All traps were pooled into a single sample. Traps of different sizes were used, resulting in a 13% smaller circumference of all traps per plot in the lowest two drift rates. In other treatments differences were $<$ 10%.

***Processing of samples***

Samples were sieved, and species were identified to relevant or practically possible levels.

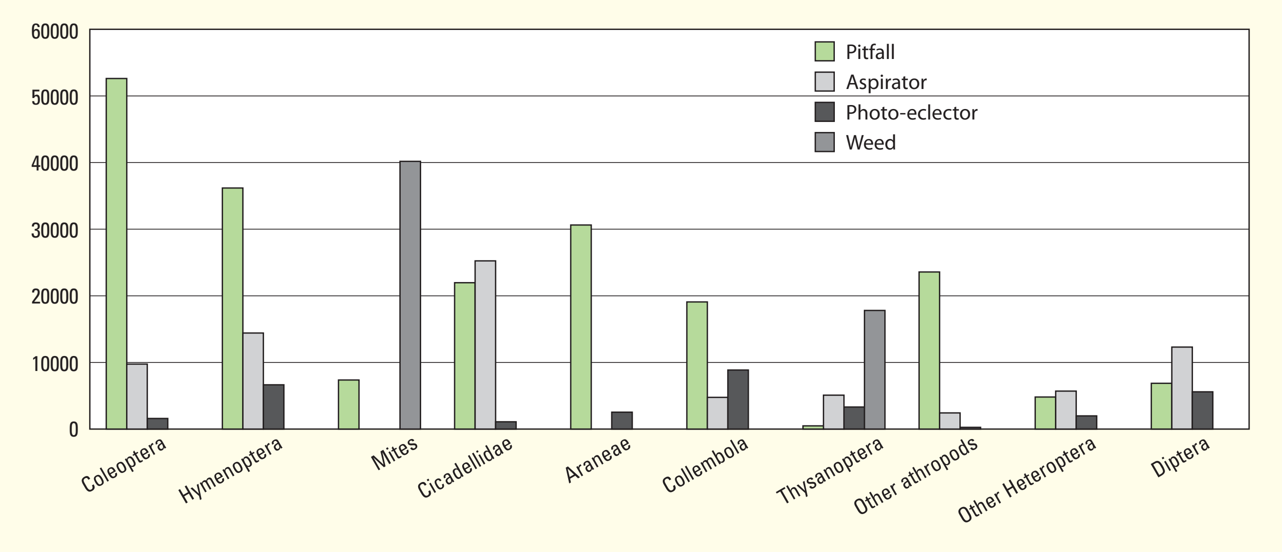


*Figure A1.1 Arthropod abundance (number of specimens) in the study area estimated with different sampling methods (copied from research report).*

## Biological system

According to the authors, the non-target arthropod fauna was very abundant and typical for grassland in North-West France. Approximately 3.8 million arthropods were counted and identified. Coleoptera were the most numerous group collected, mainly by pitfall samples. In total 147 taxa were distinguished of which 85 of the family Carabidae. 64 taxa of Hymenoptera were identified. The most abundant were the ants (Formidae), 30,000 of totally 57,000 Hymenoptera. Mites were almost exclusively collected in weed samples. 25 taxa were distinguished. Moderate abundant groups were Heteroptera, Araneae, Arthropleona, Isopoda, Diptera and Chilopoda. An overview can be found in Figure A1.1; for details see Appendix A1.3.

## Calculations and statistics

Taxa with low occurrence (less than fifteen) were pooled with taxonomically related taxa, and when no related taxa were present, they were excluded from the analysis. Effects at the community level were analysed using multivariate techniques. Ordination techniques were used to get insight in the role of relevant variables. Principal response curves were made helping the interpretation of the results of the ordination techniques. Data were log transformed prior to analyses. Data were analysed including the toxic references, and data were analysed with the test substance compared to the control, and the toxic reference compared to the control. The different sampling types were analysed separately and together. The significance of the first ordination axes and the individual sampling moments were tested with Monte Carlo permutation tests.

Effects on individual taxa were analysed using univariate statistics, always for separate sample types. Only (pooled) taxa with densities above fifteen were considered for univariate statistics. ANOVA or Mann-Whitney U test was used, followed by Dunnett's t-test.

# Results

## Actual spray volumes

Application rates deviated less then 1% from the intended rates. Water sensitive paper showed adequate spray deposit coverage.

## Community response

Figure A1.2 shows the community response of all samples combined. From Figure A1.2 it is clear that only the two highest treatments show a response, significant in the highest treatment at the first sampling after treatment.

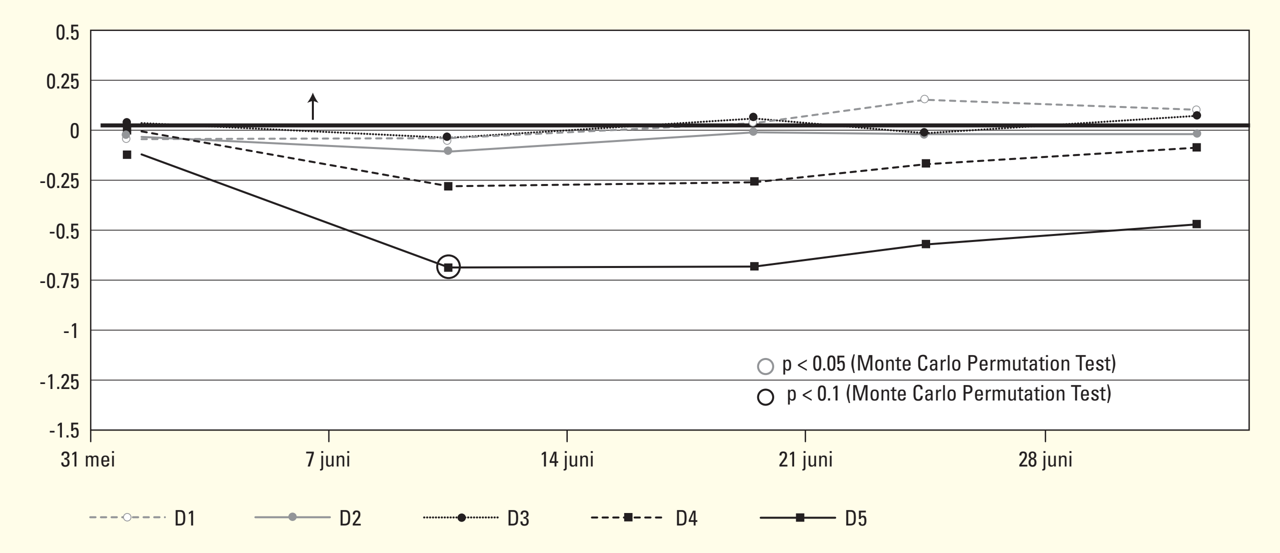


*Figure A1.2 Community response of all samples combined (copied from research report); y-axes is canonical coefficient.*

The taxa with the highest contribution to this response pattern were the Cicadellidae, the Arthropleona and *Phrurolithus* (Liocranidae). The carabid species *Brachinus* and *Poecilus* cupreus showed the largest opposite response.

Looking at the different sampling types, a comparable response was found for most sample types, except for the Berlese traps, which did not show a clear correlation. The aspirator data show significant effects on the second and third sampling date after application in the highest treatment, and non significant treatment related responses on several sampling dates.

Total number of specimens in the pitfall traps were only reduced in the highest treatment (5 g a.s./ha) one week after application.

## Single taxa

In the lowest three test rates none of the taxa showed a consistent treatment related response. In the two highest treatment rates, treatment related effects were seen, and in the highest treatment rate these effect were statistically significant in a number of occasions. The results for the single taxa are summarised in Table A1.2. For details see Appendix A1.2., showing the aggregated raw data of the study.
The results show that for a number of taxa in the highest treatment rate effects of > 50% are found, without recovery within the study period. In the D4 treatment a statistically significant effect of > 50% is found without recovery in one case only. Non significant effects or effects on single sampling moments are found for more taxa.

## Reference item

The reference item (lambda-cyhalothrin) showed significant effects on the community structure for all sampling methods, except the arthropods extracted from weed samples on some sampling moments. Also clear significant effects were found on total number of taxa and a number of individual taxa.

## Conclusion

The authors of the study report conclude that at simulated drift rates of one times, two times, and three times X g ABC/ha no statistically significant reductions were found and therefore three times X g ABC/ha can be seen as NOER. At four times X g ABC/ha only for one taxon a statistically significant reduction was found, with a tendency for recovery. Only weak community responses were found, that were not statistically detectable, and therefore this rate is classified as NOEAER (no observed ecological adverse effect rate). At five times X g ABC/ha a statistically significant community response was found, and for a number of taxa statistically significant effects were found without recovery in the study period. Therefore this rate is classified as the LOEAER (lowest observed ecological adverse effect rate).

*Table A1.2 Summary table population level effects (copied from research report)*

| Order | Taxon | Family | Rates with pronounced dose related treatment effects | |
|---|---|---|---|---|
| **Coleoptera** | Carabidae (E) | | D4 | D5 |
| | Lathridiidae (P) | | D4 | D5 |
| | Staphylinidae (P) | | | D5 |
| | Apion (A) | Curculionidae | | D5 |
| | *Tythaspis sedecimpunctata* | Coccinellidae | D4 | D5 |
| | Other Coccinellidae (P) | | | D5 |
| | juvenile Coccinellidae (P) | | D4 | D5 |
| | juvenile Dermestidae (P) | | | D5 |
| | juvenile Coleoptera (A) | | | D5 |
| **Hymenoptera** | Aphidiinae (A) | Braconidae | D4 | D5 |
| | Scelionidae (P) | | | D5 |
| | Encyrtidae (P) | | | D5 |
| | Mymaridae (A) | | | D5 |
| | Mymaridae (E) | | | D5 |
| | Trichogrammatidae (E) | | | D5 |
| **Diptera** | *Drassodes pubescens* (Ad.) (P) | Gnaphosidae | | D5 |
| | *Phrurolithus* (P) | Lycocranidae | | D5 |
| | *Xysticus* (Ad.) (P) | Thomisidae | | D5 |
| | *Europhrys* (P) | Salticidae | | D5 |
| | *Pagygnatha degeeri* (P) | Tetragnathidae | | D5 |
| | *Homalenotus* (P) | Opiliones | | D5 |
| **Collembola** | Arthropleona (P) | | | D5 |
| | Collembola (A) | | D4 | D5 |
| | Arthropleana (E) | | D4 | D5 |
| **Hemiptera** | Cicadellidae juv. (P) | | D4 | D5 |
| | Cicadellidae (P) | | D4 | D5 |
| | Cicadellidae (A) | | D4 | D5 |
| | Cicadellidae (A) | | | D5 |
| | Cicadellidae (E) | | D4 | D5 |
| **Orhoptera** | (P) | | | D5 |
| | (juveniles) (A) | | | D5 |
| % of taxa with reductions > 50% observed on at least one sampling moment | | | 9% | 26% |
| % of taxa with reductions > 50% and statistically significant on at least one sampling moment | | | 3% | 14% |
| % of taxa with no recovery (reductions > 50% on last sampling moment) | | | 3% | 11% |
| % of taxa with no recovery (reductions > 50% and statistically significant on last sampling moment) | | | 0% | 6% |
| | Pronounced effect on total taxon abundance: | | no | no |
| | Pronounced effect on total arthropod abundance: | | no | yes |
| D5 | Treatment related reduction > 50% observed on at least one sampling moment | | | |
| D5 | Treatment related reduction > 50% were statistically significant on at least one sampling moment | | | |
| D5 | Treatment related reduction remained > 50% until the last sampling moment | | | |
| D5 | Treatment related reduction remained > 50% and were statistically significant on the last sampling moment | | | |
| | Taxon collected from (P) pitfall, (A) aspirator, (E) photo-eclector or (W) weed/Berlese samples | | | |
| | For evaluations only obviously dose related effects are considered | | | |
| | Total taxa evaluated: 18; Total taxa evaluated on last sampling moment: 102 | | | |
| D1: 1 times X g ABC/ha; D2: 2 times X g ABC/ha; D3: 3 times X g ABC/ha; D4: 4 times X g ABC/ha; D5: 5 times X g ABC/ha | | | | |

*Table A1.3 Checklist for the aspects that generally are considered of importance when evaluating non-target arthropod field studies*

| Test item | Notes | Reliability lower? |
|---|---|---|
| Description | | |
| 1. Substance | Considering the substance it should be noted that for the purpose of this summary use has been made of an example, anonymised field study. Therefore no reference can be made to the actual a.s. and formulation, and detailed information about the identity, mode of action and the target organisms is not available. For an evaluation in the framework of a registration this kind of information would be essential. For the purpose of the present guidance document, we ignore the lack of this information, and assume that the necessary information concerning the substance is adequately addressed. | |
| 1.1 Purity | | N |
| 1.2 Formulation | | N |
| 1.3 Use class / mode of action | | N |
| 2. Test site | | |
| 2.1 Location | adequately reported. | N |
| 2.2 Field history | adequately reported. | N |
| 2.3 Characterisation of the crop | Information about soil type is lacking [Ri assigned by expert judgement, soil type is important for soil dwelling organisms, therefore Ri 2 is assigned] | Y [→ Ri 2] |
| 2.4 General weather conditions | adequately reported. | N |
| 3. Application | | |
| 3.1 Method of application | adequately reported | N |
| 3.2 Application rate and volume applied per ha | adequately reported | N |
| 3.3 Verification of application | adequately reported | N |
| 3.4 Application scheme | adequately reported | N |
| 3.5 (Micro) climate | adequately reported | N |
| 4. Test design | | |
| 4.1 Type & size | adequately reported | N |
| 4.2 Test date and duration | adequately reported | N |
| 4.3 Pre-treatment | adequately reported | N |
| 4.4 Untreated control | adequately reported | N |
| 4.5 Toxic reference | adequately reported | N |
| 4.6 Replications | adequately reported | N |
| 4.7 Statistics | adequately reported | N |
| 4.8 GLP | adequately reported | N |
| 5. Biological system | | |
| 5.1 Test organisms | adequately reported | N |
| 5.2 Community | Representatives of all essential groups as mentioned in Table 4 of guidance for summarising and evaluating non-target arthropod studies, were present in the field study. | N |
| 6. Sampling | | |
| 6.1 General features | adequately reported | N |
| 6.2 Actual rate | adequately checked | N |
| 6.3 Biological sampling | samples were taken shortly before application and on several time intervals after application. Duration of the test is 1 month, which excludes the possibility to observe longer term effects and recovery after 1 month. | N |
| 6.4 (Micro) climate | adequately reported | N |
| Results | | |
| 7. Application | | |
| 7.1 Actual application rate | Application rates deviated less then 1% from the intended rates. Water sensitive paper showed adequate spray deposit coverage. | N |
| 7.2 Condition of application | adequately reported | N |
| 7.3 (Micro) climate | adequately reported | N |
| 8. Endpoint | | |
| 8.1 Type | endpoints are reported in detail | N |
| 8.2 Value | endpoints are reported in detail | N |
| 8.3 Verification of endpoint | possible with available data | N |
| 8.4 Pre-treatment | adequately reported | N |

| Test item | Notes | Reliability lower? |
|---|---|---|
| Description | | |
| 8.5 Untreated control | adequately reported | N |
| 8.6 Toxic reference | the toxic reference showed clear effects for almost all taxa | N |
| 9. Elaboration of results | | |
| 9.1 Statistical comparison | The pre-treatment variation is relatively large, leading to few significant differences with the control. Significant differences were only found for differences of about 50% and more. The power analysis is not adequate. The minimum detectable difference is not given. Clear significant effects were found in the toxic reference for almost all taxa. Statistical analyses methods are up-to-date and adequate. | Y [→ Ri 2] |
| 9.2 Presentation of results | both multivariate and univariate analyses are presented in tables and figures | N |
| 9.3 Community level impact | multivariate analyses available | N |
| 10. Classification of effects | effects are classified, and the classification can be reproduced from the available data | N |

# Evaluation

## Evaluation of the reliability of the study

For the evaluation of the reliability of the study, of the checklist from the guidance for summarising and evaluating non-target arthropod studies has been used (see Table A1.3).
Summarising the conclusions of the evaluation of the scientific reliability, it is concluded that the design, conduct, elaboration of the results and the report is up-to-date and adequate. A dose-response design was used; an untreated and a toxic reference were included. Because of the lack of an adequate power analyses a Ri 2 is assigned.

## Evaluation of the results of the study

In Appendix A1.1 the results of the study are summarised, based on Appendix 6 of the research report and on additional analyses of differences, significant at P = 0.10. The data indicate that a number of times effects of > 50% are found. Effects < 50% are seldom significant at P = 0.05, indicating that this is the sensitivity of the test.
The results of the study were classified according to the classification shown in Table A1.4.
The classification of the effects based on Appendix A1.1 and Table A1.4 are given in Table A1.5.

*Table A1.4 Proposed classification of the effects in non-target arthropod field studies*

| Effect class | Description | Criteria |
|---|---|---|
| 1 | Effects could not be demonstrated (NOER) | • No (statistically significant) effects observed as a result of the treatment<br>• Observed differences between treatment and controls show no clear causal relationship |
| 2 | Slight and transient effects | • Quantitatively restricted response of one or a few taxa and only observed on one sampling occasion |
| 3 | Pronounced short term effects; recovery within two months after first application | • Clear response of taxa, but full recovery within two months after the first application<br>• Effects observed at two or more sampling instances |
| 4 | Pronounced effects; recovery within four months after first application | • Clear response of taxa, effects last longer than two months but full recovery within four months after the first application<br>• Effects observed at two or more sampling instances |
| 5 | Pronounced effects; recovery within eight months after first application | • Clear response of taxa, effects last longer than four months but full recovery within eight months after the first application<br>• Effects observed at two or more sampling instances |
| 6 | Pronounced effects; full recovery one year after first application | • Clear response of taxa, effects last longer than eight months but full recovery one year after first application<br>• Effects observed at two or more sampling instances |
| 7 | Pronounced effects; full recovery more than one year after first application | • Clear response of taxa, effects last longer than twelve months after the first application but full recovery found within the study period<br>• Effects observed at two or more sampling instances |
| 8 | Pronounced effects; no recovery within the study period | • Clear response of taxa, no recovery within the duration of the study<br>• Effects observed at two or more sampling instances |

*Table A1.5 Classification of the effects*

| | Dose | 1x | 2x | 3x | 4x | 5x |
|---|---|---|---|---|---|---|
| **INSECTA** | | | | | | |
| Heteroptera | Juv | 1 | 1 | 1 | 1 | 1 |
| Sternorrhyncha | Aphidoidae | 1 | 2↓ | 2↓ | 1 | 2↓ |
| | Cicadellidae juv | 1 | 1 | 1 | 3↓ | 8↓ |
| | Cicadellidae ad. | 1 | 1 | 1 | 2↓ | 8↓ |
| | Lygaeidai | 2↓ | 1 | 1 | 1 | 2↓ |
| | Other | 2↓ | 1 | 1 | 1 | 1 |
| Hymenoptera | Formicidae | 1 | 3↓ | 1 | 1 | 1 |
| | Ichneumonoidae | 2↓↑ | 2↓ | 1 | 2↓ | 2↓ |
| | Aphidiinae | 1 | 2↓ | | 2↓ | 8↓ |
| | Mymaridae | 1 | 1 | 1 | 1 | 2↓ |
| | Trichogrammatidae | 1 | 1 | 1 | 1 | 2↓ |
| | Chalcidoidae pooled | 1 | 2↓ | 1 | 1 | 2↓ |
| | Diapriidae | 1 | 1 | 1 | 2↓ | 2↓ |
| | Scelionidae | 2↓ | 2↓ | 1 | 1 | 2↓ |
| Coleoptera | juv/other | 1 | 1 | 1 | 1 | 1 |
| Carabidae | | 1 | 1 | 1 | 1 | 1 |
| Staphylinidae | juv | 1 | 2↓ | 1 | 1 | 2↓ |
| | Tachyporinae | 1 | 1 | 1 | 1 | 2↓ |
| Coccinellidae | juv. | 1 | 1 | 1 | 1 | 3↓ |
| | | 1 | 1 | 1 | 1 | 1 |
| | | 1 | 1 | 1 | 1 | 1 |
| | | 1 | 1 | 1 | 1 | 1 |
| | | 1 | 2↓ | 1 | 1 | 2↓ |
| Lathridiidae | juv./adults | 2↓ | 1 | 1 | 1 | 3↓ |
| | Agriotes spp. | 1 | 1 | 1 | 1 | 1 |
| Collembola | | 1 | 1 | 1 | 1 | 2↓ |
| | Arthropleona | 1 | 1 | 1 | 1 | 8↓ |
| Diptera | juv./other | 1 | 1 | 1 | 1 | 1 |
| | Phoridae | 1 | 1 | 1 | 2↑ | 1 |
| | Coccoidae | 1 | 1 | 1 | 1 | 1 |
| Lepidoptera | juv. | 1 | 1 | 1 | 1 | 1 |
| Orthoptera | order | 1 | 1 | 1 | 1 | 2↓ |
| Thysanoptera (adults) | | 1 | 1 | 2↓ | 2↓ | 2↓ |
| | | 2↓ | 2↓ | 1 | 1 | 1 |
| **ARANEA** | | | | | | |
| Hunting spiders | | | | | | |
| Lycosidae | Alopecosa | 1 | 1 | 1 | 1 | 1 |
| Thomisidae | *Xysticus* ad | 1 | 1 | 1 | 1 | 2↓ |
| Gnaphosidae | *Drassodes pubescens* | 1 | 1 | 1 | 1 | 1 |
| | *Zelotes* | 1 | 2↓ | 1 | 1 | 1 |
| Corrinidae | *Phrurolithus* | 1 | 2↓ | 1 | 1 | 8↓ |
| Salticidae | *Euophrys* | 1 | 1 | 1 | 1 | 8↓ |
| Web spiders | | | | | | |
| Linyphiidae | | 1 | 1 | 1 | 1 | 1 |
| Dictynidae | *Argenna subnigra* | 1 | 1 | 1 | 1 | 2↓ |
| Tetragnathidae | | 1 | 1 | 1 | 1 | 1 |
| **Opiliones** | Sclerosomatidae | 1 | 1 | 1 | 1 | 1 |
| **Acari** | | | | | | |
| Gamasida | | 1 | 1 | 1 | 1 | 1 |
| | Phytoseiidae female | 1 | 2↓ | 1 | 2↓ | 1 |

| | Dose | 1x | 2x | 3x | 4x | 5x |
|---|---|---|---|---|---|---|
| Actinedida | | 1 | 1 | 1 | 1 | 1 |
| Gamasida | | 1 | 1 | 1 | 1 | 1 |
| | Phytoseiidae female | 1 | 2↓ | 1 | 2↓ | 1 |
| Actinedida | | 1 | 1 | 1 | 1 | 1 |
| Oribatida | | 1 | 2↑ | 1 | 1 | 1 |
| Eupodina | Eriophyoidae | 2↓ | 1 | 1 | 1 | 1 |
| | Tydeidae | 1 | 2↓ | 1 | 1 | 1 |
| Pygmephoridae | | 1 | 1 | 1 | 1 | 1 |
| Tarsonemidae | | 1 | 1 | 1 | 1 | 1 |
| Tetranychidae | | 1 | 1 | 1 | 1 | 1 |
| **Crustacea** | Isopoda | 1 | 1 | 1 | 1 | 1 |
| **Diplopoda** | | 1 | 1 | 1 | 1 | 1 |
| **Chilopoda** | | 1 | 1 | 1 | 1 | 1 |

## Conclusion of the evaluator

From Table A1.5 (and Appendix A1.1) it is clear that most effects are found for insects.

- Based on the univariate analyses, at the population level the NOER was found at < 1x.
- At the community level the NOER was found at 3x.
- At the 4x rate clear responses were observed, but full recovery occurred within the experimental period of one month. When this recovery period is deemed ecologically acceptable for the off-crop habitat, the 4x rate may be considered the NOEAER (No Observed Ecological Adverse Effect Rate).
- The 5x rate caused clear responses in many taxa and full recovery was not observed within one month. This rate is the community and population LOEAER (Lowest Observed Ecological Adverse Effect Rate).

## Suggestions for use in risk-assessment

The study under evaluation provides a novel approach to assessing the risk of spray drift events for non-target arthropods in the off-crop area. It deviates from current recommendations under Directive EC 91/414 in several important respects:

1. The test system was chosen in a true off-crop habitat rather than in an in-crop situation subjected to agricultural inputs. This aspect should reduce uncertainty with respect to potential diffences in species sensitivity between in- and off-crop species, as the NTA exposed in this study may be considered representative for an off-crop situation in NW Europe. For the determination of a regulatory acceptable rate, the use of an assessment factor on the NOEAER could be considered, based on the fact that one field study is available, and no information about the variation between studies is at hand. From a parallel with the aquatic environment, an assessment factor of three could be considered. Obviously more studies would be needed to judge variability among the different effect levels in off-crop sites.
2. Rather than testing the effect level at a fixed rate representative for expected drift at a certain distance from a treated area in a specific cropping system under specified GAP-conditions, this study aimed at finding NOER/NOEAER/LOEAER. This enables the regulator to use that data for a wide range of cropping systems and use patterns. By comparing the LOEAER (or a derived value) to the expected distance found from standard drift models for a specific situation (involving the same product formulation) it is quickly seen at what distance from the treated crop effects may be considered acceptable.
3. The recovery endpoint for off-crop situations was made explicit. The risk manager now has the possibility to judge whether a recovery within four weeks post-application is considered acceptable. This enables unambiguous interpretation of the data.
4. The field study design allows for detecting statistical significant differences (at P = 0.05) between treatment and control of 50%. While this might be an accepted level of effect for the in-crop situation, it is questionable whether the same level of effect is acceptable for the off-crop situation. A higher level of detection, however, would put high demands on the study design.

# Appendix A1.1

*Summary of the results based on Appendix 6 of the study report (see Appendix A1.2). Different sample types are combined, an arrow means statistically significant at P = 0.01, grey means statistical significant at P = 0.05.*

| | | D1 | | | | | D2 | | | | | D3 | | | | | D4 | | | | | D5 | | | | | Ref | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | –1 | 1 | 2 | 3 | 4 | –1 | 1 | 2 | 3 | 4 | –1 | 1 | 2 | 3 | 4 | –1 | 1 | 2 | 3 | 4 | –1 | 1 | 2 | 3 | 4 | –1 | 1 | 2 | 3 | 4 |
| **INSECTA** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Heteroptera | Juv | | | | | | | | | ↓ | | | | | ↓ | | | | | | | | | | | | | ↓ (grey) | ↓ (grey) | ↓ (grey) | ↓ (grey) |
| Sternorrhyncha | Aphidoidae | | | ↓ | | ↑ | | ↓ (grey) | ↓ | | | | | ↓ (grey) | | | | | | | | | ↓ (grey) | | | | | ↓ (grey) | ↓ (grey) | ↓ (grey) | ↓ (grey) |
| | Auchenorrhyncha others | | | | | | ↓ | | | | | | | | | | | | | | | ↓ | | | | | ↓ (grey) | ↓ (grey) | ↓ (grey) | ↓ (grey) | |
| | Cicadellidae juv | | | | | | | | | | | | | ↓ | | | | ↓ (grey) | ↓ (grey) | ↓ (grey) | | | ↓ (grey) | ↓ (grey) | ↓ (grey) | ↓ (grey) | | ↓ (grey) | ↓ (grey) | ↓ (grey) | ↓ (grey) |
| | Cicadellidae ad. | | | | | | | | | | | | | | | | | | ↓ (grey) | | | | ↓ (grey) | ↓ (grey) | ↓ (grey) | ↓ (grey) | ↓ (grey) | ↓ (grey) | ↓ (grey) | ↓ (grey) | ↓ (grey) |
| | Lygaeidai | | ↓ (grey) | | | | | | | | | | | | | | | | | | | | ↓ (grey) | | | | | ↓ (grey) | | | |
| | Pentatomidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Other | | | ↓ (grey) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hymenoptera | Formicidae | | | | | | | | | ↓ (grey) | ↓ (grey) | | | | | | | | | | | | ↓ | ↓ | ↓ | | | | | | |
| | Ichneumonoidae | | ↓ (grey) | ↑ (grey) | | | | ↓ (grey) | | | | | ↓ | | | | | ↓ (grey) | | | | | ↓ | | | | | ↓ (grey) | ↓ (grey) | ↓ (grey) | ↓ (grey) |
| | Aphidiinae | | | | | ↓ | | | | ↓ (grey) | | | | | | | | | | | ↓ | | | | ↓ | ↓ | | | | ↓ (grey) | ↓ (grey) |
| | Bracionidae | | | | | | | | | | | | | | | | | | | | | | | | | | | ↓ (grey) | ↓ (grey) | ↓ (grey) | ↓ (grey) |
| | Eulophidae | | | | | | | | | ↓ | | | | | | | | | | | | | | | | | | ↓ (grey) | | | |
| | Encyrtidae | | ↓ | | | | | | | | | | ↓ | | | | | ↓ | | | | | | | | | | | | ↓ (grey) | |
| | Chalcidoidae | | | | ↓ | | | ↓ (grey) | | | ↓ | | | | | | | | | | | | ↓ (grey) | | | | | ↓ (grey) | | ↓ (grey) | ↓ (grey) |
| | Mymaridae | | | | | | | | | | | | | | | | | | | | | | ↓ (grey) | | | | | ↓ | | | |
| | Pteromalidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | ↓ (grey) | | |
| | Trichogrammatidae | | | | | | | ↓ | | | | | ↓ | | | | | ↓ | | | | | ↓ | | ↓ (grey) | | | ↓ | ↓ (grey) | ↓ (grey) | |
| | Diapriidae | | | | | | | | | | | | | | | | | ↓ (grey) | | | | | ↓ (grey) | | | | | | | | |
| | Scelionidae | ↓ (grey) | ↓ (grey) | | ↓ | | ↓ (grey) | ↓ | | | ↓ (grey) | | | | | ↓ | | ↓ | | | | | ↓ (grey) | | | | | | | ↓ (grey) | ↓ (grey) |
| | Parasitica | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Coleoptera | Juv | | | | | | | | | | | | | | | | | | | | | | | | | | | ↓ (grey) | ↓ (grey) | ↓ (grey) | ↓ (grey) |
| | Other | | | | | | | | | | | | | | | | | | | | | | | | | | | ↓ (grey) | | ↓ | ↓ (grey) |
| Carabidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Amara kulti | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Brachinus | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Harpalus | | | | | | | | | | | | | | | | | | | | | | ↓ | | | | | | | | |
| | Poecilus cupreus | | | | | | | | | | | | | | | | | | | ↑ | | | | ↑ (grey) | | | | | | | |
| | Pseudoophonus rufipes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Staphylinidae | | | | | | | ↓ (grey) | | | | | | | | | | | | | | | ↓ (grey) | | | | | ↓ (grey) | | | | |
| | | | | | | | | | | | | | | | | | | | | | | ↓ | | | | | | | | ↓ | ↓ |
| | | | | | | | | | | | | | | | | | | | | | | | ↓ (grey) | | | | | | | | |
| Coccinellidae | Adults | | | | | | | | | | | | | | | | | | | | | | | | | | | | ↓ | | ↓ (grey) |
| | Juv | | | | | | | | | | | | | | | | | | | | | | ↓ (grey) | ↓ (grey) | | | | ↓ (grey) | ↓ (grey) | ↓ (grey) | ↓ (grey) |
| | Tytthaspis sedecimpunctata | | | | | | | | | | | | | | | | | | | | | | ↓ | | | | | ↓ | | ↓ (grey) | ↓ |
| Corylophidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ↓ | ↓ |
| Curculionidae | Ephitemus spp | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Apion spp. | | | | | | | | | | | | | | | | | | | | | | | | ↓ | | | ↓ | ↓ | ↓ | |
| Melyridae | | | | | | | | | | | | | | ↓ | | | | | | | | | | ↓ | | | | | ↓ | | ↓ |
| Dermestidae juv. | | | | | | | | | ↓ (grey) | | | | | | | | | | | | | | | ↓ (grey) | | ↓ | | | ↓ (grey) | | |
| | Dermestes spp. | | | | | | | | | | | | | | | | ↓ | | | | | ↓ | | | | | | | ↓ (grey) | | |
| Lathridiidae | juv./adults | | | ↓ (grey) | | | | | | | | | | ↓ | | | | | | ↓ | | ↓ | ↓ (grey) | ↓ (grey) | ↓ (grey) | | | ↓ (grey) | ↓ (grey) | ↓ (grey) | ↓ (grey) |
| Elateridae | Agriotes spp. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ↓ (grey) | ↓ (grey) |
| Collembola | | | | | | | | | | | | | | | | | | | | | | | ↓ (grey) | ↓ | | | | | | | |
| | Arthropleona | | | | | | | | | | | | | | | | | | | | | | ↓ (grey) | ↓ (grey) | ↓ | ↓ (grey) | | | | | |

| | | D1 | | | | | D2 | | | | | D3 | | | | | D4 | | | | | D5 | | | | | Ref | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | –1 | 1 | 2 | 3 | 4 | –1 | 1 | 2 | 3 | 4 | –1 | 1 | 2 | 3 | 4 | –1 | 1 | 2 | 3 | 4 | –1 | 1 | 2 | 3 | 4 | –1 | 1 | 2 | 3 | 4 |
| Diptera | Other juv. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Cecidomyiidae | | | | | ↓ | | ↓ | | | | | | | | | | | | | | | | | | | **↓** | **↓** | **↓** | **↓** | **↓** |
| | Sciaridae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Phoridae | | | | | | | | | | | | | | | | | | | **↑** | ↑ | | | | | | | | | ↓ | ↓ |
| | Chloropidae | | | | | | | | | | | | | | | | | | | | | | ↓ | | | | | **↓** | **↓** | **↓** | **↓** |
| | Acalyptratae (other) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ↓ | ↓ |
| | Anthomyiidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hemiptera | Coccoidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | **↓** | **↓** | **↓** |
| Lepidoptera | juv. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **↓** |
| Orthoptera | order | | | | | | **↓** | | | | | | | | | | | | | | | | **↓** | | | | | **↓** | **↓** | **↓** | **↓** |
| Thysanoptera | juv. | | | | | | | | | | | | **↓** | | | | | **↓** | | | | | **↓** | | | | | ↓ | | | |
| Thysanopter | adults | | | | | | | | | | | | | | | | | | | | | | | | | | | **↓** | | **↓** | |
| Thysanoptera | | | | | **↓** | | | **↓** | | | | | | | | | | | | | | | | | | | | **↓** | **↓** | **↓** | |
| **ARANEA** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hunting spiders | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lycosidae | Alopecosa | | | | | | | | | | | | | | | | | | | | | | | | | | | | ↓ | | |
| | Alulonia albimana | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Pardosa nigriceps | | | | | | | | | | | | | | | | | | | | | | | | | | | **↓** | **↓** | | **↓** |
| | Pardosa pullata | | | | | | | | | | | | | | | | | | | | | | | | | | | | **↓** | **↓** | |
| | Trochosa | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Thomisidae | Oxyptila | | | | | | | | | | | | | | | | | | | | | | | | | | | **↓** | **↓** | **↓** | ↓ |
| | Xysticus juv | | | | | | | | | | | | | | | | | | | | | | | | | | | | ↓ | | |
| | Xysticus ad | | | | | | | | | | | | | | | | | | | | | | **↓** | | | | | **↓** | **↓** | **↓** | **↓** |
| Gnaphosidae | Drassodes pubescens | | | | | | | | | | | | | | | | | | | | | | | | | | | **↓** | | | |
| | Zelotes | ↓ | | | | | | | | | **↓** | | | | | | | | | | | | ↓ | | | | | | | | **↓** |
| Corrinidae | Phrurolithus | | | | | | | | **↓** | ↓ | | | | | | | | | ↓ | | | | ↓ | **↓** | **↓** | **↓** | | | **↓** | **↓** | |
| Salticidae | Euophrys | | | | | | | | | | | | | | ↓ | | | | | | | | | | **↓** | **↓** | | **↓** | ↓ | | |
| Web spiders | Family | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Linyphiidae | Micrargus subaequalis | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Pocadicnemis juncea | | | | | | | | | | | | | | | | | | | | | | | | | | | | ↓ | | |
| Dictynidae | Argenna subnigra | | | | | | | | | ↓ | | | | | | | | ↓ | | | | | **↓** | | | | | **↓** | **↓** | **↓** | |
| Tetragnathidae | Pachygnatha degeeri | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ↓ | **↓** |
| **Opiliones** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sclerosomatidae | Homalenotus | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Acari** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Gamasida | Nymph & male | | | | | | | | | | | | | | | | | | | | | **↑** | | | | | | | ↓ | | |
| | Phytoseiidae female | | | | | | | **↓** | | | | | ↓ | | | | | **↓** | | | | **↑** | | | | | | **↓** | **↓** | | |
| | Total | | | | | | | | | | | | | | | | | ↓ | | | | **↑** | | | | | | ↓ | **↓** | ↓ | |
| Actinedida | Erithraeidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Oribatida | Suborder | | | | | | | | | | **↑** | | ↓ | | | | | | | | | | | | | | | | | | |
| Eupodina | Eriophyoidae | | | | | **↓** | | | | | | | | | | | | | | | | | | | | | | | | **↓** | |
| | Tydeidae | | | | | | | | **↓** | | | | | | | | | | | | | | | | | | | | **↓** | ↓ | ↓ |
| Pygmephoridae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tarsonemidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tetranychidae | | | | | | ↓ | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Crustacea** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Isopoda | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ↓ | **↓** |
| **Diplopoda** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Chilopoda** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

## Appendix A 1.2 Results statistical analyses single taxa

Treatment effects were quantified using Abbott's formula (Abbott, 1925). Densities that were statistical significantly different from the control with $P < 0.05$ are indicated with grey and by a bold line around the cell; differences with $P < 0.10$ are indicated with a bold line only.
Statistical analyses: ANOVA/Dunnett's t-test, one sided, or non-parametric Mann-Whitney U-test in case error variance of the dependent variable is not equal across groups at an alpha level of 1% (Levene's test). See also chapter 5.4.

For negative effect values (increased densities compared to control densities) the formula was adapted such that negative values were at maximum 100% instead of infinity, in line with calculation of positive effect values. The general expression used for Abbott was:

If TREAT < CONTROL
Then
1 - ( TREAT / CONTROL)
Else
 - ( 1 - CONTROL / TREAT)

(note that the first part is the conventional Abbott's formula).

In field experiments it can be observed that some taxa increase in density rather than decrease due to (indirect) treatment effects. Abbott's effect calculation turns increasing densities into much larger effects than decreasing densities.

This is illustrated with an example:
If total numbers in the control were 100 and in the treatment plots 20, the effect according to Abbott would be 1 - (20 / 100) = 80%.
If however densities increased in treatment plots and the situation were reversed (20 in the water control and 100 in the treatment plot), the effect would be 1 - (100 / 20) = - 400%. Actually, in both cases one density is one fifth of the other. It would therefore be more straightforward to express this negative effect as - (1 - (20 / 100)) = - 80%.

| | S1 | S2 | S3 | S4 | S5 | S1 | S2 | S3 | S4 | S5 |
|---|---|---|---|---|---|---|---|---|---|---|
| **PITFALL** | | | **D1** | | | | | **D2** | | |
| Arthropleona | -45% | -4% | 8% | 22% | -37% | -41% | 23% | -19% | 25% | -7% |
| Orthoptera | 41% | -13% | 36% | -33% | -25% | 78% | 12% | 10% | -37% | 2% |
| Thysanoptera | | -19% | | | | | 10% | | | |
| Aphidoidea | 42% | 72% | -8% | -58% | -54% | 85% | 89% | 5% | 22% | -15% |
| Cicadellidae juv. | 28% | 38% | 29% | 9% | -30% | 11% | 9% | 9% | -12% | -19% |
| Cicadellidae ad. | 40% | 10% | 41% | -13% | 0% | 45% | 34% | 42% | -1% | 5% |
| Lygaeidae ad. | | 67% | 20% | 42% | 26% | | 46% | 12% | 10% | 0% |
| Pentatomidae ad. | | 32% | -44% | | 0% | | 43% | -53% | | 73% |
| Heteroptera other | 35% | 79% | 36% | -32% | -35% | 41% | 26% | 55% | -28% | -5% |
| Lepidoptera juv. | | | | | -50% | | | | | 60% |
| Cecidomyiidae | | -9% | | | | | -3% | | | |
| Sciaridae | -26% | | | | | 76% | | | | |
| Phoridae | 60% | -45% | 26% | 45% | 24% | 13% | -42% | -2% | 30% | 19% |
| Chloropidae | 27% | 32% | -40% | 31% | 29% | 45% | 26% | -27% | 33% | 19% |
| Acalyptratae (other) | | 67% | 35% | | | | 89% | -5% | | |
| Anthomyiidae | | | | | | | | | | |
| Diptera (other) juv. | | 54% | | | 91% | | 89% | | | 97% |
| Formicidae | -16% | 32% | 11% | 7% | 16% | 42% | 47% | 42% | 42% | 47% |
| Ichneumonoidea | | 86% | -5% | | -6% | | 68% | -5% | | -6% |
| Encyrtidae | | 67% | 26% | 69% | -14% | | 35% | -19% | 38% | -58% |
| Chalcidoidea other | | -10% | 14% | | | | 6% | -63% | | |
| Diapriidae | 39% | 31% | 20% | -35% | -38% | 46% | 69% | 51% | 13% | -40% |

| | S1 | S2 | S3 | S4 | S5 | S1 | S2 | S3 | S4 | S5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Scelionidae | 25% | 69% | 43% | 45% | -6% | 25% | 54% | 29% | 60% | 55% |
| Isopoda (all) | -69% | 58% | -59% | -58% | -40% | 79% | 28% | 63% | 58% | 77% |
| Diplopoda (all) | 3% | 35% | 53% | 50% | 7% | 20% | 24% | 11% | 0% | -7% |
| Chilopoda (all) | -11% | 5% | -1% | -17% | 19% | 62% | 5% | -15% | 40% | 59% |
| Erythraeidae | -40% | | 83% | -1% | -16% | 14% | | 12% | -61% | -10% |
| Tytthaspis sedecimpunctata | | 40% | 63% | 21% | 39% | | -2% | 38% | -20% | 27% |
| Coccinellidae (others) | 53% | | | | 33% | 51% | | | | 14% |
| Coccinellidae juv. | | 49% | 40% | -30% | -7% | | 18% | 40% | 43% | -8% |
| Corylophidae | | | | 24% | 39% | | | | 30% | 33% |
| Ephistemus spp. | | | 23% | 20% | 2% | | | -41% | -21% | -46% |
| Curculionidae | 48% | 25% | -21% | | -49% | 61% | 60% | 15% | | 0% |
| Dermestes spp. | 47% | | 34% | | | 84% | | 33% | | |
| Dermestidae juv. | 49% | 77% | 50% | 9% | 21% | 71% | 67% | 41% | 49% | 24% |
| Agriotes spp. | 39% | 27% | 39% | 70% | 55% | 12% | -17% | 19% | 48% | 4% |
| Lathridiidae | 76% | -4% | 61% | -7% | 27% | 10% | 24% | 22% | -5% | -10% |
| Aleocharinae | 33% | 62% | 45% | -15% | 19% | 49% | 58% | 62% | 38% | 38% |
| Tachyporinae | | | 47% | | -41% | | | -3% | | -33% |
| Staphylinidae (others) ad. | -14% | 46% | 42% | -17% | 0% | 32% | 65% | 40% | 13% | 46% |
| Staphylinidae juv. | 20% | 52% | 55% | 19% | -34% | 56% | 77% | 32% | 69% | 65% |
| Coleoptera juv. (others) | | 29% | 35% | 52% | 22% | | 41% | -23% | 48% | 26% |
| Amara kulti | -26% | 43% | 48% | 68% | 5% | -39% | -4% | 16% | 44% | 38% |
| Brachinus | 63% | | -40% | 52% | 11% | 46% | | 52% | 75% | 66% |
| Harpalus | 56% | 24% | -39% | -41% | -34% | 35% | -40% | -38% | -31% | -19% |
| Poecilus cupreus | | | -62% | 24% | -5% | | | -67% | -30% | -60% |
| Pseudoophonus rufipes | | | -3% | | | | | -24% | | |
| Drassodes pubescens Ad. | -5% | 36% | -20% | | | -17% | -8% | -12% | | |
| Zelotes | 48% | -19% | -25% | 15% | 36% | -9% | -15% | 7% | 49% | 55% |
| Phrurolithus | | 10% | -7% | -35% | -34% | | 37% | 53% | 41% | 52% |
| Oxyptila | 47% | -26% | 9% | -8% | 14% | -21% | -19% | -13% | -23% | -19% |
| Xysticus juv | | | 55% | | 52% | | | 0% | | 36% |
| Xysticus adult | -43% | -7% | -25% | -14% | -25% | -28% | -39% | -29% | -11% | -18% |
| Euophrys | | 7% | -27% | 23% | -39% | | 20% | -11% | 45% | -19% |
| Alopecosa | 3% | -6% | -28% | -38% | -16% | 33% | -27% | -41% | -35% | -10% |
| Aulonia albimana Ad. | -53% | 0% | -18% | 3% | -5% | -30% | 23% | 36% | 65% | 44% |
| Pardosa nigriceps | | -11% | 0% | -5% | -46% | | 12% | 1% | -44% | -49% |
| Pardosa pullata Ad. | -24% | -61% | -47% | -30% | -54% | -32% | -60% | -15% | -27% | -47% |
| Trochosa | -21% | | -10% | | -43% | 53% | | 42% | | 44% |
| Argenna subnigra Ad. | -17% | 26% | 42% | -11% | | 13% | 38% | 54% | 35% | |
| Pachygnatha degeeri | 13% | -51% | -8% | -3% | 0% | -61% | -46% | -35% | -29% | -51% |
| Micrargus subaequalis Ad. | | | 16% | | 61% | | | 8% | | 28% |
| Pocadicnemis juncea Ad. | 0% | 17% | -26% | | | -6% | 50% | -4% | | |
| Homalenotus | -8% | 60% | 55% | | | -35% | 51% | 26% | | |
| **PITFALL** | | | **D5** | | | | | **Reference** | | |
| Arthropleona | -41% | 81% | 74% | 34% | -7% | -7% | 0% | 48% | 31% | -3% |
| Orthoptera | 42% | 81% | 13% | -41% | -9% | 53% | 77% | 92% | 95% | 84% |
| Thysanoptera | | 76% | | | | | -48% | | | |
| Aphidoidea | 62% | 82% | 33% | 33% | -42% | 0% | 56% | 8% | -10% | -32% |
| Cicadellidae juv. | 21% | 78% | 90% | 90% | 87% | 32% | 67% | 91% | 95% | 92% |
| Cicadellidae ad. | -30% | 80% | 76% | 50% | 42% | 30% | 81% | 98% | 93% | 88% |
| Lygaeidae ad. | | 71% | 18% | 10% | 39% | | 54% | 64% | 81% | 74% |
| Pentatomidae ad. | | 46% | -52% | | 50% | | 54% | -21% | | 50% |
| Heteroptera other | 27% | 79% | 64% | -13% | -20% | -8% | 63% | 54% | 29% | 33% |
| Lepidoptera juv. | | | | | 0% | | | | | 93% |

| | S1 | S2 | S3 | S4 | S5 | S1 | S2 | S3 | S4 | S5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Cecidomyiidae | | 9% | | | | | -20% | | | |
| Sciaridae | -54% | | | | | -37% | | | | |
| Phoridae | 58% | -16% | -20% | -20% | 16% | -39% | 13% | 57% | 58% | 10% |
| Chloropidae | 27% | 52% | -10% | 37% | 15% | 36% | 52% | 67% | 81% | 74% |
| Acalyptratae (other) | | 78% | 30% | | | | 33% | 55% | | |
| Anthomyiidae | | | | | | | | | | |
| Diptera (other) juv. | | 92% | | | 96% | | -38% | | | 99% |
| Formicidae | 37% | 30% | 59% | 45% | 53% | -34% | -6% | 41% | -1% | 18% |
| Ichneumonoidea | | 71% | 38% | | 21% | | 57% | 5% | | 73% |
| Encyrtidae | | 80% | 49% | 13% | -49% | | 70% | 36% | -16% | -5% |
| Chalcidoidea other | | 80% | 14% | | | | -57% | 59% | | |
| Diapriidae | 32% | 83% | 69% | 40% | -5% | 29% | 26% | 9% | -25% | -48% |
| Scelionidae | 21% | 88% | -2% | -2% | -20% | 29% | 27% | 45% | 32% | 52% |
| Isopoda (all) | 24% | 47% | -30% | -5% | 52% | 65% | 80% | 51% | 52% | 80% |
| Diplopoda (all) | -53% | 14% | -4% | -44% | -41% | -35% | -63% | -61% | -18% | 26% |
| Chilopoda (all) | 47% | 58% | 24% | -53% | -21% | -37% | -79% | -37% | 13% | 22% |
| Erythraeidae | 60% | | 22% | -57% | 0% | -59% | | 94% | -32% | 41% |
| Tytthaspis sedecimpunct. | | 98% | 65% | -8% | -54% | | 96% | 99% | 96% | 97% |
| Coccinellidae (others) | 9% | | | | 67% | 37% | | | | 95% |
| Coccinellidae juv. | | 74% | 87% | 43% | 42% | | 79% | 100% | 100% | 99% |
| Corylophidae | | | | -30% | -33% | | | | 79% | 75% |
| Ephistemus spp. | | | -63% | -48% | -34% | | | 0% | -76% | -77% |
| Curculionidae | 43% | 80% | 42% | | 0% | 22% | 80% | 55% | | 14% |
| Dermestes spp. | 89% | | 62% | | | 68% | | 95% | | |
| Dermestidae juv. | 36% | 88% | 81% | 22% | 60% | 70% | 86% | 94% | 85% | 60% |
| Agriotes spp. | 24% | -12% | 33% | 43% | 6% | 34% | 60% | 88% | 94% | 92% |
| Lathridiidae | 17% | 91% | 74% | 39% | 38% | 43% | 70% | 96% | 89% | 95% |
| Aleocharinae | -26% | 70% | 47% | -8% | 40% | 23% | 48% | 66% | 38% | 83% |
| Tachyporinae | | | 78% | | -9% | | | 28% | | -13% |
| Staphylinidae (others) ad. | -11% | 65% | 58% | 20% | 10% | 4% | 65% | 40% | 20% | 48% |
| Staphylinidae juv. | 40% | 77% | 23% | 6% | 58% | 22% | 71% | 90% | 81% | 97% |
| Coleoptera juv. (others) | | 47% | 13% | 14% | 49% | | 100% | 85% | 86% | 97% |
| Amara kulti | 13% | -36% | -39% | 10% | -65% | -23% | -64% | 69% | 93% | -6% |
| Brachinus | 40% | | -87% | -18% | -68% | 86% | | 78% | 91% | 0% |
| Harpalus | 39% | 38% | 58% | 44% | 39% | 33% | -6% | 12% | 7% | -24% |
| Poecilus cupreus | | | -94% | -81% | -84% | | | 42% | 86% | 76% |
| Pseudoophonus rufipes | | | -27% | | | | | -3% | | |
| Drassodes pubescens Ad. | 15% | 59% | 58% | | | 65% | 86% | 69% | | |
| Zelotes | 21% | 38% | -9% | 15% | 35% | -5% | 47% | 2% | 29% | 61% |
| Phrurolithus | | 73% | 87% | 89% | 95% | | 66% | 80% | 72% | 75% |
| Oxyptila | -15% | 49% | 28% | -25% | -27% | 35% | 83% | 80% | 78% | 54% |
| Xysticus juv | | | 27% | | 30% | | | -27% | | -21% |
| Xysticus adult | -21% | 57% | -14% | -7% | 0% | 56% | 88% | 84% | 88% | 70% |
| Euophrys | | 67% | 41% | 95% | 53% | | 87% | 54% | 64% | 29% |
| Alopecosa | 9% | -6% | -27% | 0% | -39% | 17% | 42% | 41% | 23% | 28% |
| Aulonia albimana Ad. | 13% | 54% | 59% | 49% | 59% | -28% | 60% | 87% | 92% | 95% |
| Pardosa nigriceps | | 41% | 49% | 5% | -32% | | 82% | 78% | 58% | 68% |
| Pardosa pullata Ad. | -12% | 37% | 22% | 12% | -22% | 1% | 85% | 83% | 88% | 33% |
| Trochosa | -21% | | -19% | | -36% | 32% | | 75% | | 70% |
| Argenna subnigra Ad. | 46% | 59% | 50% | 59% | | 29% | 71% | 94% | 88% | |
| Pachygnatha degeeri | 43% | 80% | 70% | 56% | 35% | -64% | 52% | 97% | 97% | 98% |
| Micrargus subaequalis Ad. | | | -26% | | -28% | | | -44% | | -25% |
| Pocadicnemis juncea Ad. | -33% | 50% | 4% | | | 44% | 61% | 80% | | |
| Homalenotus | -58% | 83% | 57% | | | 50% | 23% | 33% | | |

| | S1 | S2 | S3 | S4 | S5 | S1 | S2 | S3 | S4 | S5 |
|---|---|---|---|---|---|---|---|---|---|---|
| **PHOTO ECLECTOR** | | | **D1** | | | | | **D2** | | |
| Arthropleona | -39% | -32% | -61% | -66% | -69% | 27% | -37% | -62% | -18% | -38% |
| Thysanoptera | | -8% | -6% | 4% | 26% | | -3% | -37% | 1% | 27% |
| Aphidoidea | | | 90% | 100% | -61% | | | 90% | 52% | 86% |
| Coccoidea (all) | | | 85% | 50% | 82% | | | 71% | -40% | 10% |
| Cicadellidae | 49% | -42% | 3% | -5% | -30% | 29% | -33% | -55% | -23% | -44% |
| Cecidomyiidae | 17% | -9% | 9% | 26% | 55% | 55% | 62% | 41% | 36% | 50% |
| Phoridae | | | 4% | 61% | 43% | | | 9% | 39% | -48% |
| Ichneumonoidea | | 73% | -73% | 30% | 46% | | 68% | 54% | 41% | 19% |
| Encyrtidae | | | 56% | 76% | 55% | | | 69% | -45% | 53% |
| Mymaridae | 43% | 80% | 25% | | -63% | -8% | 74% | -18% | | -40% |
| Trichogrammatidae | | 49% | 26% | 9% | -25% | | 67% | -13% | -21% | -23% |
| Chalcidoidea (other) | | 55% | 33% | 72% | 45% | | 73% | 69% | -13% | 53% |
| Chalcidoidea pooled | 45% | 64% | 28% | 44% | 19% | 19% | 71% | 15% | -20% | 34% |
| Scelionidae | 81% | 20% | -24% | 61% | 49% | 81% | 80% | 36% | 53% | 75% |
| **ASPIRATOR** | | | **D1** | | | | | **D2** | | |
| Collembola | 76% | 4% | -7% | | 12% | -64% | -17% | -25% | | -59% |
| Orthoptera juveniles | -8% | -4% | 13% | -17% | 40% | 17% | -27% | 11% | 6% | 45% |
| Thysanoptera juveniles | -44% | 17% | 45% | -70% | | -56% | 34% | 95% | 59% | |
| Thysanoptera adults | -34% | -7% | -21% | -40% | -68% | -29% | -19% | -31% | 6% | -59% |
| Thysanoptera | -36% | -2% | 6% | -52% | -67% | -35% | -10% | 20% | 20% | -59% |
| Aphidoidea (all) | | -49% | 39% | -36% | -29% | | -61% | 39% | 44% | 71% |
| Cicadellidae juveniles | 14% | 1% | 32% | 23% | -37% | 11% | -32% | -9% | -57% | -69% |
| Cicadellidae adults | -28% | -32% | -11% | 10% | 26% | -4% | -43% | -23% | -25% | 19% |
| Auchenhorrhyncha orthers | 11% | 34% | -39% | -45% | -51% | 58% | 40% | -60% | -35% | -32% |
| Heteroptera juveniles | 0% | -11% | -23% | 35% | 10% | -5% | -40% | -17% | 67% | -5% |
| Cecidomyiidae | 0% | -40% | -28% | -32% | 9% | -8% | -18% | -33% | -29% | -16% |
| Chloropidae | 19% | -30% | -34% | -34% | 35% | -28% | 19% | 11% | 70% | 43% |
| Acalyptratae (other) | | | 46% | 27% | 63% | | | 7% | 58% | 63% |
| Carabidae | | 43% | -8% | | 70% | | 20% | 29% | | 39% |
| Coccinellidae adults | 53% | | -29% | | 22% | -54% | | 47% | | -44% |
| Apion ssp | | -24% | -55% | -58% | 11% | | -11% | 8% | 0% | -14% |
| Lathridiidae | 9% | -57% | 32% | 30% | -15% | -2% | -17% | 17% | -18% | 24% |
| Melyridae | -19% | -35% | | 16% | | -5% | -53% | | 26% | |
| Coleoptera juveniles | 9% | -24% | 46% | -56% | -22% | -61% | -33% | -22% | -49% | -47% |
| Formicidae | -41% | -6% | 68% | 40% | 11% | -28% | 12% | 60% | 95% | 100% |
| Aphidiinae | | 81% | -50% | 5% | 82% | | 5% | -5% | 89% | 41% |
| Braconidae (other) | -5% | -39% | -48% | -22% | 6% | -19% | -14% | 2% | 16% | 42% |
| Ichneumonoidea | -15% | -2% | -49% | -34% | 24% | -17% | -9% | 0% | 26% | 41% |
| Encyrtidae | 80% | 58% | 20% | 42% | 51% | 58% | -14% | 36% | 57% | 36% |
| Eulophidae | -51% | -24% | -31% | 31% | -48% | 38% | -18% | 28% | 63% | -26% |
| Mymaridae | -24% | -18% | -28% | | 0% | 0% | 14% | 0% | | -23% |
| Pteromalidae | | -32% | 43% | 38% | -28% | | 32% | 37% | 44% | -62% |
| Chalcidoidea | -13% | -16% | -45% | 39% | -26% | 9% | -4% | 0% | 57% | -41% |
| Scelionidae | | -33% | -33% | -11% | -56% | | -53% | -22% | -34% | -27% |
| Parasitica (other) | 21% | -14% | -5% | 33% | | 11% | 56% | -59% | -72% | |
| **WEED** | | | **D1** | | | | | **D2** | | |
| Nymph and Male Gamasida | 63% | 67% | -61% | 67% | 77% | 44% | 90% | -60% | 36% | 39% |
| Female Phytoseiidae | 59% | 79% | -65% | 41% | 72% | 5% | 88% | -12% | 38% | -14% |
| Gamasida (total) | 56% | 68% | -55% | 51% | 75% | 24% | 85% | -46% | 29% | 19% |
| Eriophyoidea | -16% | | -64% | 99% | | -16% | | -74% | 52% | |
| Pygmephoridae | -73% | 4% | -86% | -43% | 19% | -58% | 25% | 15% | -40% | 35% |
| Tarsonemidae | 1% | 2% | -29% | 36% | 2% | 7% | 21% | -29% | -21% | 16% |
| Tetranychidae | 40% | 65% | 16% | 71% | 61% | -48% | 23% | 63% | 16% | -33% |

| | S1 | S2 | S3 | S4 | S5 | S1 | S2 | S3 | S4 | S5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Tydeidae | 36% | | 36% | 68% | 33% | 17% | | 79% | 80% | 27% |
| Oribatida | 18% | 67% | -42% | 27% | -45% | 53% | -42% | 7% | 64% | -66% |
| Thysanoptera | 53% | 66% | 19% | 66% | 40% | 40% | 69% | 41% | 20% | 17% |
| **PHOTO ECLECTOR** | | | **D3** | | | | | **D4** | | |
| Arthropleona | -10% | 29% | -18% | 49% | 26% | 28% | 53% | 21% | 62% | 71% |
| Thysanoptera | | -37% | -31% | -18% | -11% | | -85% | -81% | -44% | 7% |
| Aphidoidea | | | 97% | 33% | 36% | | | 74% | -29% | 0% |
| Coccoidea (all) | | | 22% | 12% | 49% | | | 76% | 60% | -83% |
| Cicadellidae | 46% | 8% | -50% | 15% | -24% | -24% | 62% | 43% | 40% | 10% |
| Cecidomyiidae | -23% | 57% | -26% | 46% | 24% | 11% | 20% | 0% | 3% | 27% |
| Phoridae | | | -74% | 45% | -19% | | | -72% | -61% | -52% |
| Ichneumonoidea | | 73% | -10% | -25% | -6% | | 76% | 31% | 22% | 46% |
| Encyrtidae | | | -25% | -68% | 3% | | | -76% | -56% | -19% |
| Mymaridae | -28% | 61% | -32% | | -33% | 35% | 59% | -42% | | 11% |
| Trichogrammatidae | | 63% | -36% | -8% | -37% | | 68% | -51% | 21% | 7% |
| Chalcidoidea (other) | | 75% | -57% | -40% | 4% | | 18% | -68% | -35% | -11% |
| Chalcidoidea pooled | -2% | 65% | -45% | -41% | -7% | 19% | 53% | -58% | -32% | -8% |
| Scelionidae | 44% | 53% | -24% | -24% | 45% | 6% | 33% | -22% | 3% | 17% |
| **ASPIRATOR** | | | **D3** | | | | | **D4** | | |
| Collembola | -12% | 42% | 53% | | -42% | -25% | 80% | 75% | | -64% |
| Orthoptera juveniles | 23% | 39% | 36% | 18% | 15% | 13% | -3% | 17% | 16% | 0% |
| Thysanoptera juveniles | -88% | 91% | 53% | -19% | | -69% | 83% | 95% | 71% | |
| Thysanoptera adults | -24% | -38% | 16% | 48% | -44% | 89% | -27% | -46% | -58% | -78% |
| Thysanoptera | -57% | -23% | 33% | 29% | -48% | 46% | -11% | -2% | -45% | -78% |
| Aphidoidea (all) | | -57% | 10% | -3% | 74% | | -61% | 8% | -41% | -1% |
| Cicadellidae juveniles | 13% | 2% | 59% | 49% | 8% | 5% | 28% | 67% | 60% | -64% |
| Cicadellidae adults | -3% | -37% | -7% | -10% | 32% | -27% | -23% | 43% | 19% | 38% |
| Auchenhorrhyncha orthers | 70% | 39% | -13% | -38% | -68% | 64% | 83% | 22% | 22% | -20% |
| Heteroptera juveniles | 31% | -4% | 3% | 67% | 41% | -36% | 20% | 7% | 58% | -26% |
| Cecidomyiidae | 37% | -61% | 26% | 20% | 46% | 1% | -51% | -34% | -24% | -44% |
| Chloropidae | -28% | -59% | -21% | -4% | -45% | 0% | -39% | 7% | 6% | -14% |
| Acalyptratae (other) | | | 39% | 15% | 33% | | | -13% | -61% | 4% |
| Carabidae | | 13% | 0% | | -47% | | 67% | 63% | | 26% |
| Coccinellidae adults | -80% | | 7% | | -25% | -41% | | -25% | | -42% |
| Apion ssp | | -58% | 0% | -5% | -14% | | 14% | -32% | -36% | 11% |
| Lathridiidae | 47% | -10% | 58% | 43% | -29% | 67% | 39% | 48% | 72% | 18% |
| Melyridae | 31% | 43% | | 74% | | -32% | 40% | | 53% | |
| Coleoptera juveniles | 17% | -46% | 6% | 16% | 28% | 11% | -13% | 1% | -14% | -22% |
| Formicidae | -28% | 12% | 56% | 57% | 15% | -59% | 29% | 42% | 73% | 85% |
| Aphidiinae | | 86% | -28% | 21% | 41% | | 95% | -25% | 79% | 35% |
| Braconidae (other) | -42% | -16% | -17% | -14% | -10% | -54% | 16% | -4% | -26% | -32% |
| Ichneumonoidea | -24% | 24% | -17% | -11% | 2% | -44% | 46% | -15% | 2% | -24% |
| Encyrtidae | 59% | 11% | 15% | 0% | -15% | 41% | -22% | 24% | 11% | 0% |
| Eulophidae | 48% | -22% | 3% | -3% | -33% | 38% | -11% | -5% | -9% | -57% |
| Mymaridae | -28% | -20% | 48% | | -48% | 63% | 35% | -4% | | 8% |
| Pteromalidae | | -59% | 53% | 44% | -57% | | -33% | -6% | 50% | -76% |
| Chalcidoidea | -52% | -16% | 39% | 35% | -45% | 73% | 17% | -22% | 30% | -18% |
| Scelionidae | | -52% | -26% | -5% | -35% | | -47% | -38% | -9% | -64% |
| Parasitica (other) | -5% | -40% | -51% | -5% | | -5% | 33% | -54% | -13% | |
| **WEED** | | | **D3** | | | | | **D4** | | |
| Nymph and Male Gamasida | -29% | 70% | -65% | -26% | 6% | 63% | 87% | -53% | 62% | 77% |
| Female Phytoseiidae | -58% | 79% | -43% | 23% | 19% | -12% | 96% | -37% | 87% | 69% |
| Gamasida (total) | -37% | 75% | -48% | -4% | -2% | 5% | 88% | -55% | 74% | 65% |
| Eriophyoidea | 77% | | 100% | 80% | | -89% | | -84% | -82% | |

| | S1 | S2 | S3 | S4 | S5 | S1 | S2 | S3 | S4 | S5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Pygmephoridae | -13% | 21% | -42% | 34% | 48% | -22% | 47% | -51% | -23% | -17% |
| Tarsonemidae | 14% | 70% | -11% | 19% | 4% | 28% | -22% | -43% | -47% | -24% |
| Tetranychidae | -30% | 86% | 24% | -16% | 17% | -58% | 72% | 27% | 42% | -38% |
| Tydeidae | 7% | | 39% | 52% | 58% | 0% | | 32% | 26% | 70% |
| Oribatida | 58% | 100% | -53% | 69% | -10% | 19% | -21% | -59% | 64% | -41% |
| Thysanoptera | -1% | 42% | -41% | 27% | 21% | 19% | 37% | -14% | 42% | 18% |
| **PHOTO ECLECTOR** | | | **D5** | | | | | **Reference** | | |
| Arthropleona | 9% | 24% | 88% | 90% | 61% | 15% | 65% | -18% | -39% | 16% |
| Thysanoptera | | -11% | -6% | -41% | 2% | | 88% | 88% | 78% | 5% |
| Aphidoidea | | | 6% | 85% | -21% | | | 100% | 100% | 100% |
| Coccoidea (all) | | | 64% | -7% | -24% | | | 95% | 100% | 100% |
| Cicadellidae | 54% | 62% | 80% | 80% | 52% | 49% | 23% | 100% | 100% | 100% |
| Cecidomyiidae | 6% | 31% | -35% | 23% | 24% | -9% | 97% | 100% | 92% | 100% |
| Phoridae | | | -69% | -42% | -30% | | | -49% | 73% | -52% |
| Ichneumonoidea | | 95% | 14% | 19% | 17% | | 89% | 31% | 78% | 75% |
| Encyrtidae | | | -48% | -13% | 3% | | | 83% | 100% | 96% |
| Mymaridae | 43% | 88% | -44% | | -10% | 22% | 95% | 57% | | 78% |
| Trichogrammatidae | | 75% | 34% | 76% | 52% | | 79% | 92% | 100% | 26% |
| Chalcidoidea (other) | | 65% | -26% | 17% | 16% | | 100% | 44% | 100% | 85% |
| Chalcidoidea pooled | 32% | 78% | -10% | 0% | 18% | 13% | 91% | 68% | 100% | 78% |
| Scelionidae | -11% | 67% | -59% | 50% | 57% | 63% | 73% | -33% | 100% | 76% |
| **ASPIRATOR** | | | **D5** | | | | | **Reference** | | |
| Collembola | -88% | 96% | 75% | | 19% | 25% | 66% | -63% | | 29% |
| Orthoptera juveniles | 51% | 64% | 38% | 26% | 35% | 11% | 91% | 94% | 94% | 95% |
| Thysanoptera juveniles | -86% | 66% | 100% | 100% | | -83% | 60% | 97% | 100% | |
| Thysanoptera adults | 0% | 38% | -25% | -28% | -69% | 19% | 82% | 50% | 92% | -37% |
| Thysanoptera | -46% | 44% | 28% | -3% | -67% | -34% | 77% | 72% | 94% | -35% |
| Aphidoidea (all) | | 52% | 42% | 10% | -64% | | 52% | 53% | -58% | -83% |
| Cicadellidae juveniles | 11% | 88% | 93% | 86% | 44% | 49% | 82% | 91% | 86% | 78% |
| Cicadellidae adults | 26% | 57% | 74% | 54% | 63% | 20% | 73% | 82% | 77% | 65% |
| Auchenhorrhyncha orthers | 66% | 81% | 5% | 24% | 2% | 83% | 100% | 98% | 90% | 77% |
| Heteroptera juv. | -43% | 56% | 37% | 65% | -29% | -40% | 88% | 93% | 98% | 90% |
| Cecidomyiidae | -23% | -11% | 5% | -42% | 15% | 4% | 92% | 65% | 84% | 57% |
| Chloropidae | 22% | 22% | -49% | 8% | 20% | -64% | 85% | 82% | 89% | 79% |
| Acalyptratae (other) | | | 7% | 38% | -8% | | | 57% | 73% | 50% |
| Carabidae | | 67% | 50% | | 70% | | 37% | 25% | | 70% |
| Coccinellidae adults | -41% | | 40% | | 11% | -55% | | 93% | | 100% |
| Apion ssp | | 40% | 33% | 81% | 89% | | 88% | 92% | 95% | 74% |
| Lathridiidae | 77% | 50% | 55% | 72% | 18% | 79% | 97% | 77% | 90% | 88% |
| Melyridae | 36% | 43% | | 26% | | 26% | 100% | | 100% | |
| Coleoptera juveniles | -33% | 62% | 61% | 51% | 36% | 20% | 77% | 88% | 92% | 94% |
| Formicidae | -44% | -48% | 84% | 60% | 85% | -49% | 75% | 74% | 94% | 85% |
| Aphidiinae | | 86% | 71% | 79% | 94% | | 90% | 57% | 100% | 94% |
| Braconidae (other) | 43% | 42% | -8% | -24% | 50% | -22% | 94% | 51% | 56% | 78% |
| Ichneumonoidea | 10% | 56% | 9% | 19% | 64% | -6% | 88% | 51% | 77% | 73% |
| Encyrtidae | -1% | 45% | 2% | -8% | 4% | 86% | 69% | 34% | 38% | 4% |
| Eulophidae | -9% | 22% | 39% | 47% | -32% | 0% | 84% | 33% | 34% | -10% |
| Mymaridae | 2% | 66% | -8% | | 29% | 6% | 50% | 43% | | -52% |
| Pteromalidae | | -7% | 23% | 81% | 0% | | 46% | 73% | 75% | -70% |
| Chalcidoidea | 21% | 63% | 6% | 57% | 3% | 25% | 57% | 36% | 52% | -58% |
| Scelionidae | | -27% | -36% | -2% | -30% | | 31% | 7% | -5% | -35% |
| Parasitica (other) | -24% | 39% | -14% | 10% | | 0% | 61% | -5% | -25% | |
| **WEED** | | | **D5** | | | | | **Reference** | | |
| Nymph/Male Gamasida | -80% | 87% | 4% | 92% | 32% | 19% | 90% | 75% | 83% | 61% |

| | S1 | S2 | S3 | S4 | S5 | S1 | S2 | S3 | S4 | S5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Female Phytoseiidae | -75% | 75% | 41% | 88% | -35% | 45% | 88% | 90% | 84% | 56% |
| Gamasida (total) | -77% | 75% | 24% | 90% | 1% | 44% | 90% | 87% | 84% | 55% |
| Eriophyoidea | 15% | | 83% | 77% | | 73% | | 75% | 100% | |
| Pygmephoridae | 43% | 21% | -79% | -22% | 47% | -18% | -63% | -55% | 2% | 27% |
| Tarsonemidae | 16% | -3% | -51% | 57% | -29% | 46% | 0% | -34% | 47% | 3% |
| Tetranychidae | -68% | 71% | 23% | 50% | -45% | 36% | 78% | 72% | -15% | -61% |
| Tydeidae | -62% | | 57% | 68% | 3% | 17% | | 96% | 98% | 58% |
| Oribatida | -82% | 53% | -54% | 44% | -92% | 37% | 67% | -75% | 71% | -4% |
| Thysanoptera | -25% | 58% | -26% | 47% | -36% | 21% | 77% | 77% | 85% | 42% |

# Appendix A1.3 Number of specimens found in the different sampling methods

## Coleoptera

| | | |
|---|---|---|
| P | Carabidae juv. | 282 |
| P | Drypta dentata | 1 |
| P | Parophonus mendax | 2 |
| P | Trechus quadristriatus | 4 |
| P | Trechus obtusus | 4 |
| P | Trechus quadristriatus gr. spp. | 3 |
| P | Synuchus nivalis | 17 |
| P | Percosia equestris | 4 |
| P | Phyla tethys | 1 |
| P | Syntomus obscuroguttatus | 82 |
| P | Stomis pumicatus | 35 |
| P | Semiophonus signaticornis | 1 |
| P | Stenolophus teutonus | 10 |
| P | Pterostichus melanarius | 453 |
| P | Pterostichus nigrita | 1 |
| P | Pterostichus vernalis | 4 |
| P | Pterostichus strenuus | 22 |
| P | Pseudoophonus rufipes | 500 |
| P | Poecilus versicolor | 16 |
| P | Poecilus kugelanni | 13 |
| P | Poecilus cupreus | 1752 |
| P | Philochtus biguttatus | 2 |
| P | Phyla obtusa | 16 |
| P | Philochthus lunulatus | 4 |
| P | Panagaeus bipustulatus | 12 |
| P | Parophonus maculicornis | 87 |
| P | Paradromius linearis | 18 |
| P | Ophonus azureus | 7 |
| P | Ophonus puncticeps | 1 |
| P | Olisthopus rotundatus | 2 |
| P | Notiophilus quadripunctatus | 10 |
| P | Notiophilus aquaticus | 4 |
| P | Nebria salina | 72 |
| P | Microlestes luctuosus | 10 |
| P | Microlestes minutulus | 125 |
| P | Metallina properans | 3 |
| P | Metallina lampros | 1 |
| P | Leistus ferrugineus | 2 |
| P | Harpalus attenuatus | 1 |
| P | Harpalus tardus | 13 |
| P | Harpalus smaradignus | 1 |
| P | Harpalus serripes | 175 |
| P | Harpalus rufitarsis | 171 |
| P | Harpalus rubripes | 443 |
| P | Harpalus oblitus | 6 |
| P | Harpalus luteicornis | 1057 |
| P | Harpalus latus | 424 |
| P | Harpalus distinguendus | 13 |
| P | Harpalus dimidiatus | 261 |
| P | Harpalus cupreus | 559 |
| P | Harpalus anxius | 199 |
| P | Harpalus affinis | 109 |
| P | Diachromus germanus | 3 |
| P | Gynandromorphus etruscus | 2 |
| P | Clivina fossor | 171 |
| P | Cicindela campestris | 1 |
| P | Carabus purpurascens | 92 |
| P | Carabus auratus | 398 |
| P | Calathus melanocephalus | 4 |
| P | Calathus fuscipes | 37 |
| P | Badister bipustulatus | 4 |
| P | Brachinus glabratus | 131 |
| P | Brachinus crepitans | 3 |
| P | Brachinus sclopeta | 426 |
| P | Brachinus elegans | 2953 |
| P | Anisodactylus signatus | 14 |
| P | Anisodactylus binotatus | 88 |
| P | Anchomenus dorsalis | 17 |
| P | Amblystomus niger | 4 |
| P | Amara strenua | 1 |
| P | Amara familiaris | 2 |
| P | Amara communis | 5 |
| P | Amara kulti | 14530 |
| P | Amara tibialis | 9 |
| P | Amara similata | 28 |

| | | |
|---|---|---|
| P | Amara plebeja | 20 |
| P | Amara ovata | 5 |
| P | Amara montivaga | 2 |
| P | Amara lunicollis | 309 |
| P | Amara fulvipes | 16 |
| P | Amara convexior | 27 |
| P | Amara aenea | 60 |
| P | Agonum moestum | 1 |
| P | Acupalpus dubius | 7 |
| P | Acupalpus meridianus | 1 |
| P | Ptiliidae | 1 |
| P | Haliplidae | 2 |
| P | Tenebrionidae | 1 |
| P | Scolytidae | 1 |
| P | Meloidae | 1 |
| P | Coleoptera juv. (others) | 814 |
| P | Hydrophilidae | 5 |
| P | Dytiscidae | 1 |
| P | Mycetophagidae | 4 |
| P | Cantharidae | 12 |
| P | Buprestidae | 1 |
| P | Scydmaenidae | 3 |
| P | Staphylinidae juv. | 850 |
| P | Staphylinidae (others) | 6 |
| P | Euasthetinae | 1 |
| P | Omaliinae | 1 |
| P | Xantholininae | 213 |
| P | Tachyporinae | 583 |
| P | Steninae | 8 |
| P | Staphylininae | 469 |
| P | Paederinae | 183 |
| P | Oxytelinae | 13 |
| P | Metopsiinae | 51 |
| P | Aleocharinae | 3328 |
| P | Silvanidae | 383 |
| P | Silphidae (others) juv. | 18 |
| P | Silphidae (others) | 40 |
| P | Silpha spp. juv. | 159 |
| P | Silpha spp. | 177 |
| P | Scarabaeidae | 32 |
| P | Pselaphidae | 16 |
| P | Phalacridae | 28 |
| P | Oedemeridae | 5 |
| P | Nitidulidae | 54 |
| P | Mordellidae | 27 |
| P | Monotomidae | 3 |
| P | Melyridae | 51 |
| P | Malachiidae | 116 |
| P | Leiodidae | 35 |
| P | Lathridiidae | 6106 |
| P | Histeridae | 71 |
| P | Elateridae (others) | 37 |
| P | Athous spp. | 318 |
| P | Agriotes spp. | 1431 |
| P | Dermestidae juv. | 3377 |
| P | Dermestidae (others) | 35 |
| P | Dermestes spp. | 573 |
| P | Curculionidae | 592 |
| P | Cryptophagidae (others) | 1 |
| P | Ephistemus spp. | 1313 |
| P | Atomaria spp. | 252 |
| P | Corylophidae | 481 |
| P | Coccinellidae juv. | 1773 |
| P | Coccinellidae (others) | 468 |
| P | Tytthaspis sedecimpunctata | 1397 |
| P | Clambidae | 54 |
| P | Chrysomelidae | 226 |
| P | Cerambycidae | 41 |
| P | Byrrhidae | 21 |
| P | Bruchidae | 13 |
| P | Anthicidae | 11 |
| P | Anobiidae | 1 |
| A | Coleoptera adults (other) | 972 |
| E | Coleoptera (other) adults | 301 |
| A | Coleoptera juveniles (other) | 3953 |

| | | |
|---|---|---|
| E | Coleoptera (other) juveniles | 45 |
| E | Staphylinidae (other) | 96 |
| A | Staphylinidae (other) | 8 |
| E | Aleocharinae (other) | 302 |
| A | Aleocharinae | 4 |
| A | Melyridae | 678 |
| E | Melyridae | 75 |
| A | Lathridiidae | 1174 |
| E | Lathridiidae | 390 |
| A | Curculionidae (other) | 95 |
| E | Curculionidae (other) | 9 |
| A | Apion ssp | 1008 |
| E | Apion ssp | 23 |
| A | Coccinellidae adults | 602 |
| E | Coccinellidae adults | 201 |
| A | Coccinellidae juveniles | 372 |
| E | Coccinellidae juveniles | 89 |
| A | Chrysomelidae | 83 |
| E | Chrysomelidae | 20 |
| A | Cerambycidae | 337 |
| E | Cerambycidae | 69 |
| A | Carabidae | 481 |
| E | Carabidae | 58 |
| E | Anobidae | 2 |
| A | Anobidae | 1 |

| | | |
|---|---|---|
| P | Heteroptera (other adults) | 699 |
| P | Heteroptera (other juveniles) | 537 |
| A | Heteroptera (other) adults | 114 |
| E | Heteroptera (other) adults | 27 |
| A | Heteroptera juveniles | 1062 |
| P | Pentatomidae ad. | 705 |
| E | Heteroptera (other) juv. | 80 |
| A | Miridae (ad.) | 103 |
| P | Pentatomidae juv. | 21 |
| E | Miridae (ad.) | 15 |
| P | Lygaeidae ad. | 1128 |
| A | Fulgoromorpha (other) ad. | 7 |
| P | Lygaeidae juv. | 4 |
| E | Fulgoromorpha (other) ad. | 4 |
| A | Fulgoromorpha (other) juv. | 37 |
| P | Anthocoridae ad. | 2 |
| E | Fulgoromorpha (other) juv. | 2 |
| A | Delphacidae adults | 89 |
| E | Delphacidae adults | 4 |
| A | Delphacidae juveniles | 462 |
| P | Fulgoromorpha (other) ad. | 14 |
| A | Cicadomorpha (other) ad. | 876 |
| E | Cicadomorpha (other) ad. | 88 |
| P | Fulgoromorpha (other) juv. | 70 |
| A | Cicadomorpha (other) juv. | 87 |
| P | Cicadomorpha (other) ad. | 28 |
| E | Cicadomorpha (other) juv. | 5 |
| A | Cicadellidae adults | 12209 |
| E | Cicadellidae adults | 903 |
| P | Cicadomorpha (other) juv. | 47 |
| A | Cicadellidae juveniles | 13206 |
| P | Cicadellidae ad. | 7293 |
| E | Cicadellidae juveniles | 353 |
| P | Cicadellidae juv. | 14745 |
| E | Sternorrhyncha (other) | 21 |
| A | Sternorrhyncha (other) | 8 |
| P | Psylloidea ad. | 2 |
| E | Coccoidea (all) | 1442 |
| A | Coccoidea (all) | 149 |
| A | Aphidoidea (all) | 2911 |
| E | Aphidoidea | 359 |
| P | Coccoidea ad. | 44 |
| P | Coccoidea juv. | 60 |
| P | Aphidoidea | 1649 |
| P | Aleyrodoidea | 1 |
| P | Thysanoptera ad. | 320 |

# Araneae

| | | |
|---|---|---|
| A | Phalangium opilio juv. | 1 |
| E | Gongylidiellum murcidum Adult | 3 |
| E | Diplocephalus graecus Ad. | 1 |
| E | Cnephalocotes obscurus Ad. | 24 |
| E | Ceratinopsis stavia Ad. | 18 |
| E | Araeoncus humilis Ad. | 1 |
| A | Linyphia s.l. juv. | 8 |
| E | Erigoninae indet. juveniles | 59 |
| A | Microlinyphia pusilla Ad. | 2 |
| A | Microlinyphia pusilla juv. | 33 |
| A | Meioneta rurestris Adult | 11 |
| E | Mangora acalypha Ad. | 3 |
| E | Mangora juv. | 45 |
| A | Meioneta mollis Ad. | 1 |
| A | Meioneta juv. | 5 |
| E | Hypsosinga sanguinea Ad. | 1 |
| E | Hypsosinga pygmaea Ad. | 4 |
| A | Lepthyphantes tenuis Adult | 6 |
| E | Hypsosinga albovittata Ad. | 1 |
| E | Hypsosinga juv. | 57 |
| A | Lepthyphantes tenuis juv. | 3 |
| E | Argiope bruennichi juv. | 8 |
| A | Linyphiinae indet. Juveniles | 26 |
| E | Araneus s.l. juv. | 5 |
| E | Araneidae other juv. | 9 |
| E | Pachygnatha degeeri Ad. | 9 |
| E | Pachygnatha degeeri juv. | 103 |
| A | Tiso vagans Ad. | 1 |
| E | Steatoda phalerata Ad. | 3 |
| A | Pocadicnemis juncea Ad. | 4 |
| E | Steatoda phalerata juv. | 2 |
| E | Neottiura suaveolens Ad. | 21 |
| E | Neottiura bimaculata Ad. | 15 |
| E | Theridion (Neottiura) juv. | 1 |
| E | Robertus lividus Ad. | 2 |
| E | Robertus arundineti Ad. | 10 |
| E | Enoplognatha ovata-group juv. | 3 |
| E | Enoplognatha thoracica Adult | 20 |
| A | Cnephalocotes obscurus Ad. | 1 |
| A | Erigoninae indet. juveniles | 3 |
| E | Enoplognatha thoracica juv. | 2 |
| A | Linyphiidae other juv. | 7 |
| E | Enoplognatha mordax Ad. | 5 |
| A | Mangora acalypha Ad. | 5 |
| E | Crustulina sticta Ad. | 3 |
| A | Mangora juv. | 1 |
| A | Hypsosinga pygmaea Ad. | 3 |
| E | Achaearanea juv. | 1 |
| A | Argiope bruennichi juv. | 10 |
| E | Theridiidae juv. | 7 |
| A | Araneus s.l. juv. | 1 |
| A | Araneidae other juv. | 6 |
| E | Ero juv. | 3 |
| E | Hahnia nava Ad. | 5 |
| A | Pachygnatha degeeri juv. | 12 |
| P | Phalangium opilio Ad. | 360 |
| E | Argenna subnigra Adult | 114 |
| P | Phalangium opilio juv. | 171 |
| E | Argenna subnigra juv. | 6 |
| P | Oligolophus juv. | 680 |
| P | Nelima doriae Ad. | 5 |
| A | Neottiura suaveolens Ad. | 1 |
| A | Neottiura bimaculata Ad. | 11 |
| P | Leiobunum blackwalli Ad. | 3 |
| P | Homalenotus quadridentatus Ac | 648 |
| A | Theridion (Neottiura) juv. | 5 |
| P | Homalenotus quadridentatus juv | 311 |
| E | Pisaura mirabilis Ad. | 2 |
| P | Phalangiidae juv. | 13 |
| E | Pisaura mirabilis juv. | 13 |
| P | Nemastoma bimaculatum Ad. | 105 |
| A | Enoplognatha ovata-group juv. | 3 |
| P | Nemastoma juv. | 38 |
| A | Enoplognatha thoracica Adult | 2 |
| E | Pardosa sp. Juv. | 5 |

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|---|---|---|
| A | Enoplognatha mordax juv. | 4 |
| E | Pardosa vittata Ad. | 1 |
| P | Linyphiidae (other) Ad. | 1 |
| P | Linyphiidae (other) juv. | 4 |
| E | Pardosa pullata Ad. | 1 |
| E | Pardosa pullata juv. | 5 |
| P | Stemonyphantes lineatus Ad. | 3 |
| E | Pardosa nigriceps Ad. | 8 |
| P | Stemonyphantes juv. | 2 |
| E | Pardosa nigriceps juv. | 101 |
| P | Porrhomma microphthalmum Ac | 8 |
| P | Neriene furtiva Ad. | 2 |
| A | Uloborus walckenaeri juv. | 1 |
| P | Microlinyphia pusilla juv. | 2 |
| A | Argenna subnigra Adult | 1 |
| P | Meioneta simplicitarsis Ad. | 9 |
| P | Meioneta rurestris Ad. | 156 |
| P | Meioneta mollis Ad. | 22 |
| E | Aulonia albimana Ad. | 13 |
| P | Meioneta juv. | 43 |
| E | Aulonia albimana juv. | 4 |
| E | Alopecosa juv. | 11 |
| P | Lepthyphantes tenuis Ad. | 32 |
| E | Alopecosa pulverulent juv. | 2 |
| P | Lepthyphantes tenuis juv. | 19 |
| E | Alopecosa cuneata juv. | 3 |
| P | Lepthyphantes insignis Ad. | 3 |
| A | Pardosa sp. Juv. | 2 |
| P | Lepthyphantes ericaeus Ad. | 2 |
| P | Diplostyla concolor Ad. | 1 |
| P | Centromerus prudens Ad. | 1 |
| P | Centromerus incilium Ad. | 6 |
| P | Centromerita concinna Ad. | 4 |
| P | Centromerita juv. | 42 |
| E | Neon reticulatus | 1 |
| E | Heliophanus juv. | 1 |
| P | Linyphiinae juv. | 73 |
| E | Heliophanus flavipes Ad. | 2 |
| E | Euophrys frontalis Ad. | 10 |
| P | Walckenaeria atrotibialis Ad. | 3 |
| P | Walckenaeria antica Ad. | 19 |
| E | Euophrys frontalis juv. | 4 |
| A | Myrmarachne formicaria Ad. | 1 |
| E | Euophrys aperta Adult | 32 |
| P | Walckenaeria juv. | 20 |
| P | Tiso vagans Ad. | 200 |
| E | Euophrys aperta juv. | 6 |
| A | Heliophanus flavipes Ad. | 5 |
| P | Tapinocyba praecox Ad. | 46 |
| E | Euophrys aequipes Ad. | 10 |
| P | Pocadicnemis juncea Ad. | 408 |
| E | Salticidae | 1 |
| P | Pelecopsis radicicola Ad. | 1 |
| E | Tibellus oblongus Ad. | 23 |
| P | Pelecopsis parallela Ad. | 19 |
| E | Tibellus juv. | 3 |
| P | Oedothorax apicatus Ad. | 1 |
| P | Micrargus subaequalis Ad. | 509 |
| E | Thanatus striatus Ad. | 5 |
| E | Thanatus juv. | 14 |
| P | Metopobractus prominulus Ad. | 7 |
| A | Tibellus oblongus Ad. | 5 |
| P | Jacksonella falconeri Ad. | 4 |
| A | Tibellus juv. | 3 |
| E | Philodromus juv. | 2 |
| P | Gongylidiellum murcidum Ad. | 1 |
| P | Erigone dentipalpis Ad. | 1 |
| P | Diplocephalus graecus Ad. | 6 |
| E | Xysticus erraticus Adult | 395 |
| P | Cnephalocotes obscurus Ad. | 43 |
| P | Ceratinopsis stativa Ad. | 77 |
| E | Xysticus erraticus juv. | 39 |
| E | Xysticus kochi Adult | 26 |
| P | Ceratinella brevis Ad. | 3 |
| P | Erigoninae (juv. other) | 126 |

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|---|---|---|
| E | Xysticus cristatus Adult | 8 |
| E | Xysticus cristatus/kochi juv. | 9 |
| A | Xysticus erraticus juv. | 3 |
| P | Mangora acalypha Ad. | 1 |
| E | Xysticus acerbus Adult | 2 |
| E | Xysticus juv. | 74 |
| P | Hypsosinga pygmaea Ad. | 1 |
| P | Hypsosinga albovittata Ad. | 1 |
| P | Hypsosinga juv. | 3 |
| E | Thomisus onustus juv. | 1 |
| A | Xysticus juv. | 21 |
| E | Oxyptila simplex Adult | 18 |
| P | Argiope bruennichi juv. | 2 |
| E | Oxyptila juv. | 11 |
| P | Araneidae (juv. other) | 5 |
| P | Pachygnatha degeeri Ad. | 663 |
| P | Pachygnatha degeeri juv. | 943 |
| E | Micrommata virescens Adult | 9 |
| A | Oxyptila simplex Adult | 1 |
| E | Micrommata virescens juv. | 19 |
| A | Oxyptila juv. | 6 |
| E | Anyphaena accentuata Adult | 2 |
| P | Theridiidae (juv. other) | 1 |
| P | Neottiura suaveolens Ad. | 15 |
| P | Neottiura bimaculata Ad. | 8 |
| E | Zora parallela Ad. | 2 |
| E | Zora parallela juv. | 1 |
| P | Steatoda phalerata Ad. | 21 |
| E | Phrurolithus festivus Ad. | 6 |
| P | Steatoda phalerata juv. | 1 |
| E | Clubiona terrestris Adult | 1 |
| P | Robertus lividus Ad. | 5 |
| E | Clubiona subtilis Adult | 2 |
| E | Clubiona pseudoneglecta Adult | 240 |
| P | Robertus arundineti Ad. | 88 |
| A | Phrurolithus festivus Ad. | 1 |
| E | Clubiona diversa Adult | 43 |
| P | Robertus juv. | 1 |
| E | Clubiona juv. | 37 |
| P | Episinus juv. | 1 |
| A | Clubiona pseudoneglecta Adult | 4 |
| E | Clubionidae | 1 |
| P | Enoplognatha (juv. other) | 1 |
| P | Enoplognatha thoracica ad. | 27 |
| E | Zelotes pusillus juv. | 2 |
| P | Enoplognatha thoracica juv. | 2 |
| E | Zelotes pedestris Ad. | 2 |
| P | Enoplognatha mordax Ad. | 5 |
| E | Zelotes pedestris juv. | 1 |
| E | Zelotes lutetianus Ad. | 3 |
| P | Ero furcata Ad. | 1 |
| P | Ero furcata juv. | 17 |
| E | Zelotes lutetianus juv. | 1 |
| P | Hahnia nava Ad. | 61 |
| E | Zelotes latreillei Ad. | 2 |
| E | Zelotes civicus Ad. | 4 |
| P | Hahnia nava juv. | 2 |
| E | Zelotes juv. | 23 |
| P | Tegenaria juv. | 3 |
| E | Phaeocedus braccatus Ad. | 15 |
| P | Dictynidae other juv. | 1 |
| E | Micaria pulicaria Ad. | 1 |
| P | Argenna subnigra Ad. | 700 |
| E | Micaria formicaria Ad. | 2 |
| P | Argenna subnigra juv. | 6 |
| E | Micaria albovittata Ad. | 4 |
| P | Pisaura mirabilis adults | 18 |
| E | Micaria juv. | 4 |
| P | Pisaura mirabilis juveniles | 1 |
| E | Haplodrassus signifer Ad. | 1 |
| E | Drassodes pubescens Adult | 38 |
| P | Lycosidae (juv. other) | 11 |
| P | Xerlolycosa miniata Ad. | 6 |
| E | Drassodes cupreus Ad. | 2 |
| P | Trochosa terricola Ad. | 28 |

## Araneae (continued)

| | | |
|---|---|---|
| E | Drassodes juv. | 11 |
| P | Trochosa ruricola (adults) | 526 |
| P | Trochosa ruricola (juveniles) | 17 |
| P | Trochosa robusta Ad. | 3 |
| P | Trochosa other juv. | 123 |
| P | Pardosa other juv. | 150 |
| P | Pardosa vittata Ad. | 33 |
| P | Pardosa vittata juv. | 1 |
| P | Pardosa pullata Ad. | 2163 |
| P | Pardosa pullata juv. | 34 |
| P | Pardosa proxima Ad. | 41 |
| P | Pardosa prativaga Ad. | 21 |
| P | Pardosa palustris Ad. | 24 |
| P | Pardosa paludicola Ad. | 90 |
| P | Pardosa nigriceps Ad. | 836 |
| P | Pardosa nigriceps juv. | 179 |
| P | Pardosa hortensis Ad. | 5 |
| P | Pardosa agrestis Ad. | 12 |
| P | Aulonia albimana Ad. | 1430 |
| P | Aulonia albimana juv. | 10 |
| P | Alopecosa pulverulenta Ad. | 671 |
| P | Alopecosa cuneata Ad. | 1265 |
| P | Alopecosa juv. | 384 |
| P | Phlegra fasciata juv. | 3 |
| P | Phlegra fasciata Ad. | 23 |
| P | Neon valentulus Ad. | 15 |
| P | Myrmarachne formicaria Ad. | 3 |
| P | Myrmarachne formicaria juv. | 1 |
| P | Heliophanus flavipes Ad. | 35 |
| P | Evarcha arcuata Ad. | 3 |
| P | Euophrys frontalis juv | 7 |
| P | Euophrys frontalis Ad. | 198 |
| P | Euophrys aperta juv. | 3 |
| P | Euophrys aperta Ad. | 249 |
| P | Euophrys aequipes Ad. | 141 |
| P | Bianor aurocinctus juv. | 3 |
| P | Bianor aurocinctus Ad. | 8 |
| P | Tibellus oblongus Ad. | 18 |
| P | Tibellus juv. | 3 |
| P | Thanatus striatus Ad. | 14 |
| P | Thanatus juv. | 8 |
| P | Xysticus kochi Ad. | 314 |
| P | Xysticus juv. | 143 |
| P | Xysticus erraticus Ad. | 6614 |
| P | Xysticus erraticus juv. | 496 |
| P | Xysticus cristatus Ad. | 99 |
| P | Xysticus cristatus/kochi juv. | 1 |
| P | Xysticus acerbus Ad. | 20 |
| P | Oxyptila simplex Ad. | 2557 |
| P | Oxyptila sanctuaria Ad. | 197 |
| P | Oxyptila spp. juv. | 170 |
| P | Micrommata virescens Ad. | 2 |
| P | Micrommata virescens juv. | 32 |
| P | Zora spinimana Ad. | 1 |
| E | Araneae others unid. | 1 |
| P | Zora parallela Ad. | 37 |
| P | Zora parallela juv. | 2 |
| P | Phrurolithus minimus Ad. | 1 |
| E | Phalangida adults | 1 |
| P | Phrurolithus festivus Ad. | 1481 |
| E | Phalangium opilio Ad. | 7 |
| P | Phrurolithus festivus juv. | 44 |
| E | Phalangium opilio juv. | 4 |
| P | Agroeca proxima Ad. | 1 |
| E | Oligolophus juv. | 3 |
| P | Agroeca juv. | 2 |
| P | Clubiona subtilis Ad. | 1 |
| P | Clubiona pseudoneglecta Ad. | 65 |
| P | Clubiona diversa Ad. | 35 |
| E | Phalangida juveniles | 1 |
| P | Clubiona spp. juveniles | 16 |
| E | Stemonyphantes juv. | 1 |
| P | Zelotes (Drassyllus) juv. | 20 |
| E | Porrhomma microphtalmum Ad. | 3 |
| P | Zelotes petrensis Ad. | 3 |
| E | Microlinyphia pusilla Ad. | 2 |
| P | Zelotes pusillus Ad. | 223 |
| E | Microlinyphia pusilla juv. | 12 |
| P | Zelotes praeficus Ad. | 506 |
| E | Meioneta simplicitarsis Ad. | 32 |
| E | Meioneta rurestris Adult | 204 |
| P | Zelotes pedestris Ad. | 174 |
| P | Zelotes lutetianus Ad. | 51 |
| E | Meioneta mollis Ad. | 25 |
| P | Zelotes latreillei Ad. | 137 |
| E | Meioneta juv. | 44 |
| P | Zelotes civicus Ad. | 369 |
| P | Zelotes atrocaeruleus Ad. | 5 |
| E | Linyphia s.l. juv. | 5 |
| P | Zelotes (juveniles) | 106 |
| E | Lepthyphantes tenuis Adult | 11 |
| P | Phaeocedus braccatus Ad. | 95 |
| E | Lepthyphantes tenuis juv. | 15 |
| P | Phaeocedus braccatus juv. | 4 |
| P | Micaria pulicaria Ad. | 39 |
| P | Micaria albovittata Ad. | 70 |
| E | Lepthyphantes other juv. | 1 |
| P | Micaria (juveniles) | 17 |
| P | Haplodrassus signifer Ad. | 176 |
| E | Linyphiinae indet. Juveniles | 13 |
| P | Haplodrassus dalmatensis Ad. | 6 |
| E | Walckenaeria dysderiodes Ad. | 1 |
| P | Haplodrassus (juveniles) | 21 |
| E | Walckenaeria antica Ad. | 3 |
| P | Drassodes pubescens Ad. | 580 |
| E | Tiso vagans Ad. | 31 |
| P | Drassodes cupreus Ad. | 3 |
| E | Pocadicnemis juncea Ad. | 231 |
| P | Drassodes (juveniles) | 16 |
| E | Plecopsis parallela Ad. | 3 |
| P | Callilepis nocturna Ad. | 2 |
| P | Zodarion italicum Ad. | 12 |
| E | Micrargus subaequalis Ad. | 38 |
| E | Metopobactrus prominulus Ad. | 7 |
| P | Dysdera erythrina Ad. | 3 |
| P | Dysdera juv. | 2 |
| E | Maso sundevali Ad. | 1 |

## Acari

| | | |
|---|---|---|
| P | Oribatida | 471 |
| P | Erythraeidae | 7031 |
| W | Thysanoptera | 17894 |
| W | Oribatida | 2024 |
| W | Acaridae other | 6 |
| W | Hypopus | 10 |
| W | Acaridae | 63 |
| W | Actenidida other | 4 |
| W | Tydeidae | 761 |
| W | Trombidiidae | 2 |
| W | Tetranychidae | 3259 |
| W | Tarsonemidae | 15214 |
| W | Stigmaeidae | 46 |
| W | Scutacaridae | 2 |
| W | Pygmephoridae | 10598 |
| W | Nanorchestidae | 12 |
| W | Microtrombidiidae | 9 |
| W | Eupodidae | 22 |
| W | Eupalopsellidae | 16 |
| W | Erythraeidae | 342 |
| W | Eriophyoidea | 1685 |
| W | Cunaxidae | 131 |
| W | Bdellidae | 6 |
| W | Gamasida (total) | 3000 |
| W | Gamasida other female | 346 |
| W | Female Phytoseiidae | 1097 |
| W | Nymph and Male Gamasida | 1333 |
| W | Larvae Gamasida | 241 |

## Hymenoptera

| | | |
|---|---|---|
| A | Hymenoptera (other) ad. | 1 |
| A | Hymenoptera (other) juv. | 28 |
| A | Parasitica (other) | 4 |
| E | Proctotrupoidea | 9 |
| A | Proctotrupoidea (other) | 1 |
| A | Scelionidae | 1240 |
| E | Scelionidae | 1191 |
| A | Platygastridae | 132 |
| E | Platygastridae | 46 |
| A | Megaspilidae | 19 |
| E | Megaspilidae | 13 |
| A | Diapriidae | 131 |
| E | Diapriidae | 62 |
| E | Ceraphronidae | 194 |
| A | Ceraphronidae | 129 |
| A | Cynipoidea | 274 |
| E | Cynipoidea (other) | 155 |
| E | Chalcidoidea (other) | 484 |
| A | Chalcidoidea (other) | 339 |
| A | Pteromalidae | 979 |
| E | Pteromalidae | 388 |
| E | Trichogrammatidae | 1137 |
| A | Trichogrammatidae | 391 |
| A | Mymaridae | 1606 |
| E | Mymaridae | 839 |
| P | Hymenoptera (other) juv. | 56 |
| A | Eulophidae | 1193 |
| E | Eulophidae | 148 |
| P | Parasitica (other) | 47 |
| A | Encyrtidae | 4984 |
| E | Encyrtidae | 1023 |
| P | Cynipoidea | 146 |
| A | Braconidae (other) | 1164 |
| E | Braconidae (other) | 276 |
| P | Ceraphronidae | 197 |
| P | Scelionidae | 1718 |
| A | Aphidiinae | 363 |
| E | Aphidiinae | 227 |
| P | Diapriidae | 1070 |
| A | Alysiinae | 159 |
| E | Alysiinae | 22 |
| E | Ichneumonidae | 287 |
| A | Ichneumonidae | 53 |
| P | Chalcidoidea (other) | 38 |
| P | Trichogrammatidae | 152 |
| E | Aculeata (other) | 116 |
| A | Aculeata (other) | 30 |
| P | Pteromalidae | 208 |
| A | Bethylidae | 28 |
| E | Bethylidae | 8 |
| A | Formicidae | 1149 |
| E | Formicidae | 107 |
| P | Mymaridae | 106 |
| P | Eulophidae | 19 |
| A | Symphyta adults | 7 |
| P | Encyrtidae | 1284 |
| A | Symphyta juveniles | 64 |
| P | Aphelinidae | 47 |
| P | Braconidae | 220 |
| P | Ichneumonidae | 330 |
| P | Aculeata (other) | 210 |
| P | Formicidae | 30433 |
| P | Symphyta ad. | 1 |
| P | Symphyta juv. | 15 |

## Diptera

| | | |
|---|---|---|
| P | Diptera (other) juv. | 432 |
| P | Calyptratae (other) | 59 |
| P | Calliphoridae | 23 |
| P | Anthomyiidae | 315 |
| P | Acalyptratae (other) | 171 |
| P | Sphaeroceridae | 103 |
| P | Opomyzidae | 52 |
| P | Chloropidae | 1648 |
| P | Agromyzidae | 30 |
| A | Diptera (other) juveniles | 74 |
| P | Aschiza (other) | 14 |
| E | Diptera (other) juveniles | 3 |
| P | Phoridae | 2824 |
| A | Calyptratae | 54 |
| E | Calyptratae (other) | 37 |
| A | Acalyptratae (other) | 331 |
| E | Acalyptratae (other) | 73 |
| P | Syrphidae ad. | 2 |
| A | Sphaeroceridae | 49 |
| E | Sphaeroceridae | 10 |
| A | Agromizidae | 290 |
| P | Brachycera | 90 |
| E | Agromizidae | 33 |
| A | Chloropidae | 3926 |
| E | Chloropidae | 467 |
| P | Nematocera (other) | 114 |
| P | Sciaridae | 553 |
| E | Tricimba ssp | 445 |
| A | Tricimba ssp. | 3 |
| A | Drosophilidae | 62 |
| P | Chironomidae | 19 |
| E | Drosophilidae | 5 |
| A | Aschiza (other) | 135 |
| E | Aschiza (other) | 39 |
| P | Ceratopogonidae | 13 |
| E | Phoridae | 910 |
| A | Phoridae | 310 |
| A | Orthorrhapha | 172 |
| E | Orthorrhapha | 114 |
| A | Nematocera (other) | 81 |
| E | Nematocera (other) | 51 |
| A | Scatopsidae | 4 |
| E | Scatopsidae | 1 |
| E | Psychodidae | 2 |
| A | Psychodidae | 1 |
| A | Sciaridae | 385 |
| E | Sciaridae | 343 |
| A | Chironomidae | 254 |
| E | Chironomidae | 12 |
| A | Ceratopogonidae | 52 |
| E | Ceratopogonidae | 22 |
| A | Cecidomyiidae | 6213 |
| E | Cecidomyiidae | 3086 |

## Other insects

| | | |
|---|---|---|
| E | Arthropoda (other) | 50 |
| A | Arthropoda (other) | 2 |
| E | Insecta (other) adults | 1 |
| E | Insecta (other) juveniles | 3 |
| A | Insecta (other) juveniles | 2 |
| A | Neuroptera (other) adults | 5 |
| E | Neuroptera (other) adults | 5 |
| A | Neuroptera (other) juveniles | 50 |
| E | Neuroptera (other) juveniles | 2 |
| A | Lepidoptera adults | 287 |
| E | Lepidoptera adults | 52 |
| A | Lepidoptera juveniles | 201 |
| E | Lepidoptera juveniles | 44 |
| P | Chilopoda (all) | 1445 |
| P | Diplopoda (all) | 3136 |
| P | Isopoda (all) | 17274 |
| P | Insecta (other) ad. | 71 |
| P | Insecta (other) juv. | 20 |
| P | Cecidomyiidae | 457 |
| P | Chrysopidae juv. | 2 |
| P | Lepidoptera ad. | 124 |
| P | Lepidoptera juv. | 281 |
| A | Thysanoptera adults | 3795 |
| E | Thysanoptera adults | 3304 |
| A | Thysanoptera juveniles | 1374 |
| E | Thysanoptera juveniles | 154 |
| P | Thysanoptera juv. | 97 |
| E | Psocoptera (all) | 15 |
| A | Psocoptera (all) | 8 |
| P | Psocoptera (all) | 3 |
| P | Orthoptera ad. | 542 |
| A | Orthoptera adults | 27 |
| E | Orthoptera adults | 19 |
| A | Orthoptera juveniles | 1916 |
| P | Orthoptera juv. | 716 |
| E | Orthoptera juveniles | 113 |
| E | Arthropleona | 8496 |
| A | Arthropleona | 1615 |
| P | Arthropleona | 18952 |
| A | Symphypleona | 3251 |
| E | Symphypleona | 477 |
| P | Symphypleona | 163 |

| | |
|---|---|
| P | pitfall data |
| A | aspirator data |
| E | photo-eclector data |
| W | weed |

# ANNEX 2 EXAMPLE OF A SUMMARY OF AN IN-CROP FIELD STUDY

**An evaluation of the effects of field and drift rates of UVW on the non-target arthropod fauna of a cereal field in England.**

## Header Table and Abstract

| | | | |
|---|---|---|---|
| Reference | : Anonymous, 2004 | GLP statement | : Yes |
| Type of study | : Terrestrial arthropod community field study | Guideline | : PSD handbook, UK |
| | | Acceptability | : Acceptable |
| Year of execution | : 2002-2003 | | |
| Test substance | : UVW, purity 456 g/L | | |

| Substance | Taxa | Method | Location, Crop | Exposure regime | Date of application | Duration | Effect class | Value [g a.s./ha] | Ri |
|---|---|---|---|---|---|---|---|---|---|
| UVW (456 g DEF/L) batch 789 | *arthropod community arable land* | in crop field study | South-West England | 3 repeated applications, exposure range: 0.2 and 10 g a.s./ha | 3, 15 and 31 May 2002 | effects monitored 8 weeks and 47-57 weeks after last application | Community | | 2 |
| | | | | | | | 1 | 0.2 | |
| | | | | | | | 4 | 10 | |
| | | | | | | | Population | | |
| | | | | | | | 3-4 | 0.2 | |
| | | | | | | | 6-8 | 10 | |

*Abstract*
In a Ri 2 field study the effects of UVW, applied in the rates 10 (field rate) and 0.2 (drift rate) g a.s./ha were determined on natural occurring communities on a cereal field in England. The dose of 0.2 g a.s./ha showed class 3 effects and a dose of 10 g as/ha showed class 7 effects (full recovery not observed within 1 year).
The simulated drift caused statistically significant reductions in several taxa (1 Carabidae, 4 Staphylinidae, 2 Linyphiidae), but with the exception of O. retusus recovery was observed within 1 month of last application. Effects in 2003 appeared on individual sampling moments or were not treatment related, and for that reason it was concluded that no relevant effects were found in the next season for the drift rate.
At the field rate of 10 g a.s./ha statistically significant reductions on subsequent sampling occasions were seen in 33 of 49 taxa analysed (6 Carabidae, 14 Staphylinidae, 1 Catopidae. 10 Linyphiidae, Acari and Hymenoptera). Two months after last application (sometimes 3 months after first occurrence of effects) 8 taxa were still significantly reduced. For nine others recovery was not demonstrated on 2 subsequent time points. Within season recovery was thus not demonstrated for a large number of taxa. The 2003 samples however show that for two taxa clear significant effects were found (Linyphiidae and Acari).
A simulated drift-rate of UVW did not influence the arthropod community measured in the PRC. The community was recovered within the season (class 4).

*Reference*
Anonymous. 2004. An evaluation of the effects of field and drift rates of UVW on the non-target arthropod fauna of a cereal field in England.

## Extended summary

## Description

***Reference***
Anonymous, 2004

***Guidelines***
Guideline to study the within-season effects of insecticides on non-target terrestrial arthropods in cereals in summer. Part three/A3/Appendix 2 of The Registration Handbook (Pesticides Safety Directorate), UK.

***GLP statement***
Yes

***Test substance***
UVW (456 g DEF/L), batch 789, insecticide, toxic reference: lambda-cyhalothrin.
***Location, test site***

Field test was carried out on winter barley in south-west England. Soil type of the different plots was characterised as silty clay, silty clay loam and clay loam. Clay content 28-36%, organic matter 5.7-7.8 % and pH 5.5-6.1. Test site commercial cereal crop (animal feed). In 2001 the field was treated with glyphosate, ploughed, cultivated (crumbling and levelling), drilled and rolled. The fields were sown with winter barley on 13 October 2001. During the test period deflufenican and isoproturon (herbicide mixture) were applied on 17-11-01 and 28-10-02, the fungicides cyproconazole and cyprodinil and picoxystrobin on 19-04-02, the herbicide glyphosate on 24-07-02, the insecticide cypermethrin on 28-10-02, the fungicides fenpropimorph and flusilazole on 23-04-02 and on two plots only the herbicide tralkoxydim and mineral oil and surfactants on 23-04-02.

***Test design, application***

Test compound was applied on 3, 15 and 31 May 2002 with a boom sprayer with a 24 m boom and 48 Lurmark 05F110 nozzles, 400 L/ha. Four replicates, application regimes: water only, 456 g a.s./ha (field rate), 2% x 456 = 9.12 g a.s./ha (drift rate), 20 g a.s./ha lambda-cyhalothrin.

A randomised block design with four replicates of four plots each was used. Plot size 1.0-1.8 ha. All fields bordered by similar length of hedgerows. A 6 m untreated headland was left around the field boundaries for all treatments.

Application took place between 9:00 and 17:00 h, temperature ranged from 10.4 $^{o}$C to 20.5 $^{o}$C and relative air humidity ranged from 45% till 66%; wind speed ranged from 0-29.4 km/h. Sampling of effect parameters occurred until 57 weeks after last application.

***Verification of dosages***

Spraying equipment and vehicle speed were calibrated on each treatment day, and were always within respectively 10% and 15% of the calculated value. Volume sprayed was monitored using a board computer.

***Test conditions***

Meteorological data were obtained from a weather station on the site. Rain took place during almost all 7 day sampling periods (see below).

***Sampling***

The sampling scheme is shown in Table A2.1.

***Visual observations***

Visual observations were aimed at phytophagous taxa, especially cereal aphids, by identifying and counting the taxa present on ten tillers per plot. When phytophagous taxa were found on more than two tillers, the amount of tillers monitored was raised to fifty (14 June 2002 – 22 July 2002).

***Pitfall trap sampling***, aimed at epigeal arthropods. Six traps per plot, in the central region of the plots, 12 m from field boundaries, 6 m between traps, for seven days. Samples were pooled per plot.

***Processing of samples***

Samples were sieved, and species were identified to relevant or practically possible levels. Carabidae and Staphylinidae were identified to the species level where possible. Other Coleoptera were identified to family level. Aranea were identified to the species level where possible. Collembola were identified to family or genus (for *Lepidocyrtus* spp.). Other groups were identified to family, super family or order level.

## Biological system

Cereal aphids were only observed in the crop in significant numbers for a short period from mid-June to early July 2002 and were only found in the water control UVW drift rate treated plots, implying the insecticide treatments effectively controlled them in the other plots.

146 taxa were distinguished, of which 46 were present in sufficient numbers for statistical analysis by analyses of variance. From this 46 taxa, 16 were Carabidae, 14 Staphylinidae, 10 Linyphiidae, 3 Collembola, 3 Acari, 1 Diptera, Hymenoptera and 1 other coleopteran taxon. An overview of total numbers is not presented by the authors of the study report.

*Table A2.1 Sampling scheme (vo = visual observation, pt = pitfall trap).*

| Date | Activity | Sample type | Days after final application |
|---|---|---|---|
| 5 April 2002 | | vo | |
| 9 April 2002 | | vo, pt | |
| 16 April 2002 | | vo, pt | |
| 30 April 2002 | | vo, pt | |
| 3 May 2002 | 1st application | | |
| 14 May 2002 | | vo, pt | |
| 15 May 2002 | 2nd application | | |
| 24 May 2002 | | vo, pt | |
| 31 May 2002 | 3rd application | | |
| 10 June 2002 | | vo | 10 |
| 14 June 2002 | | vo | 14 |
| 17 June 2002 | | pt | 17 |
| 17-18 June 2002 | | vo | 17-18 |
| 24 June 2002 | | vo, pt | 24 |
| 1 July 2002 | | vo, pt | 31 |
| 8 July 2002 | | vo. pt | 38 |
| 15 July 2002 | | vo, pt | 45 |
| 22 July 2002 | | vo, pt | 52 |
| 30 April 2003 | | pt | 334 |
| 21 May 2003 | | pt | 355 |
| 19 June 2003 | | pt | 384 |
| 9 July 2003 | | pt | 404 |

## Calculations and statistics

Pitfall trap data were Log transformed and analysed with a two way ANOVA. Significant results were further analysed with a Tukey test. Only taxa with a mean of > 1 individual per plot in the control were used for analyses. Additionally, a multivariate analysis method using Principal Response Curves was used to analyse community effects.

# Results

## Actual spray volumes

Application volumes deviated less then 1.2% from the intended rates.

## Visual observations

Aphids were found in low numbers, and only in the water control and drift rate plots.

## Community response

Figure A2.1 shows the community response of all pitfall samples in 2002. From Figure A2.1 it is clear that only field dose and the toxic reference show a significant response. At 23 July (53 days after last treatment) significant differences are not present anymore.

The taxa with the highest contribution to this response pattern were the Staphylinidae (*Stenus clavicornis, Philonthus cognatus,* staphylinid larvae, *Tachyporus hypnorum* and *Tachinus signatus*). Of the spiders taxa affected by the field rate treatments the majority were small web building types belonging to the Linyphiidae. *Oedothorax* sp. (female), *Savignya frontata* (male) and *Erigone atra* (male) showed the highest correlation to the observed PRCs. Carabids with the highest species scores included the common species *Bembidion lampros*, *Loricera pilicornis*, *Agonum dorsale* and *B. guttula*.

For 2003, the PRC does not show any significant differences between treatments.

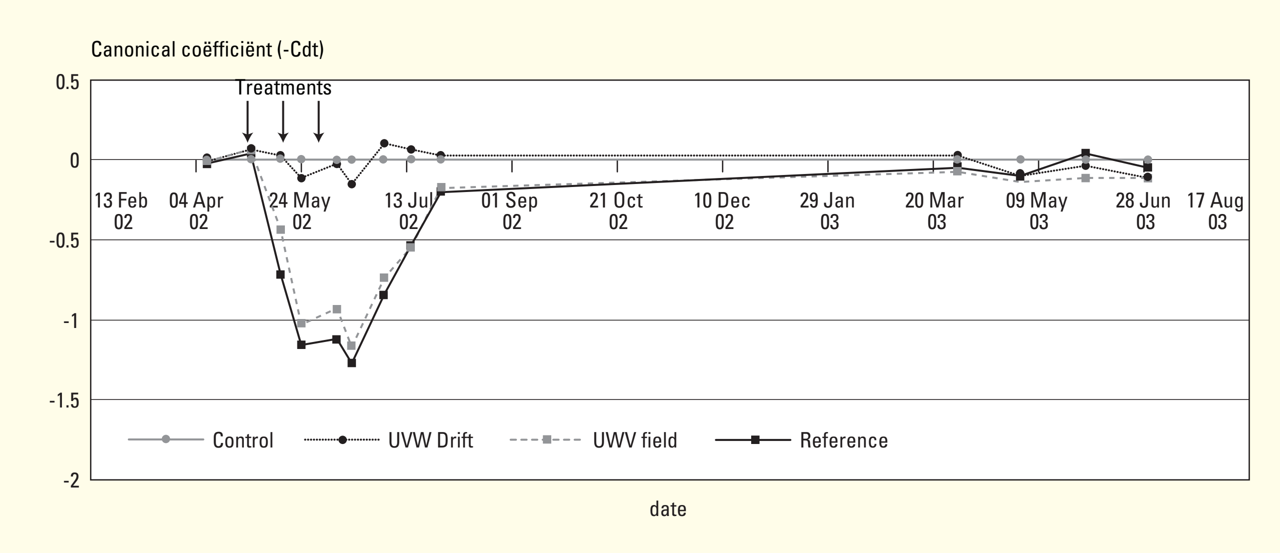


*Figure A2.1 Principle Response Curves (PRC1) for all species/taxa from pitfall catches.*

Table A2.2 summarises the effect on taxa in 2002. From Table A2.2 it is clear that the field rate of UVW results in comparable effects as the toxic reference. Effects in the drift rate of UVW are much smaller.

*Table A2.2 Number of taxa affected in 2002 (significantly lower than control on at least one post-treatment sampling occasion, $p < 0.05$, percentages are percentage of the taxa affected).*

| Treatment | Carabidae | Staphylinidae | Linyphiidae | Collembola | Other taxa | % of all taxa |
|---|---|---|---|---|---|---|
| Drift rate UVW | 1 taxon (6%) | 4 taxa (29%) | 2 taxa (20%) | none | none | 14 |
| Field rate UVW | 6 taxa (38%) | 14 taxa (100%) | 10 taxa (100%) | none | 3 taxa | 67 |
| Lambda-cyhalothrin | 11 taxa (69%) | 14 taxa (100%) | 10 taxa (100%) | 1 taxon | 5 taxa | 84 |

The detailed results are summarised in Table A2.3.
Table A2.4 shows the detailed results for 2003 (for Abott values, see Appendix A2.2)

## Reference item

The reference item (lambda-cyhalothrin) showed significant effects on the community structure. Also clear significant effects were found on total number of taxa and a number of individual taxa.

## Conclusion of the authors of the study report

The authors of the study report conclude that at simulated drift rates of 2% of UVW, only one taxon is affected later than two weeks after the final application. *Oedothorax retusus* male were affected on the final sampling of 2002 (42 d after last treatment). In the 2003 samples effects were found on individual sampling moments or were not treatment related, as in the case of Agonum dorsale, and for that reason, effects in 2003 were not deemed relevant.
The field rate of UVW affected one carabid taxon *(Loricera pilicornis)* later than four weeks after first treatment, with recovery between six and eight weeks after first treatment. One Tachyporinae taxon was affected by eight weeks after first treatment. Of the linyphid spider taxa seven out of ten taxa were still adversely affected in the last sampling of 2002, eight weeks after first treatment (52 d after last treatment). Some species declined in the untreated control as well, so that is was impossible to indicate whether recovery has occurred *(Bembidion guttula* and *Tachinus signatus)*. The only group still affected in 2003 (at the field rate) were the 'other' Acari (excluding Ceratozetoidea and Trombidiiae). These groups were recovered by the third sampling occasion in June 2003. From the multivariate analyses of the data it is concluded that no long-term effect on non-target arthropod communities was likely to occur from the field rate of UVW, and that effects were not statistically different from those of the toxic reference.
Concerning the drift rate it is concluded that three applications per season have no significantly adverse effects on non-target arthropod communities.

*Table A2.3 Greatest reduction in numbers as compared to the control and the recovery time (e.g. 80% means 80% less then control (= 20% of control)).*

| Taxon | UVW drift rate | | UVW field rate | | Toxic reference | |
|---|---|---|---|---|---|---|
| | Greatest % reduction | Recovery (weeks) | Greatest % reduction | Recovery (weeks) | Greatest % reduction | Recovery (weeks) |
| **Carabidae** | | | | | | |
| *Agonum dorsale* | | | 97 | 2-4 | 100 | 2-4 |
| *Agonum muelleri* | 80 | <3 | | | 71 | <3 |
| *Asaphidion curtum* | | | | | 90 | low nrs |
| *Bembidion guttula* | | | 100 | <52 | 100 | <52 |
| *Bembidion lampros* | | | 97 | 4-6 | 99 | 4-6 |
| *Bembidion lunulatum* | | | 100 | 2-6 | 100 | 2-6 |
| Carabid larvae | | | 100 | 4-6 | 100 | 4-6 |
| *Loricera pilocornis* | | | 100 | 4-8 | 100 | 6-8 |
| *Poecilus cupreus* | | | | | 89 | low nrs. |
| *Pterostichus melanarius* | | | | | 100 | <3 |
| *Trechus quadristriatus* | | | | | 96 | <3 |
| **Staphylinidae** | | | | | | |
| Aleocharinae other | | | 92 | 2-4 | 94 | 2-4 |
| *Aloconota gregaria* | | | 98 | 6-8 | 100 | 6-8 |
| *Amischa* sp. | | | 94 | 6-8 | 99 | <52 |
| *Anotylus rugosus* | 67 | 2-4 | 100 | 4-6 | 100 | 4-6 |
| *Gabrius* sp. | | | 100 | 6-8 | 100 | 6-8 |
| *Oxyopoda tarda* | | | 98 | 6-8 | 100 | 6-8 |
| *Philonthus cognatus* | 58 | <3 | 100 | 2-4 | 100 | 2-4 |
| *Philonthus varius* | | | 94 | 2-4 | 100 | 2-4 |
| Staphylinid larva | 68 | 2-4 | 99 | 6-8 | 100 | 6-8 |
| *Stenus clavicornis* | | | 100 | 6-8 | 100 | 6-8 |
| *Tachinus signatus* | 87 | 2-4 | 100 | <52 | 100 | < 52 |
| *Tachyporus hypnorum* | | | 100 | 2-4 | 100 | 2-4 |
| Tachyporinae (other) | | | 100 | <52 | 100 | <52 |
| *Xantholinus longiventris* | | | 69 | 2-4 | 91 | 2-4 |
| Other | | | | | | |
| Catopidae (*Ptomaphagus* sp) | | | 100 | low nrs. | 100 | low nrs. |
| Linyphiidae | | | | | | |
| *Bathyphantes gracilis* | | | 100 | <52 | 100 | <52 |
| *Erigone atra* male | 100 | 2-4 | 100 | <52 | 100 | <52 |
| *Erigone dentipalpis* male | | | 100 | low nrs. | 100 | low nrs. |
| Linyphiidae juv. | | | 100 | <52 | 100 | <52 |
| Linyphiidae female other | | | 93 | 4-8 | 100 | 4-8 |
| Linyphiidae male other | | | 100 | 4-6 | 100 | 4-6 |
| *Oedothorax fuscus male* | | | 99 | <52 | 99 | <52 |
| *Oedothorax retusus* male | 100 | <52 | 100 | <52 | 100 | <52 |
| *Oedothorax* sp. female | | | 100 | <52 | 100 | <52 |
| *Savignia frontata* male | | | 100 | <52 | 100 | <52 |
| Other | | | | | | |
| Acari trombididae | | | | | 100 | 2-4 |
| Acari other | | | 92 | 52 | 98 | 52 |
| Diptera | | | | | 84 | <3 |
| Hymenoptera | | | 90 | 2-4 | 79 | 2-4 |
| Sminthuridae | | | | | 79 | 2-4 |

*Table A2.4 Summary of the results of 2003 based on Appendix A2.2. Different sample types are combined, an arrow means statistically significant at P = 0.01, grey means statistical significant at P = 0.05.*

| **Taxon** | **Date** | **30-04** | **12-05** | **19-06** | **09-07** | **30-04** | **12-05** | **19-06** | **09-07** | **30-04** | **12-05** | **19-06** | **09-07** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Drift rate** | | | | **Full rate** | | | | **Toxic reference** | | | |
| **COMMUNITY** | Taxon | | | | | | | | | | | | |
| **INSECTA** | | | | | | | | | | | | | |
| Heteroptera | Nymph | | | | | | | | | | | | |
| Sternorrhyncha | Aphidoidea | | | | | | | | | | | | |
| | Hemiptera, Heteroptera | | | | | | | | | | | | |
| Homoptera | | | | | | | | | | | | | |
| Hymenoptera | | | | | | | | | | | | | |
| Apocrita | Formicoidea | | | | | | | | | | | | |
| | Hymenoptera | | | | | | | | | | | | |
| Coleoptera | | | | | | | | | | | | | |
| Carabidae | *Agonum dorsale* | ↓ | ↓ | | | | | | | | | | |
| | *Agonum muelleri* | | | | | | | | | | | | |
| | *Amara* spp. | | | | | | | | | | | | |
| | *Asaphidion curtum* | | | | | | | | | | | | |
| | *Bembidion guttula* | | | | | | | | | | | | |
| | *Bembidion lampros* | | | | | ↓ | ↓ | | | | | | |
| | *Bembidion lunulatum* | | | | | | | | | | | | |
| | *Bembidion obtusum* | | | | | | | | | | | | |
| | *Carabid larvae* | | | | | | | | | | | | |
| | *Harpalus rufipes* | | | | | | | | | | | | |
| | *Loricera pilocornis* | | | | | | | | | | | | |
| | *Nebria brevicollis* | | | | | ↑ | | | | | | ↑ | |
| | *Notiophilus bigattus* | | ↑ | | | | | | | | | | ↑ |
| | *Poecilus cupreus* | | | | | | | | | | | | |
| | *Pterostichus madidus* | | | | | | | | | | | | |
| | *Pterostichus melanarius* | | | | | | | | | | | ↑ | |
| | *Pterostichus niger* | | | | ↑ | | | | | | | | |
| | *Pterostichus strenuus* | | | | | | | | | | | | |
| | *Synuchus nivalis* | | | | | | | | | | | | |
| | *Trechus quadristriatus* | | | | | | | | | | | ↑ | ↑ |
| Staphylinidae | Aleocharinae other | | | | | | | | | | | | |
| | *Aloconota gregaria* | | | | | | ↑ | | | | ↑ | | |
| | *Amischa* sp. | | | | | | | | | ↑ | | | |
| | *Anotylus rugosus* | | | ↑ | | | ↓ | | | | | | |
| | *Anotylus tetracarinatus* | | | | | | | | | | | | |
| | *Callicerus obscurus* | | | | | | | | | | | | |
| | Gabrius sp. | | | | | | | | | | | | |
| | *Oxyopoda tarda* | | | | | | | | | | | | |
| | *Philonthus carbonarius* | | | | | | | | | | | | |
| | *Philonthus cognatus* | | | | | | | | | | | | |
| | Staphylinid larva | | | | | | | | | | | | |
| | *Stenus clavicornis* | | ↓ | | | | | | | | | | |
| | *Sunius propinquus* | | | | | | ↓ | | | | | | |
| | *Tachinus signatus* | | | | | | | | | | | | |
| | *Tachyporus hypnorum* | | | | | | | | | | | | |
| | Tachyporinae (other) | | | | | | | | | | | | |
| | *Xantholinus longiventris* | ↓ | | | | | | | | | | | |
| Coccinellidae | *Coccinella 7 punctata* | | | | | | | | | | | | |

| Taxon | Date | 30-04 | 12-05 | 19-06 | 09-07 | 30-04 | 12-05 | 19-06 | 09-07 | 30-04 | 12-05 | 19-06 | 09-07 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Drift rate | | | | Full rate | | | | Toxic reference | | | |
| Other Coleoptera | | | | | | | | | | | | | |
| Collembola | Entomobrycidae *Lepidocyrus* spp. | | ↑ | | | | ↑ | | | ↑ | ↑ | ↑ | |
| | Isotomidae | | | | | | | | | | | | ↑ |
| | Sminthuridae | ↓ | | | | ↓ | | | | | | | |
| Dermaptera | | | | | | | | | | | | | |
| Diptera | | | | | | | | | ↑ | | | | |
| Lepidoptera | | | | | | | | | | | | | |
| Neuroptera | Chrysopidae larvae | | | | | | | | | | | | |
| Orthoptera | Orthoptera | | | | | | | | | | | | |
| Thysanoptera | Thysanoptera | | | | | | | | | | | | |
| Anoplura | Anoplura | | | | | | | | | | | | |
| Siphonaptera | Siphonaptera | | | | | | | | | | | | |
| **ARANEA** | | | | | | | | | | | | | |
| Hunting spiders | | | | | | | | | | | | | |
| Lycosidae | | | | | | | | | | | | | |
| Thomisidae | Thomisidae | | | | | | | | | | | | |
| Web spiders | | | | | | | | | | | | | |
| Linyphiidae | *Bathyphantes gracilis* | | | | | | | | | | | | |
| | *Erigone atra* male | ↑ | | | | | | | | | | | |
| | *Erigone dentipalpis* male | | | | | | | | | | | | |
| | Linyphiidae juv. | | | | | | | | | | | | |
| | Linyphiidae female other | | | | | | | | | | | | |
| | Linyphiidae male other | | | | | | | | | | | | |
| | *Oedothorax fuscus* male | | | | | | | | | | | | |
| | *Oedothorax retusus* male | | | | | | | | | | | | |
| | Oedothorax sp. female | | | | | ↓ | | | | | | | |
| | *Savignia frontata* male | | | | | | | | | | | | |
| Tetragnathidae | | | | | | | | | | | | | |
| Gnaphosidae | | | | | | | | | | | | | |
| Agelenidae | | | | | | | | | | | | | |
| **Opiliones** | | | | | | | | | | | | | |
| **Acari** | | | | | | | | | | ↓ | | ↓ | ↓ |
| Actinedida | Acari trombididae | | | | | | | | | | | | |
| Oribatida | Acari Ceratozetoidea | | | | | | | | | | | | |
| | other | | | | | ↓ | ↓ | ↓ | | ↓ | ↓ | | ↓ |
| **OTHERS** | | | | | | | | | | | | | |
| **Chilopoda** | Chilopoda | | | | | | | | | | | | |
| **Diplopoda** | Diplopoda | | | | | | | | | | | | |
| **Crustacea** | Isopoda | | | | | | | | | | | | |

# Evaluation

## Evaluation of the reliability of the study

For the evaluation of the reliability of the study, use has been made of the checklist from the guidance for summarising and evaluating non-target arthropod studies (see Table A2.5).

*Table A2.5 Checklist for the aspects that generally are considered of importance when evaluating non-target arthropod field studies.*

| Test item | Notes | Reliability lower? |
|---|---|---|
| Description | | |
| 1. Substance | | |
| 1.1 Purity | adequately reported | N |
| 1.2 Formulation | adequately reported | N |
| 1.3 Use class / mode of action | not reported | Y [→ Ri 2] |
| 2. Test site | | |
| 2.1 Location | adequately reported | N |
| 2.2 Field history | field history not described in detail, not indicated whether temperature and relative humidity are within normal range | Y [→ Ri 2] |
| 2.3 Characterisation of the crop | adequately reported | N |
| 2.4 General weather conditions | adequately reported | N |
| 3. Application | | |
| 3.1 Method of application | adequately reported | N |
| 3.2 Application rate and volume applied per ha | adequately reported | N |
| 3.3 Verification of application | adequately reported | N |
| 3.4 Application scheme | adequately reported | N |
| 3.5 (Micro) climate | adequately reported | N |
| 4. Test design | | |
| 4.1 Type & size | adequately reported | N |
| 4.2 Test date and duration | adequately reported | N |
| 4.3 Pre-treatment | adequately reported | N |
| 4.4 Negative control | adequately reported | N |
| 4.5 Positive control | adequately reported | N |
| 4.6 Replications | adequately reported | N |
| 4.7 Statistics | adequately reported | N |
| 4.8 GLP | adequately reported | N |
| 5. Biological system | | |
| 5.1 Test organisms | adequately reported | N |
| 5.2 Community | unclear whether the community is representative for the off-crop community | Y [→ Ri 2] |
| 6. Sampling | | |
| 6.1 General features | adequately reported | N |
| 6.2 Actual dose | adequately reported | N |
| 6.3 Biological sampling | adequately reported | N |
| 6.4 (Micro) climate | adequately reported | N |
| Results | | |
| 7. Application | | |
| 7.1 Actual application rate | adequately reported | N |
| 7.2 Condition of application | adequately reported | N |
| 7.3 (Micro) climate | adequately reported | N |
| 8. Endpoint | | |
| 8.1 Type | adequately reported | N |
| 8.2 Value | mean and s.d. not reported | Y [→ Ri 2] |
| 8.3 Verification of endpoint | adequately reported | N |
| 8.4 Pre-treatment | adequately reported | N |
| 8.5 Negative control | adequately reported | N |
| 8.6 Positive control | adequately reported | N |

| Test item | Notes | Reliability lower? |
|---|---|---|
| Description | | |
| 9. Elaboration of results | | |
| 9.1 Statistical comparison | details of univariate analyses not reported, statistical power compared to results not reported | Y [→ Ri 2] |
| 9.2 Presentation of results | adequately reported | N |
| 9.3 Community level impact | adequately reported | N |
| 10. Classification of effects | effects are not classified | Y [→ Ri 2] |

## Description of the study

1. Substance
   Considering the substance it should be noted that no further specification of the mode of action (other than 'insecticide' ) was given in the study report. For this reason it is difficult to predict and check the effects expected, and a lower reliability is indicated. It should be noted however, that in the framework of a regular registration, this kind of information usually is available at the registrating authority.
2. Test Site
   Details about location, crop and general climatic conditions are adequately reported. The field history is not reported in detail. Not indicated whether temperature and relative humidity were within normal ranges. Therefore Ri 2 is assigned.
3. Application
   Details about way of application, rain, dosage, date and conditions are adequately addressed.
4. Test design
   All items adequately addressed, negative and positive control included.
5. Biological system
   Representatives of all essential groups as mentioned in Table 4 of guidance for summarising and evaluating non-target arthropod studies were present in the field study. See Appendix A2.1. The aim of the study is however to assess the effects of the drift rate. In this context it is questionable whether the in-crop species are representative for the off-crop fauna, and whether sampling by pitfalls only is sufficient. When Table 4 is taken into account, it appears that in the present study a number of taxa of importance for the off-crop situation are present in very low number in the study. Because this aspect is mainly of importance for the use of the results of the study, we indicate a lower reliability here and discuss it later on, but this aspect will not render the study itself unreliable. The authors do not indicate whether the non-target arthropod fauna is representative for an arable field in England.
6. Adequately reported, dose was checked by checking the applied volume.
   Results of the study
7. Application
   Application rate checked by checking the sprayed volumes.
8. Endpoints
   Endpoints are reported in detail. The toxic reference showed clear effects for almost all taxa (the criterion of > 50% effect for at least 10% of the taxa on at least one sampling occasion is clearly met). Mean and S.D. are not indicated, resulting in Ri 2.
9. Elaboration of the results
   Power analysis is not given. The minimum detectable difference is not given. Clear significant effects ($P = 0.05$) were found in the toxic reference for almost all taxa. Statistical analyses methods are up to date and adequate. The results of the univariate analyses are not reported in detail, resulting in Ri2.
10. Classification of the effects
    Effects are not classified. NB: effect classes were not available at that time.

Summarising the conclusions of the evaluation of the scientific reliability, it is concluded that the design, conduct, elaboration of the results and the report is generally adequate. Because some aspects were assigned less reliable, for the study as a whole Ri 2 is assigned.

## Evaluation of the results of the study

In Table A2.3 the results of the study are summarised. The data indicate that significant effects are at least 69%. In Appendix A2.1 the number of specimens found in the untreated control are listed, allowing getting an impression whether numbers are high enough for statistical evaluation.

In Table A2.7 results of the study were classified according to the classification in chapter 2 of the guidance document (see Table 5).

*Table A2.6 Proposed classification of the effects in non-target arthropod field studies.*

| Effect class | Description | Criteria |
|---|---|---|
| 1 | Effects could not be demonstrated (NOER) | • No (statistically significant) effects observed as a result of the treatment<br>• Observed differences between treatment and controls show no clear causal relationship |
| 2 | Slight and transient effects | • Quantitatively restricted response of one or a few taxa and only observed on one sampling occasion |
| 3 | Pronounced short term effects; recovery within two months after first application | • Clear response of taxa, but full recovery within two months after the first application<br>• Effects observed at two or more sampling instances |
| 4 | Pronounced effects; recovery within four months after first application | • Clear response of taxa, effects last longer than two months but full recovery within four months after the first application<br>• Effects observed at two or more sampling instances |
| 5 | Pronounced effects; recovery within eight months after first application | • Clear response of taxa, effects last longer than four months but full recovery within eight months after the first application<br>• Effects observed at two or more sampling instances |
| 6 | Pronounced effects; full recovery one year after first application | • Clear response of taxa, effects last longer than eight months but full recovery one year after first application<br>• Effects observed at two or more sampling instances |
| 7 | Pronounced effects; full recovery more than one year after first application | • Clear response of taxa, effects last longer than twelve months after the first application but full recovery found within the study period<br>• Effects observed at two or more sampling instances |
| 8 | Pronounced effects; no recovery within the study period | • Clear response of taxa, no recovery within the duration of the study<br>• Effects observed at two or more sampling instances |

The last sampling in 2002 is at 52 days after last application. This means that for short term effects, a class three is assigned. For taxa that are affected on the last sampling date of 2002, but recovered at the first sampling moment in 2003, a class five is assigned, because it is not clear when recovery occurred.

*Table A2.7 Classification of the effects; - numbers too low for statistical evaluation P = 0.05.*

| | Drift rate | | Full rate | |
|---|---|---|---|---|
| | Effect class | Notes | Effect class | Notes |
| Arthropod community | 1 | | 4↓ | |
| Diptera | 1 | | 2↑ | |
| Hymenoptera | 1 | | 3↓ | |
| Agonum dorsale | 2↓ | 2 based on single sign. decrease in May 2003; | 3↓ | sign. increase in July 2002 is not consistent with previous decrease, no sign. effects in 2003 therefore recovery within 2 m concluded |
| *Agonum muelleri* | 3↓ | | 1 | |
| *Amara* spp. | 1 | | 2↑ | |
| *Asaphidion curtum* | 2↑ | | 1 | |
| *Bembidion guttula* | 1 | | 4↓ | effects last 2 months (so, not **longer** than 2 m as stated for Cl 4), recovery established after 3 months (= within 4), therefore Class 4; effects in 2003 are not significant |
| *Bembidion lampros* | 1 | | 4↓ | see *B. guttala* |
| *Bembidion lunulatum* | 1 | | 3↓ | |
| *Bembidion obtusum* | 1 | | 1 | |
| Carabid larvae | 1 | | 4↓ | see *B. guttala* |
| *Loricera pilocornis* | 1 | | 4↓ | sign. increase in July 2002 is not consistent with previous decrease, no sign. effects in 2003 therefore recovery within 4 m concluded |
| *Nebria brevicollis* | 1 | | 1 | |
| *Notiophilus bigattus* | 1 | | 2↑ | |
| *Poecilus cupreus* | 1 | | 1 | |
| *Pterostichus madidus* | 1 | | 1 | |
| *Pterostichus melanarius* | 2↑ | | 1 | |
| *Trechus quadristriatus* | 1 | | 1 | |
| Aleocharinae other | 1 | | 3↓ | sign. increase in July 2002 is not consistent with previous decrease, therefore recovery within 2 m concluded; otherwise Cl 6 applies |
| *Aloconota gregaria* | 1 | | 4↓ | in the absence of effects in 2003, it is assumed that recovery was established in July 2002, although in 2002 there is only 1 sampling without effect |
| *Amischa* sp. | 1 | | 4↓ | see *A. gregaria* |
| *Anotylus rugosus* | 2↓ | | 4↓ | |
| *Gabrius* sp. | 1 | | 4↓ | see *A. gregaria* |
| *Oxyopoda tarda* | 1 | | 4↓ | see *A. gregaria* |
| *Philonthus varius* | 2↑ | | 6↓↑ | on the last 2 sampling points in 2002 an increase is found. Since this increase seems to be treatment related, it is taken into account as an effect, and since no significant differences are found in 2003, class 6 is assigned. |
| *Philonthus cognatus* | 2 | | 3 | |
| Staphylinid larva | 2 | | 4 | see *A. gregaria* |
| *Stenus clavicornis* | 1 | | 4 | see *A. gregaria* |
| *Tachinus signatus* | 4↓ | sign. increase in April 2003, not taken into account since it is not treatment related. Not clear whether recovery occurred within 2 months because numbers in control were too low. Therefore class 4 is assigned. | 6↓ | Because last sampling in July 2002 is not valid, it cannot be established that recovery occurred, and because of the absence of effects in 2003, class 6 is assigned |

| | Drift rate | | Full rate | |
|---|---|---|---|---|
| | **Effect class** | **Notes** | **Effect class** | **Notes** |
| *Tachyporus hypnorum* | 2↑↓ | single sampling with increase in 2002, with decrease in 2003; not considered to be treatment related | 3↓ | |
| Tachyporinae (other) | 2↑ | increase should be counted as effect; | 6↓ | single increase in July 2003 is not considered to be related to previous effects, therefore recovery by April 2003 (= within 1 year) concluded. |
| *Xantholinus longiventris* | 1 | | 3↓ | |
| Ptomophagus spp. | 2↑ | sign. increase in April 2003 is counted as an effect | 4↓ | Although last sampling in July 2002 is not valid, it can be assumed that recovery occured, because the forlast sampling in 2002 and the samplings in 2003 does not show significant effects |
| *Bathyphantes gracilis* | - | Numbers too low on a number of sampling occasions, no effect class assigned | 6↓ | duration of effects probably not longer than 8 months, but recovery only demonstrated by 2003 sampling (1 year) |
| *Erigone atra* male | 3↓ | | 6↓ | see *B. gracilis* |
| *Erigone dentipalpis* male | - | Numbers too low on a number of sampling occasions, no effect class assigned | 2↓ | Effects on 1 sampling occasion only |
| Linyphiidae juv. | 1 | | 6↓ | see note B. *gracilis* |
| Linyphiidae female other | 1 | | 4↓ | sign. increase in April 2003, not counted as an effect, see B. guttala |
| Linyphiidae male other | 1 | | 4↓ | see *B. guttala* |
| *Oedothorax fuscus* male | 2↓ | based on single sign. decrease in May 2003 | 6↓ | see *B. guttala* |
| *Oedothorax retusus* male | 2↓ | based on single sign. decrease on 29 july and no significant differences in 2003 | 6↓ | see *B. guttala* |
| *Oedothorax* sp. female | 1 | | 8↓↑ | effects found on almost all sampling moments in 2002, decrease in june 2003, increase in July 2003. Given the large number of significant effects, this is not interpreted as recovery; Cl 8 applies. |
| *Savignia frontata* male | 1 | | 6↓ | see *B. guttala* |
| Trombididae | 1 | | 2↓ | based on single decrease in June 2003 |
| Other Acari | 1 | | 8↓ | only 1 sampling without sign. differences in 2003 |

## Conclusion of the evaluator

From Table A2.7 (and Appendix A2.1) it is clear that most effects are found for Linyphiid spiders.

Concerning the scientific reliability it is concluded that the design, conduct, elaboration of the results and the report is generally adequate. Because some aspects were assigned less reliable, for the study as a whole Ri 2 is assigned.

- Since the study has no NOER design, it is not possible to derive a NOER from the study.
- At the field rate clear responses were observed, which did not recover within the season (last sampling data 29 July). Most taxa were recovered at the start of the next season. For one taxon recovery took place during the next season.
- At the drift rate effects of class three and more were found for three taxa, two of them recovering within two months after first occurrence of effects. For one taxon *(Tachinus signatus)*, recovery was only observed at the start of the next season.
- When recovery in the next season is defined as acceptable, the drift rate could be defined as acceptable rate. However the drift rate suggests that the populations of concern are off-crop populations. In order to assess the effects on the off-crop vegetation, a number of essential taxa are missing in the study, among others due to the limitation of the sampling method of pitfall traps.

## Suggestions for use in risk-assessment

The use of the field rate of UVW has shown to have a considerable effect on the non-target arthropods present in an arable field. Effects are comparable to that in the toxic reference. For a number of (especially spider) taxa, recovery was found in the next season.
For the use of the results of the drift rate for off-crop effect assessment it is questionable whether the present study is suited to assess the effects on off-crop communities, since a number of relevant taxa for the off-crop situations was not present (or sampled) in the present study, (e.g. herbivores, see section 3.2).

## Appendix A2.1

*Number of specimens found in the untreated control of the pitfall traps. 2002 10 sampling occasions (Collembola and Acari ceratozetoidea 9 sampling occasions), 2003 4 sampling occasions.*

| | | 2002 | 2003 |
|---|---|---|---|
| **INSECTA** | | | |
| Heteroptera | Nymph | 0 | 3 |
| Sternorrhyncha | Aphidoidea | 30 | 11 |
| | Hemiptera, Heteroptera | 8 | 2 |
| Homoptera | Homoptera adult | 4 | 8 |
| | Homoptera nymph | 0 | 20 |
| Hymenoptera | | | |
| Apocrita | Formicoidea | 13 | 8 |
| | Hymenoptera | 1050 | 694 |
| Coleoptera | | | |
| Carabidae | Abax parallelepipedus | 6 | 9 |
| | Agonum assimile | 3 | 2 |
| | Agonum dorsale | 843 | 564 |
| | Agonum muelleri | 516 | 425 |
| | Amara spp. | 177 | 76 |
| | Anisodactylus binotarus | 1 | 0 |
| | Asaphidion curtum | 96 | 44 |
| | Badister bipustulaus | 1 | 0 |
| | Bembidion guttula | 423 | 131 |
| | Bembidion lampros | 1258 | 203 |
| | Bembidion lunulatum | 293 | 94 |
| | Bembidion obtusum | 184 | 135 |
| | Bembidion (other) | 3 | 0 |
| | Bembidion quadrimuculatum | 7 | 1 |
| | Calathus fuscipes | 10 | 16 |
| | Calathus melanocephalus | 1 | 0 |
| | Carabid (unidentified) | 2 | 0 |
| | Carabid larvae | 214 | 558 |
| | Carabus nemoralis | 5 | 0 |
| | Carabus violaceus | 13 | 15 |
| | Clivina fossor | 5 | 6 |
| | Cychrus caraboides | 0 | 0 |
| | Demetrias Alricapillus | 30 | 19 |
| | Harpalus aeneus | 0 | 1 |
| | Harpalus rufipes | 69 | 97 |
| | Leistus fulvibarbis | 2 | 1 |
| | Loricera pilocornis | 1120 | 440 |
| | Nebria brevicollis | 480 | 437 |
| | Notiophilus bigattus | 300 | 174 |
| | Poecilus cupreus | 104 | 39 |
| | Pterostichus madidus | 273 | 133 |
| | Pterostichus melanarius | 858 | 1258 |

| | | 2002 | 2003 |
|---|---|---|---|
| | Pterostichus niger | 42 | 65 |
| | Pterostichus vernalis | 5 | 30 |
| | Synuchus nivalis | 31 | 35 |
| | Trechus quadristriatus | 537 | 1101 |
| Staphylinidae | Aleocharinae other | 663 | 77 |
| | Aloconota gregaria | 985 | 1315 |
| | Amischa sp. | 328 | 142 |
| | Anotylus rugosus | 189 | 101 |
| | Anotylus tetracarinatus | 150 | 9 |
| | Callicerus obscurus | 35 | 13 |
| | Gabrius sp. | 160 | 36 |
| | Lathrobium geminum | 10 | 1 |
| | Lesteva longoclytrata | 1 | 1 |
| | Micropeplus sp | 1 | 0 |
| | Oxyopoda tarda | 161 | 102 |
| | Philonthus carbonarius | 386 | 114 |
| | Philonthus cognatus | 1301 | 170 |
| | Philontus laminatus | 30 | 14 |
| | Philonthus marginatus | 0 | 1 |
| | Philonthus sordidus | 1 | 0 |
| | Philonthus sp. (other) | 4 | 0 |
| | Philonthus splendens | - | 0 |
| | Platystethus arenarius | - | 0 |
| | Quedis tristis | 5 | 2 |
| | Quedis sp. | 0 | 0 |
| | Rugilus orbiculatus | 16 | 4 |
| | Staphylinid larva | 523 | 134 |
| | Staphylinid other | 14 | 0 |
| | Philonthus spendens | 0 | - |
| | Stenus boops | 0 | 2 |
| | Stenus clavicornis | 413 | 148 |
| | Stenus crassus | 2 | 0 |
| | Stenus impressus | 0 | 0 |
| | Stenus nanus | 19 | 2 |
| | Stenus ossium | 4 | 0 |
| | Stenus sp | 2 | 3 |
| | Sunus propinquus | 48 | 28 |
| | Tachinus signatus | 566 | 53 |
| | Tachyporus hypnorum | 280 | 141 |
| | Tachyporinae (other) | 128 | 113 |
| | Xantholinus longiventris | 515 | 262 |
| | Xantholinus sp. (other) | 4 | 5 |
| Coccinellidae | Coccinella 7 punctata | 4 | 0 |
| Other Coleoptera | Anthicidae | 0 | 0 |
| | Catopidae (Ptomaphagus sp) | 196 | 53 |
| | Catopidae choleva sp. | - | 3 |
| | Chrysomelidae | 24 | 3 |
| | Clambus armadillo | 38 | 26 |
| | Curculioniodea | 17 | 12 |
| | Elateridae | 30 | 6 |
| | Histeridae | 5 | 1 |
| | Hydraenidae | 149 | 11 |
| | Hydrophyllidae | 26 | 1 |

| | | 2002 | 2003 |
|---|---|---|---|
| | Lathrididae | - | 35 |
| | Other Coleoptera larva | 2 | 1 |
| | Other Coleoptera | 27 | 9 |
| | Pselaphidae | 0 | 1 |
| | Ptiliidae | 7 | 2 |
| | Scarabaeidae | 17 | 1 |
| | Silphidae | 3 | 1 |
| Collembola | Entomobrycidae Lepidocyrus spp. | 6302 | 1159 |
| | Isotomidae | 8426 | 4384 |
| | Poduroidea | - | 0 |
| | Sminthuridae | 1189 | 623 |
| Dermaptera | Dermaptera | 0 | 2 |
| Diptera | Diptera adult | 1016 | 479 |
| | Diptera larvae | 1 | 1 |
| Lepidoptera | Lepidoptera (adult) | 3 | 0 |
| | Lepidoptera (larvae) | 0 | 6 |
| Neuroptera | Chrysopidae larvae | 1 | 1 |
| Orthoptera | Orthoptera | 4 | 4 |
| Thysanoptera | Thysanoptera | 13 | 17 |
| Anoplura | Anoplura | - | 0 |
| Siphonaptera | Siphonaptera | 2 | 3 |
| **ARANEA** | | | |
| Hunting spiders | | | |
| Lycosidae | Alopecosa pulverulenta | 2 | 0 |
| | Alopecosa sp. female | 3 | 2 |
| | Alopecosa sp. male | 0 | 0 |
| | Lycosidae juv | 24 | 3 |
| | Pardosa amentata female | 7 | 5 |
| | Pardosa amentata male | 1 | 5 |
| | Pardosa nigriceps male | 2 | 0 |
| | Pardosa palustris female | 14 | 5 |
| | Pardosa palustris male\ | 0 | 6 |
| | Pardosa prativaga female | 7 | 1 |
| | Pardosa prativaga male | 0 | 0 |
| | Pardosa pullata female | 2 | 0 |
| | Pardosa pullata male | 2 | 1 |
| | Pardosa sp. female | 3 | 2 |
| | Pardosa sp. male | | 0 |
| | Trochosa ruricola female | - | 1 |
| | Trochosa ruricola male | - | 12 |
| Thomisidae | Thomisidae | 2 | 1 |
| Web spiders | | | |
| Linyphiidae | Bathyphantes gracilis | 95 | 16 |
| | Erigone atra male | 411 | 129 |
| | Erigone dentipalpis male | 57 | 14 |
| | Linyphiidae juv. | 171 | 93 |
| | Linyphiidae female other | 103 | 21 |
| | Linyphiidae male other | 94 | 33 |
| | Lepthyphantes tenuis | 28 | 9 |
| | Oedothorax fuscus male | 663 | 304 |
| | Oedothorax retusus male | 79 | 17 |
| | Oedothorax sp. female | 812 | 161 |

| | | 2002 | 2003 |
|---|---|---|---|
| | Savignia frontata male | 309 | 114 |
| Tetragnathidae | Pachygnatha clerki | 18 | 4 |
| | Pachygnatha degeeri | 24 | 10 |
| | Tetragnathidae (other) | 1 | 0 |
| Gnaphosidae | Gnaphosidae juv | 0 | 0 |
| Agelenidae | Agelenidae male | 0 | 0 |
| **Opiliones** | | | |
| | Phlangium opilio | 5 | 2 |
| | Other Opiliones | 0 | 1 |
| **Acari** | | | |
| Actinedida | Acari trombididae | 162 | 215 |
| Oribatida | Acari Ceratozetoidea | 8205 | 9491 |
| | other | 249 | 803 |
| | Ixodes | - | 0 |
| **OTHERS** | | | |
| **Chilopoda** | Chilopoda | 34 | 56 |
| **Diplopoda** | Diplopoda | 28 | 68 |
| **Crustacea** | Isopoda | 17 | 11 |

# Appendix A2.2

*Abott values for the 2003 data, grey and bold lines+ P<0.05 and bold lines only P<0.1*

| Date | 30-apr-03 | 21-mei-03 | 10-jun-03 | 09-jul-03 | 30-apr-03 | 21-mei-03 | 10-jun-03 | 09-jul-03 | 30-apr-03 | 21-mei-03 | 10-jun-03 | 09-jul-03 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample | 7 | 8 | 9 | 10 | 7 | 8 | 9 | 10 | 7 | 8 | 9 | 10 |
| 2 | **Test item drift rate** | | | | **Test item full rate** | | | | **Reference item** | | | |
| 1 Agonum dorsale | 63.3% | 65.9% | 33.3% | 47.8% | 56.3% | 28.6% | 16.3% | 26.0% | 77.3% | 59.0% | 10.1% | 22.1% |
| 2 Agonum muelleri | 26.3% | 35.8% | 35.9% | 33.3% | 5.0% | 21.3% | 23.1% | 8.3% | 27.2% | -0.7% | 14.5% | -4.0% |
| 3 Amara spp. | | -22.5% | -25.4% | 31.8% | | -1.8% | -87.4% | -81.1% | | 54.5% | -8.3% | -70.7% |
| 4 Asaphidion curtum | 11.3% | | | | 75.8% | | | | 51.6% | | | |
| 5 Bembidion guttula | 39.6% | 27.1% | 28.3% | | 56.0% | 51.9% | 50.0% | | 58.8% | 61.9% | 79.7% | |
| 6 Bembidion lampros | -6.9% | 18.3% | 9.0% | | 49.1% | 51.1% | 3.0% | | -3.6% | 1.4% | -37.2% | |
| 7 Bembidion lunulatum | 5.3% | -19.8% | | | 5.3% | 27.6% | | | 3.4% | -26.1% | | |
| 8 Bembidion obtusum | 30.6% | 33.3% | 40.0% | | 41.6% | -15.0% | 40.0% | | 54.3% | 57.1% | 78.7% | |
| 9 Carabid | 15.4% | -39.0% | 15.8% | -11.3% | -25.8% | 20.0% | 7.1% | -33.3% | 29.5% | -37.5% | -37.8% | -24.1% |
| 10 Demetrias atricapillus | | | 16.7% | | | | 0.0% | | | | 77.8% | |
| 11 Harpalus rufipes | | 13.3% | -11.5% | 13.9% | | -11.8% | -30.3% | -31.3% | | 58.3% | -41.5% | 42.4% |
| 12 Loricera pilicornis | 19.3% | -10.2% | -37.2% | 16.4% | -29.6% | -32.4% | -30.8% | -37.1% | -5.0% | -15.2% | -61.8% | -51.1% |
| 13 Nebria brevicollis | -24.7% | -6.8% | -26.0% | | -42.9% | -49.7% | -22.0% | | -34.1% | -44.2% | -47.3% | |
| 14 Notiophilus biguttatus | 53.2% | 55.7% | 45.2% | 13.8% | 6.3% | 15.3% | -29.5% | -43.5% | -5.7% | 35.3% | -10.6% | -71.1% |
| 15 Poecilus cupreus | | -3.2% | 0.0% | | | 6.7% | -71.8% | | | -36.8% | -28.3% | |
| 16 Pterostichus madidus | | | 4.5% | 7.0% | | | 25.0% | 30.2% | | | 15.2% | 40.7% |
| 17 Pterostichus melanarius | | 40.6% | -2.9% | -19.1% | | 22.9% | -5.3% | -24.4% | | 58.8% | -24.9% | -21.1% |
| 18 Pterostichus niger | | | -52.6% | -78.1% | | | -19.6% | -51.4% | | | -27.0% | -44.6% |
| 19 Pterostichus vernalis | | | -11.8% | -19.4% | | | 46.7% | 40.0% | | | -29.7% | 30.0% |
| 20 Synuchus nivalis | | | | 61.9% | | | | -30.4% | | | | -5.9% |
| 21 Trechus quadristriatus | 25.9% | 33.3% | 50.6% | -20.3% | -4.2% | -16.1% | 10.4% | -18.1% | -21.8% | -2.9% | -59.0% | -63.6% |
| 22 Total Carabidae | 15.5% | 22.5% | 10.6% | -17.4% | -8.8% | -13.6% | -13.5% | -23.8% | -0.8% | -3.4% | -35.1% | -36.9% |
| 23 Aleocharinae other | 55.4% | -38.9% | -14.7% | -47.8% | -22.3% | -29.8% | 3.4% | -52.0% | -40.6% | -11.1% | 21.8% | -45.5% |
| 24 Aloconota gregaria | 8.5% | -43.3% | 30.1% | 2.5% | -24.5% | -47.0% | 8.1% | -14.0% | -26.6% | -57.5% | -15.4% | -42.8% |
| 25 Amischa sp. | 8.6% | 8.9% | -9.8% | -16.0% | -41.9% | -23.7% | 2.7% | 1.7% | -56.7% | -37.9% | -15.9% | -26.3% |
| 26 Anotylus rugosus | -41.0% | -43.1% | -69.2% | -50.0% | 38.0% | 48.2% | 50.0% | 57.1% | 29.8% | -9.3% | -43.8% | 7.1% |
| 27 Gabrius sp. | | | 5.9% | | | | 11.8% | | | | -44.6% | |
| 28 Oxyopoda tarda | 55.6% | | 42.9% | | 4.8% | | 14.3% | | 42.9% | | -50.0% | |
| 29 Philonthus carbonarius | | 46.7% | 33.3% | 40.0% | | 25.3% | 42.3% | 9.5% | | 20.0% | 36.8% | -19.2% |
| 30 Philonthus cognatus | | 61.3% | 37.1% | 49.2% | | 41.3% | 13.4% | -27.3% | | 47.9% | 28.5% | -33.3% |
| 31 Staphylinid | | | 64.8% | 10.0% | | | 70.5% | 0.0% | | | 1.5% | -15.8% |
| 32 Stenus clavicornis | -35.5% | 53.6% | 35.9% | -33.3% | -67.0% | -13.8% | 20.5% | -52.4% | -38.3% | 43.5% | 21.4% | -41.2% |
| 33 Sunius propinquus | -23.1% | -16.7% | | | 70.0% | 90.0% | | | 80.0% | 60.0% | | |
| 34 Tachinus signatus | | -13.4% | -31.3% | -50.9% | | -14.8% | -15.4% | 45.5% | | -3.1% | -41.1% | -15.4% |
| 35 Tachyporinae (other) | 7.7% | 38.7% | 18.1% | | 30.8% | 34.2% | 11.1% | | 0.0% | 61.3% | 24.1% | |
| 36 Tachyporus hypnorum | 14.1% | 39.2% | 36.4% | 46.0% | 38.3% | 32.3% | 12.1% | 30.0% | 42.7% | 44.2% | 31.3% | -9.1% |
| 37 Xantholinus longivent | 30.5% | -23.2% | 43.5% | 30.8% | 5.8% | -5.7% | 4.3% | 53.8% | 14.8% | -18.0% | 15.0% | 0.0% |
| 38 Total Staphylinidae | 13.3% | 1.8% | 26.5% | -4.6% | -8.2% | 0.7% | 15.5% | -14.1% | -5.1% | 0.2% | -5.8% | -38.4% |
| 39 Catopidae (Choleva spp.) | | | -45.5% | 12.3% | | | 58.3% | 92.3% | | | 100.0% | 84.6% |
| 40 Catopidae (Ptomaphag | -65.3% | -33.0% | | | 47.0% | 40.0% | | | -26.7% | 33.3% | | |
| 41 Clambus armadillo | | | | -37.5% | | | | 76.9% | | | | 92.3% |
| 42 Lathridiidae | | | -8.3% | -13.3% | | | -29.0% | -55.2% | | | -2.9% | -27.8% |
| 43 Bathyphantes gracilis | | | | | | | | | | | | |
| 44 Erigone atra male | -35.1% | -30.2% | -13.8% | -4.8% | -31.1% | -26.2% | -28.6% | -22.6% | -45.8% | -45.5% | -41.4% | -45.5% |
| 45 Linyphiidae | 31.7% | 10.0% | 16.7% | 37.8% | 56.8% | 18.9% | 23.3% | -5.3% | 35.3% | 50.0% | 15.6% | 16.7% |
| 46 Linyphiidae female other | | | -37.5% | | | | 10.0% | | | | -37.5% | |
| 47 Linyphiidae male other | | | -16.7% | -1.6% | | | 0.0% | -45.5% | | | -60.5% | -7.7% |
| 48 Oedothorax fuscus male | | | 60.0% | 14.1% | | | 15.5% | 12.1% | | | -15.8% | -19.5% |
| 49 Oedothorax sp. female | -17.0% | 22.2% | 44.7% | -21.3% | 62.5% | 66.7% | 47.4% | -36.8% | 50.6% | 55.6% | 1.8% | -47.8% |
| 50 Savignya frontata mal | 43.6% | 37.3% | | | 23.2% | 29.3% | | | 7.8% | 20.0% | | |
| 51 Total Araneae | -7.3% | -15.1% | 12.4% | -5.4% | 6.7% | 5.3% | 0.9% | -13.4% | -7.6% | -8.2% | -31.6% | -31.3% |
| 52 Entomobryidae Lepido | -37.4% | -49.5% | -22.0% | 25.9% | -31.7% | -47.0% | -43.1% | 12.6% | -41.6% | -59.2% | -65.0% | -32.3% |
| 53 Isotomidae | 39.3% | 0.9% | -36.1% | -56.0% | -9.0% | -21.8% | -27.3% | -54.9% | -39.8% | -37.3% | -38.1% | -70.3% |
| 54 Sminthuridae | 54.6% | -21.6% | 60.1% | 64.0% | 58.7% | 56.6% | 70.2% | 20.0% | 48.7% | 39.1% | 67.6% | 11.4% |
| 55 Acari (soil mites) | -11.6% | -20.2% | 16.3% | 20.2% | 53.2% | 34.9% | 62.1% | 62.7% | 91.0% | 89.8% | 94.0% | 81.4% |
| 56 Acari other | 51.7% | 45.2% | 37.4% | 30.1% | 73.9% | 86.1% | 73.6% | -8.8% | 50.7% | 85.9% | 50.2% | 39.8% |
| 57 Acari Trombidiidae | -20.0% | 17.8% | 2.1% | | 72.2% | 83.6% | 79.6% | | 72.2% | 58.2% | 58.7% | |
| 58 Chilopoda | -46.9% | 7.3% | 40.9% | 80.0% | -8.0% | 25.5% | 31.8% | 0.0% | 27.5% | 9.1% | 33.3% | 0.0% |
| 59 Diplopoda | 85.4% | 75.0% | | | 97.9% | 81.7% | | | 29.2% | -7.7% | | |
| 60 Diptera | -13.3% | -57.8% | 20.8% | -30.7% | 13.0% | -15.6% | -24.1% | -41.6% | -2.5% | 29.4% | -3.2% | 2.7% |
| 61 Hymenoptera | -3.0% | -21.5% | -24.3% | -15.2% | 24.1% | -13.6% | -21.0% | -1.8% | 10.5% | 6.5% | -23.9% | 19.8% |
| No. of taxa significant compared to the control (MWU, alpha =0.1) | 3 | 3 | 1 | 0 | 5 | 4 | 1 | 1 | 2 | 1 | 1 | 3 |
| No. of taxa more than compared to the control | 7 | 5 | 4 | 3 | 11 | 8 | 6 | 5 | 9 | 12 | 8 | 3 |
| total taxa | 40 | 45 | 52 | 43 | 40 | 45 | 52 | 43 | 40 | 45 | 52 | 43 |

## The Dutch Platform for the Assessment of Higher Tier Studies

In the framework of pesticide registration, reports on field effect studies (field studies are a prominent example of so-called Higher Tier Studies) are submitted to the competent authorities. These reports are evaluated by different experts between and within countries, and this evaluation often has a decisive role in the process. Because of the complexity of these studies and a relative lack of criteria, a wide range of methodological problems has to be conquered by every expert in every case. As a result, similar cases have been judged by different standards. The experts in the Netherlands have organised themselves in the Dutch Platform for the Assessment of Higher Tier Studies. The aim is to harmonise the evaluation of higher tier studies and to increase the uniformity of the evaluation reports as a first step to a uniform risk assessment.

The Dutch Platform for the Assessment of Higher Tier Studies publishes practical and easy to use guidance documents for the evaluation of field effect studies and other higher tier studies.

**RIVM**

National Institute
for Public Health
and the Environment

P.O. Box 1
3720 BA Bilthoven
The Netherlands
www.rivm.nl