

Industry allocated project number

 tarryn@satgi.co.za Tel: 021 872-1438	 inmaak@mweb.co.za Tel: 021 872-1501	 thesa@hortgro.co.za Tel: 021 882-8470	 dappies@dtd.co.za Tel: 021 870 2900	 andraga@winetech.co.za Tel: 021 807 3387
		X		X

Indicate (X) client(s) to whom this final report is submitted. Replace any of these with other relevant clients if required.

## FINAL REPORT 2014

### Programme & Project Leader Information

	Research Organisation Programme leader	Project leader
<b>Title, initials, surname</b>	Prof M Samways	Dr P Addison
<b>Present position</b>	HOD	Lecturer
<b>Address</b>	Department of Conservation Ecology & Entomology University of Stellenbosch Private Bag X1 7602 Matieland	Department of Conservation Ecology & Entomology University of Stellenbosch Private Bag X1 7602 Matieland
<b>Tel. / Cell no.</b>	021 808 3782	021 808 4671
<b>Fax</b>	021 808 4807	021 808 4807
<b>E-mail</b>	Samways@sun.ac.za	pia@sun.ac.za

### Project Information

<b>Research Organisation Project number</b>	US E PA 01		
<b>Project title</b>	Generating a taxonomic database of fruit pests in the Western Cape		
<b>Fruit kind(s)</b>	All fruit kinds		
<b>Start date (mm/yyyy)</b>	2008	<b>End date (mm/yyyy)</b>	12/2013
<b>Project keywords</b>	Database, pest risks, user-pay identification service		

Approved by Research Organisation Programme leader (tick box)

THIS REPORT MUST INCLUDE INFORMATION FROM THE **ENTIRE** PROJECT**Executive Summary**

Give an executive summary of the total project.

Correct insect pest identification is a critical aspect of IPM in fruit production. Damage symptoms are also often not identified correctly, which leads to incorrect treatment/management of a suspected pest problem. The aim of this project is to build an active taxonomic database of pests occurring in deciduous fruit orchards, wine grapes and other fruit crops based on, primarily, correct identification by an expert or using molecular techniques, which should lead to a better understanding and therefore better management of pest problems. Of the 470 of the samples submitted for identification, only 171 were related to the fruit industries. For this reason and due to limitations of capacity in the Department, it is recommended that for the service only samples limited to the fruit industry be processed. With limited capacity, this would be the most practical way in which to continue with the service in future and yet still gain valuable information on potential pest risks.

**Problem identification and objectives**

State the problem being addressed and the ultimate aim of the project.

Correct insect pest identification is a critical aspect of IPM in fruit production. Damage symptoms are also often not identified correctly, which leads to incorrect treatment/management of a suspected pest problem. Identification of new and/or invasive pests often occurs too late, by which time eradication or further preventative treatment is not possible. The aim of this project is to build an active taxonomic database of pests occurring in deciduous fruit orchards, wine grapes and other fruit crops based on, primarily, correct identification by an expert or using molecular techniques, which should lead to a better understanding and therefore better management of pest problems. In addition, data associated with specimens will be collected.

**Workplan (materials and methods)**

List trial sites, treatments, experimental layout and statistical detail, sampling detail, cold storage and examination stages and parameters.

The following data will be collected using a set format (Appendix A):

- 1) Name of collector and date collected
- 2) Reason for identification
- 3) Habitat description
- 4) GPS position of location where collected
- 5) Other relevant biological information
- 6) Specimen ID result
- 7) SUEC accession number
- 8) High quality photograph of insect and/or damage symptom

For this data entry, initially Microsoft Access will be used, and it was decided to then use Biota 2 Biodiversity Database Manager (Sinauer, MA) for further use. The latter is an interactive database for specimen collections. However, due to problems with cost and licence upgrades, it was decided to leave the data in the more freely accessible MS Access format.

Specimens will all receive codes, which will be co-ordinated with the Departments accession numbering system. This will also allow for future specimens from research projects to be loaded onto this system.

If correct identifications cannot be made at Stellenbosch University, the specimen will be sent to an expert for identification (e.g. ARC Biosystematics Division). All reference specimens will be correctly curated in the museum. Various PCR protocols will be developed in order to do quick identifications, in conjunction with the Department of Genetics sequencing service. All information (insect samples and related information) will be obtained from samples coming in to the Department from industry. The number of samples processed using experts or the sequencing service will be limited by available funds. The budget provides for approximately 60 samples for expert identification (@ R155 per species ID) and 40 samples for molecular sequencing (@ R90 per sequence) per annum. Finally, the Department of Conservation Ecology and Entomology has invested in a fully automated montage camera system (Leica LAS microscope and camera), which enables us to take high quality images and eliminates the various focussing problems associated with taking good images of insects. These will be incorporated into the database and are a critical aspect of good record keeping.

### Results and discussion

State results obtained and list any industry benefits. If applicable, include a short discussion covering ALL accumulated results from the start of the project. Limit it to essential information only.







A total of 470 samples were submitted and processed from January 2008 until December 2013. Of these, 171 were relating to fruit crops, while the rest were from various sources, including medical and veterinary, households, vegetables and berry crops, amongst others. All major records from deciduous fruit crops and vines are summarized in Table 1. The database is available upon request in CD format (MS Access database).

Table 1. Samples submitted for identification from deciduous fruit and vines from January 2008 to December 2013. Samples marked in grey refer to notable submissions, in terms of new pest status or unusually high abundances. Some of these are imaged below the graph.

SUEC No	Habitat	Fruit	Location	ID	Common name	ID by
14-16	Bottled wine	Wine	Origen wines	Thysanura	Silverfish	US
13-37	Bottled wine	Wine	China/Stellenbosch	Leucophenga subpollinosa	asynvliegje	US
11-40	Bottled wine	Wine	Kent, UK	Tachinidae	Parasitic fly	US
12-45	Canned fruit	Peaches	Malaysia (exported form SA)	Cecidomyiidae	gall flies	US
08-36	Coldstore	Pear	Elgin	Diptera	Died	
12-27	Coldstore	Plum	Langkloof	Tortrix capensana	Apple leaf roller	US
12-49	Orchard		Klapmuts	Aphis mellifera	Kaapse heuningby	US
12-69	Orchard		Ceres	Cantharidae	Firefly	US
14-21	Orchard	Apple	Grabouw, Molteno	Cheilomenes propinqua	Striped ladybird	I Minnaar, CIB
13-05	Orchard	Apple	Van Rhyndshoogte	Panonychus ulmi	European red mite	US
08-12	Orchard	Apple	Grabouw, Molteno	Orius?	Predator	US
08-24	Orchard	Apple	Grabouw, Molteno	Tortrix capensana???	bladroller	US
08-26	Orchard	Apple	Grabouw, The Valley	Undetermined moth larvae		US
09-10	Orchard	Apple	Molteno, Elgin	Mentaxya muscosa		US
09-12	Orchard	Apple	Somerset West, Lourensford	Camenta?	White grub	ARC
10-20	Orchard	Apple	Freestate	Cetoniinae?	Vrugte tor	US
11-03	Orchard	Apple	Grabouw, Molteno	Aphis spiraeicola Patch		I Millar, ARC
11-15	Orchard	Apple	Grabouw, Molteno	Tortrix capensana	leafroller	US
11-27	Orchard	Apple	Langkloof	Ceratitis capitata	Medfly	US
11-34	Orchard	Apple	Glenbrae, Grabouw	"leafroller parasitiod"		US
11-35	Orchard	Apple	Molteno, Grabouw	Balaustium gramium	Velvet mites	ARC
12-14	Orchard	Apple	Experimental farm, Elgin	Thaumatotibia leucotreta	False codling moth	US
12-16	Orchard	Apple	Molteno, Elgin	Tortrix capensana	apple leafroller	US
12-17	Orchard	Apple	Molteno, Elgin	Tortrix capensana	apple leafroller	US
12-33	Orchard	Apple	Ceres	Not insect damage		US
12-65	Orchard	Apple	Ceres	Prionorhinus canus		US

13-13	Orchard	Apple	Molteno. Grabouw	Pseudococcidae viburni	peer witluis	Welma Pieterse
13-71	Orchard	Apple	Elandsrivier	Prasoidea sericea	Fruit nibbler	US
13-82	Orchard	Apple	Grabouw	Melanterius laculatus Lea		R Stals, ARC
10-36	Orchard	Apple	Reitz	Scarab beetles		
14-26	Orchard	Apple	Matjiesrivier, Ceres	Cydia pomonella	codling moth	US
08-37	Orchard	Apple	Elgin, Glen Fruin Fruit	Lobesia stericta		NHM
13-11	Orchard	Apple	Naboomspruit, Limpopo	Psychidae	bagworms	US
12-35	Orchard	Apple and pears	Hemel-en-Aarde	Cydia pomonella	codling moth	US
13-16	Orchard	Apple leaves	Grabouw	Amblyseius rubicolus	Addoensis	US
13-16	Orchard	Apple leaves	Grabouw	Neoseiulus californicus	californicus	US
13-01	Orchard	Apples and 1 peach	Tulbagh	Cydia pomonella	codling moth	US
13-77	Orchard	Apricot	Prins Albert	Antestia damage		US
14-11	Orchard	Apricot		Tanymecus praecanus		US
14-01	Orchard	Apricots	Koelfontein, Ceres	Cydia pomonella	Codling moth	US
11-08	Orchard	Feeding on Aphids	Grabouw, Molteno	Harmonia axyridis		US
11-08	Orchard	Feeding on Aphids	Grabouw, Molteno	Cheilomenes propinqua		US
12-34	Orchard	Cover crops	Monteith trust	Spodoptera		US
08-22	Orchard	Insect host	Timberlea, Stellenbosch	Pseudaphycus maculipennis Mercet	Mealybug parasitoid	ARC
08-22	Orchard	Insect host	Timberlea, Stellenbosch	Pseudaphycus sp. (Encyrtidae)	Mealybug parasitoid	ARC
10-05	Orchard	Nectarine	Prince Alfred Hamlet	Pieridae		US
12-80	Orchard	Nectarine		Bryobia rubrioculus	Bryobia	US
10-34	Orchard	Nectarine	Ceres	Telephorus pictus		US
08-02	Orchard	Nectarine	Ceres	Thaumatotibia leucotreta	False codling moth larvae	US
08-48	Orchard	Olive	Paarl, Dunderach Poultry farm	Melanaspis corticosis		ARC
11-47	Orchard	Olive		Cloniocerus kraussi	(stamboorder)	US
11-69	Orchard	Olive	Napier	Cloniocerus kraussi	Privot borer	US
11-69	Orchard	Olive	Napier	Antestia		US
11-70	Orchard	Olive	Wereldsgeluk Olywe	Coryphoderma tristis	Quince borer	US
10-35	Orchard	Olive	Worcester			
11-59	Orchard	Olive	Willow creek olive estate, Nuy Valley	Syrphidae	Syrphid fly	US
11-60	Orchard	Olive	Worcester	Cloniocerus kraussi	Privet borer	US
12-40	Orchard	Olive	Paarl	Euphyllura longiciliata	African olive psyllid	ARC
13-41	Orchard	Olive	SirLowry's Pass	Lindigaspis rossi	Ross's Black scale	US
13-41	Orchard	Olive	SirLowry's Pass	Eurytoma species	Seedwasp	US
08-03	Orchard	Olive	Simondium	Plerochila australis	Olive lace bug	US
08-04	Orchard	Peach	Robertson	Thaumatotibia leucotreta & Cydia molesta	FCM & OFM larvae	US
14-08	Orchard	Peach	Wellington	Grapholita molesta	Oriental fruit moth	US
11-24	Orchard	Peach	Frankenhof, Swellendam	Grapholita molesta		US
12-56	Orchard	Peach	Citrusdal	Julodis fascicularis	Jewel beetle	US
12-74	Orchard	Peach	Langkloof	Cantharidae/Lamp yridae	Fireflies	US
13-20	Orchard	Peach	Montagu	Grapholita molesta	Oriental fruit moth	US
13-66	Orchard	Peach	Groen Erfenis plaas	Aphididae	Aphids	US
14-30	Orchard	Peaches		Epichoristodes acerbella	pear leaf roller	US
08-06	Orchard	Pear	Tradouw, Die vlakke			US
12-43	Orchard	Pear	Worcester	Trialeurodes vaporariorum	greenhouse whitefly	US
14-26	Orchard	Pear	Northridge, Ceres	Cydia pomonella	codling moth	US
08-16	Orchard	Pear	Elgin, Oak Valley	Cydia pomonella	Codling moth	US

					larvae	
08-21	Orchard	Pear	Stellenbosch, Welgevallen	Cydia molesta	Oriental Fruit moth	US
09-05	Orchard	Pear	Wolseley			US
11-01	Orchard	Pear	Franschhoek	Ceratitis specie	Fruit fly	US
12-10	Orchard	Pear	the Valley, Elgin	stinkbug damage		US
12-18	Orchard	Pear	Prince Alfred Hamlet	Ectomyeloid ceratoniae	Carob moth	US
12-19	Orchard	Pear	Prince Alfred Hamlet	Totricidae		US
12-30	Orchard	Pear	Wolseley	Cydia pomonella	codling moth	US
12-30	Orchard	Pear	Wolseley	Thaumatotibia leucotreta	False codling moth	US
13-08	Orchard	Pear	Bersig Estate, Breederivier	Pseudococcus	Longtailed mealybug	ARC
13-21	Orchard	Pear	Ceres	not insect damage		US
14-15	Orchard	Pear	Smarag Farm, Elgin	Antestiopsis orbitalis	Antestia	US
08-19	Orchard	Pear	Swellendam, Groenerferis	Thrips damage		US
08-56	Orchard	Pear	Worcester, de Hoek, Bossieveld	Cydia pomonella	codlingmoth	DNA
13-33 (B1)	Orchard	Pear	Ceres	Cydia pomonella	codling moth	US
13-33(A1)	Orchard	Pear	Ceres	Cydia pomonella	codling moth	US
13-33(A2)	Orchard	Pear	Ceres	Cydia pomonella	codling moth	US
13-33(A2)	Orchard	Pear	Ceres	Ectomyeloid ceratoniae	Carob moth	US
13-33(B2)	Orchard	Pear	Ceres	Cydia pomonella	codling moth	US
14-30	Orchard	Pear		Cydia pomonella	codling moth	US
14-03	Orchard	Plum	Tulbagh	Ceratitis species	fruitfly	US
14-07	Orchard	Plum	Ceres	Epichoristodes acerbella	leafroller	US
14-07	Orchard	Plum	Ceres	Thaumatotibia leucotreta	False codling moth	US
12-79	Orchard	Plum	Klapmuts, Paarl	Oxycarenus exitiosus	False Chinch bug	US
10-07	Orchard	Plum	Grabouw, Glen Brae	Pieridae		US
10-10	Orchard	Plum	Montagu	Thaumatotibia leucotreta	False Codling Moth	US
12-07	Orchard	Plum	Robertson	Quadraspidiotus perniciosus	Verderflike dopluis	US
12-11	Orchard	Plum	Groenkloof, Langkloof	leafroller	leafroller	US
12-54	Orchard	Plum	Grabouw	only damage-snail, bollworm, beetle?		US
13-14	Orchard	Plum	Goedemoed, Robertson	Quadraspidiotus perniciosus	Verderflike dopluis	US
12-01	Orchard	weeds?	Glenbrae, Grabouw	Nysius sp	seedbug	US
11-39	Packstore	Apple	Glenbrae, Grabouw	leafroller	leafroller	US
13-43	Packstore	Apricots	Ladismith	Unknown	Unknown	US
08-10	Vineyard	Grape	Robertson	Spodoptera littoralis		US
11-28	Vineyard	Grape	The Grange, HexRiver	Thaumatotibia leucotreta	False codling moth	US
11-29	Vineyard	Grape	Glen Oak, HexRiver	Thaumatotibia leucotreta	False codling moth	US
11-30	Vineyard	Grape	Wolwehoek, HexRiver	Thaumatotibia leucotreta	False codling moth	US
11-31	Vineyard	Grape	Somerslus, HexRiver	Thaumatotibia leucotreta	False codling moth	US
11-32	Vineyard	Grape	Excelsior boerdery	Thaumatotibia leucotreta	False codling moth	US
08-30	Vineyard	Grapes	Simondium, Stellenbosch	Chrysomelidae		US
09-04	Vineyard	Grapes	Upington	Agoma trimenii	Trimen's False Tiger	US
10-08	Vineyard	Grapes	Wellington, Tweefontein	Plangia compressa	Long horned cricket	US
10-11	Vineyard	Grapes	Grabouw	Hippotion osiris	Large Striped Hawk moth	US
10-16	Vineyard	Grapes	Lutzville	Oecanthus sp	tree crickets	US
11-12	Vineyard	Grapes	Riebeeck Kasteel	Cydia pomonella	codling moth	US

12-47	Vineyard	Grapes	Paarl	Holocacista sp.	Leaf miner	US
12-50	Vineyard	Grapes	Kanoneiland	Curculionidae		
12-50	Vineyard	Grapes	Kanoneiland	Pentatomid	Stinkbug	US
12-60	Vineyard	Grapes	Kanoneiland	Haltica indigacea		US
12-70	Vineyard	Grapes	DeHoop, Paarl	Sciobius sp		US
12-71	Vineyard	Grapes	Irene, Noord-Paarl	Heliothrips sylvanus	Guava Thrips	US
12-72	Vineyard	Grapes		Monolepta sp		US
13-02	Vineyard	Grapes	Trawal	Macchiodemus diploterus	Grain chinch bug	US
13-04	Vineyard	Grapes		Blattaria	kakkerlak	US
13-31	Vineyard	Grapes		Theretra capensis	Pylstertmot	US
13-47	Vineyard	Grapes	Clanwilliam	Periplaneta americana	American cockroach	US
13-55	Vineyard	Grapes	Zambia	Planococcus ficus	Pear mealybug	US
13-56	Vineyard	Grapes	Kakamas	Coryphodema tristis	Cossid moth	US
13-57	Vineyard	Grapes	Stellenbosch	Bostrychidae	stompkopkewers	US
13-76	Vineyard	Grapes	Kakamas		Cotton strainer	US
14-33	Vineyard	Grapes	Robertson			US
11-66	Vineyard	Grapes	Blouputs	Agoma trimenii		US
11-68	Vineyard	Grapes	Karsten Boerdery, Upington	Elachistidae	grass minor moth	US
11-78	Vineyard	Grapes	Hexriver	Adoretus ictericus		US
12-06	Vineyard	Grapes	Bonnievale	Spodoptera littoralis	tamatiemot	US
12-52	Vineyard	Grapes	Reingeluk, Augrabies	Tertramonium frigidum		US
12-58	Vineyard	Grapes	Constantia farms	Sciobius tottus		US
12-62	Vineyard	Grapes	Protea heights, Devon Valley	Heterobostrychus sp		US
12-67	Vineyard	Grapes	Augrabies	Pseudococcidae	witluis	US
12-76	Vineyard	Grapes	Keimoes	Oxycarenus exitiosus	False Chinch bug	US
13-44	Vineyard	Grapes		woodborer	Old damage	US
14-17	Vineyard	Grapes	Vineyard	Oxycarenus annulipes		US
13-09	Vineyard	Grapes	Ausenkehr	Oxycarenus exitiosus	False Chinch bug	US
08-53	Vineyard	Grapes	Riebeeck-Kasteel	Lobesia stericta		NHM
10-06	Vineyard	Grapes	Franschhoek, Fredericksburg	Spodoptera littorales		US
11-63	Vineyard	Kiesieblaar	DeWetshof, Robertson	Cynthea cardui	painted lady	US
08-17	Wine barrels		Stellenbosch	Bostrychidae		US
13-68	Wine cellar	Wine cellar	Stellenbosch	Arcitalitus sylvaticus?	Lawn Shrimp	US
						
<i>Lobesia stericta</i>		<i>Agoma trimenii</i> on vines		<i>Oxycarenus exitiosus</i>		
						
Damage by <i>Camentia</i> sp. on apple roots		<i>Camentia</i> sp.		<i>Holocacista</i> sp. in vines		

Status of Stellenbosch University identification service

The ultimate aim of the project was to establish a user-pay identification service, targeting specifically the fruit industry. Relating to this, the objective further was to enable staff to gain experience in making accurate identifications. All submissions were curated and stored for future reference.

As of January 2014, the service has now been included in the Department of Plant Pathologies Disease Clinic (Stellenbosch University) and is now being administrated by the Disease Clinic. For the duration of the project, identifications were made by Drs Juanita Heunis and Pia Addison, as well as consulting relevant experts in the Department of Conservation Ecology and Entomology. Where necessary or requested, samples were further identified by the ARC Biosystematic Division, Pretoria, or DNA analysis. Unfortunately, during 2014, Dr Heunis resigned her assistance from the service due to other research commitments. As the service for insects is not yet financially stable, the future of the service will be determined by availability of capacity in the Department.

Complete the following table

Milestone	Target Date	Extension Date	Date Completed	Achievement
1. Develop database	December 2013			Database developed in MS Access for easy accessibility, available upon request in CD format
2. Write popular article	December 2014			

### Accumulated outputs

List ALL the outputs from the start of the project. The year of each output must also be indicated.

Insect pest database has been developed.

### Conclusions

Correct identification of insect material is still needed by the fruit industries. Several identifications made of the past 6 years have been important for highlighting potential risks to the industries. Ongoing monitoring of insect pests through this database is still important and should continue, but staff capacity to do this is a major threat to this goal. The majority of the samples submitted for identification were not related to the fruit industries, so an option for the service would be to limit which samples can be processed. With limited capacity, this would be the most practical way in which to continue with the service in future.

### Technology development, products and patents

Indicate the commercial potential of this project, eg. Intellectual property rights or commercial product(s)

NA

### Suggestions for technology transfer

List any suggestions you may have for technology transfer

Popular article to be written highlighting main results for the project

### Human resources development/training

Indicate the number and level (eg. MSc, PhD, post doc) of students/support personnel that were trained as well as their cost to industry through this project. Add in more lines if necessary.

Student level (BSc, MSc, PhD, Post doc)	Cost to Project
1.	
2.	
3.	
4.	
5.	

Publications (popular, press releases, semi-scientific, scientific)

Presentations/papers delivered



**Total cost summary of the project**

TOTAL COST IN REAL TERMS	COST	CFPA	DFTS	Deciduous	SATI	Winetech	THRIP	OTHER	TOTAL
YEAR 1	<u>2009</u>			<u>22 400</u>		<u>22 400</u>	<u>22 400</u>		<b>67 200</b>
YEAR 2	<u>2010</u>			<u>25 760</u>		<u>25 760</u>	<u>25 760</u>		<b>77 280</b>
YEAR 3	<u>2011</u>			<u>28 000</u>		<u>28 000</u>	<u>28 000</u>		<b>84 000</b>
YEAR 4	<u>2012</u>			<u>32 480</u>		<u>32 480</u>	<u>32 480</u>		<b>97 440</b>
YEAR 5	<u>2013</u>			<u>36 000</u>		<u>36000</u>	<u>36000</u>		<b>108 000</b>
<b>TOTAL</b>				<b>144 640</b>		<b>144 640</b>	<b>144 640</b>		<b>433 920</b>