AFRICAP SOUTH AFRICA

AGROECOLOGY Monitoring Project Report



AFRICAP Agroecology team:

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1. Introduction

The AFRICAP project (www.africap.info) is an interdisciplinary collaborative research and capacity building programme working with local organizations and governments in Malawi, South Africa, Tanzania, and Zambia. AFRICAP is creating an evidence base to underpin new country-specific policies in agriculture and food production. This project is funded through the UK government's Global Challenges Research Fund (GCRF) and led by the University of Leeds, in the UK, and the Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN) in South Africa. The in-country partners include the National Agricultural Marketing Council (NAMC), the Department of Agriculture, Forestry and Fisheries (DAFF), the Department of Rural Development and Land Reform (DRDLR) and the Agricultural Research Council-Small Grain (ARC-SG) in Bethlehem.

Through this project, newly created country-specific policies will be piloted and evaluated in large-scale test sites to enable fast implementation and to build national capacity for future evidence-based policy development. Learned lessons will be translated into other contexts across Africa with the support of local, national, regional and international networks with a stake in sustainable agri- food systems. The aim of this project is to make agriculture and food production in sub-Saharan Africa more productive, sustainable, and resilient to climate change.

The Agroecology aspect of the project focused on investigating how climate adaptation influenced changes in management practices, which in turn affected insect diversity and insect pest prevalence and biocontrol. Monocropping and agricultural intensification may affect the species distribution within an ecosystem and result in dominance of some species, causing an increase in pests and a reduction in abundance and diversity of other insects that contribute important ecosystem functions. This may result in increased crop damage and associated crop yield losses that will affect food production and security. Understanding of how farm-level mechanisms influence insect diversity and population decline will help plan pest management, reduce trade-offs with biodiversity and ecosystem services, and agricultural intensification more sustainably.

2. Objectives

The objectives were to:

- Evaluate biodiversity in commercial and smallholder farms in Thabo Mofutsanyane district of the Free State province.
- Survey and collect insects in commercial and subsistence crop production systems in the Thabo Mofutsanyane district (Qwaqwa, Bethlehem, Clarens, Cornelia and Vrede areas) during the four-sampling seasons (January /February 2020, May / June 2020, October / November 2020 and March/April 2021).
- Compare the abundance and diversity of insects and insect pests within the contrasting farming systems in commercial and smallholder farms in Thabo Mofutsanyane district.

• Collect soil samples to determine the physicochemical properties including bulk density of all sampling sites.

3. Materials and Methods

3.1 Study area for insect monitoring

Site selection within the Thabo Mofutsanyane district was facilitated by NAMC and DAFF teams who earmarked the localities of Clarens, Cornelia, Vrede, Bethlehem and Qwaqwa for undertaking the AFRICAP agroecological research initiative (Fig. 1) (Table. 1 – Appendix 1). These teams selected landscape hotspots and located commercial and smallholder farms which practice conservation and conventional agriculture (CA & CT, respectively) to produce maize and dry beans or soybeans. A survey was conducted to assess the distribution of insects in agroecological systems with different agricultural management practices and, therefore, determine to what extent these practices could impact insect distribution and diversity within these systems.



Figure 1: Sampling sites for insect monitoring on commercial farms and subsistence farms, comparing conventional agriculture fields (GT) to conservation agricultural fields (CA) in the Thabo Mofutsanvane area of South Africa.

Insect abundance was monitored on 35 farms (19 conventional agriculture (CT), 16 conservation agriculture (CA). Sampling sites included 16 commercial farms, 4 in the Clarens area, 4 in the Warden area, 6 in the Vrede area and 2 in the Bethlehem area and 20 small scale, subsistence farms in the Qwaqwa area around Phutaditjhaba. Sites were chosen where CA farms neighbored CT farms in the same area. According to the Köppen-Geiger climate classification (CSIR 2015) the study area falls in the Cwc climatic zone (warm temperate climate with dry winter; $P_{wmin} < P_{smin}$ and $P_{smax} > 10P_{wmin}$). This climatic zone comprises an area of 3 564km² in South Africa (Fig. 1) (CSIR 2015).

Insect sampling was carried out in the field – border combinations and sampling stations within each farm. At each field-border combination, three sampling stations ($1m^2$ quadrat) were located in the focal field and towards the selected border type: (i) **centre** - 100 m inside the focal field or centre of the field for small fields (ii) **edge** – 1 - 2 m* into the field, and (iii) **adjacent** - 10 m in to the adjacent field. Three sampling stations on commercial farms (stations 1, 2 & 3) and two stations (stations 1 & 3) on smallholder farms were identified from the four field categories of maize, beans, grassland, and fallow (Fig. 2).



Figure 2: The presentation of the field border – combination location of the sampling stations. **A)** Two sampling stations on a smallholder farm; and **B)** three stations on a commercial or 20m x 20m large farm. * There was a minor modification of 2 m instead of 1m from the edge on commercial farms. Maps adapted from the sampling protocol.

3.2 Insect sampling protocol

All insect assemblages were monitored in four distinct seasons during 2020-21:

- i) 8-31 January 2021: Mid-summer. Crops: Maize and soya seedling-jointing stage.
- ii) 11 May 12 June 2021: Late autumn. Crops: Maize and soya mature-harvest.
- iii) 15 October 11 November 2021: Late Spring. Crops: pre-seeding.
- iv) 14 March 12 April 2022: Mid-summer. Crops: Maize and soya seedling-jointing stage.

Insect (invertebrate) sampling was performed by using broad-spectrum yellow sticky traps and pitfall traps. For canopy or flying insects, one sticky trap card was fixed on a metal dropper using twisted wires on each sampling station. For ground dwelling invertebrates, two pitfall cups (made from cut coke bottles) at 50cm distance on both sides of the sticky trap dropper were embedded into the soil in a hole which was dug using an auger (Fig. 3). These cups contained 1/3rd volumes of a brine solution (water, vinegar, salt and liquid detergent) to preserve trapped specimens until collection. Pitfall trap cups were roofed with paper plates that were suspended above the cup by the skewer sticks to reduce evaporation of the brine and splashing of trapped insects by rain. All trapped specimens were retrieved (collected) 7 days post installation. Invertebrate specimens collected from the pitfall traps were sifted from the brine using a tea strainer, transferred into 100ml specimen jars with a low volume of 96% alcohol (Ethanol) for specimen preservation. All specimens were transported to the ARC – Small Grain (SG) laboratory, sorted into morpho species (i.e., based on morphological characteristics) and were later identified to the nearest possible taxa by Dr Astrid Jankielsohn at ARC – SG, Bethlehem, South Africa.



Figure 3: A) Main Picture: Installation of broad-spectrum sticky trap and pitfall traps on a grass – maize border combination field during October / November sampling. Maize was planted in October 2020; seedlings begin to emerge (not yet visible on the picture). **B)** Positioning of the traps per sampling station; **C)** Close view of installed traps. Main Photo by: Amos Msia, ARC- SG; Other photos by: Teboho Mofokeng, AFRICAP RA.

In addition to invertebrate trapping and collection, visual observations of the crop, recorded using the CyberTracker Application (version 1.0.343), comprised the growth stage, pest and disease damage (on roots, leaves, stems, and fruiting bodies), direct-indirect evidence of animals, and the sampling station coordinates. The Application assisted the research assistants in capturing the necessary information and pictures.

3.2.1 Specimen sorting protocol

Prior to specimen sorting, specimens on sticky traps were released from the sticky surface by immersing cut pieces of the sticky card in a cup or bowl of kerosene (Paraffin)

(cups were contained in big box with a lid) for 2 hours to dissolve the glue. Specimens were then sifted from kerosene using a tea strainer, air – dried for 15 - 30 minutes on the tabletop, after which they were transferred and fixed in 96% alcohol in the same manner in which the specimens were preserved (Fig.4). All samples were stored at ambient temperature while awaiting the sorting process.



Figure 4: A) Caught specimens on sticky traps were released from the sticky surface of the stick card by immersing the cut pieces of the sticky card into a cupful or bowl of kerosene; **B)** Insect specimens released from the sticky cards, ready to be sifted; and **C)** After sifting from the kerosene, specimens were preserved in 96% alcohol contained in the specimen jars.

A. Sorting specimens from Sticky Traps

Specimens from each sampling station were placed in a sorting tray; individual insects were identified to unique morphospecies or operational taxanomic units (OTUs) using a dissecting microscope, and their abundance and body sizes (L x B in mm) were recorded. A representative sample (\pm 10 insects) of each OTU was collected in 2µL vials containing 96% alcohol. Labels (e.g F1 - 1 - S1 – J or M) were placed on the vial of each OTU with reference codes (1; 3 or 10) inside the vial. If OTUs appeared again in different farm samples, information for such OTUs was recorded accordingly. All samples in vials were placed in vial containers and sent to Dr Jankielsohn for identification.

325 identified specimens were listed on a reference collection, which entailed information about the sample reference code, order, family, species, body size and the functional feeding group (FFG) (Appendix 2).

B. Sorting specimens from Pitfall traps

Pitfall trap specimens were placed into a tea strainer and rinsed with water to clean off any mud. After repeated washing, clean contents were emptied into a sorting tray of 30 cm x 20cm (L x B). Sorting, labelling and referencing used the same protocol as with sticky traps. However, reference codes inside the vials were given as PJ- 1; PJ - 3 or PJ – 10. When the specimen sorting was done, all the vials were placed in the vial containers and stored at ambient temperature.

Data for each farm were recorded on each respective day and/or on the second day of sorting. Insect abundance and size were digitised and compiled into a composite data sheet which comprised both commercial and smallholder farm data. Where data could not be provided, "N/A" was assigned followed by a statement to explain the nature of the circumstances. Among the common reasons was "data not available due to flooding of pitfall cups during heavy rains"; or "cups trampled by the tractor or animals" while in the field. Data were shared through emails to respective team members in the UK (Leeds University) for data analyses.

3.3 Soil sampling

3.3.1. Collecting soil samples for texture, pH, carbon, N, P, and other nutrients

In each field, soil samples were collected from 0-15 cm and 15-30 cm depths at three and two randomly selected points per field at commercial and smallholder farms, respectively. Soil samples were collected with an auger (Fig. 4). Prior to soil sampling, the auger was marked at 15 cm and 30 cm length (Fig. 4). Collected soil samples were contained in plastic bags one for 0-15cm soil samples and the other for 15-30cm soil samples which were marked or pre-labelled with a code that reflected the farm, field, and sample number as well as the sampling depth, e.g F1 - 1 - 1 and 0 - 15 cm or 15 - 30cm, accordingly. The same sampling procedure was repeated in two or three sampling points (depending on field size) in the same field. Soil samples from each field were thoroughly mixed and about 350g (estimated in the field) was put in a pre-labelled sampling bag and packed in a cooler bag.

Soil samples from each farm were then taken to the laboratory where about 200g samples were each placed in a new pre-labelled plastic bag with number codes from 1–80. All 80 samples were transported to the ARC – SG Soil laboratory for further preparation such as grinding and sieving before analysis of the physicochemical parameters was done.



Photos by: Teboho Mofokeng, AFRICAP Research Assistant (RA).

3.3.2. Collecting soil samples for bulk density

The sampling protocol was same as above (section 3.3.1). Prior to sampling, the volume of the auger at 15cm height was calculated. Soil samples from each sampling station were collected into plastic bags which were also marked or pre-labelled with a code that reflected the farm, field and sample number followed by "BD" which denoted bulk density, and lastly the sampling depth, e.g F1 - 1 – 1 BD and 0 - 15 cm or 15 - 30cm, accordingly. Three samples (replicates) for each of 0-15cm and 15-30cm depths on commercial farms and two on smallholder farms were collected.

Samples were taken to the ARC – Small Grain soil laboratory for bulk density determination. Moist soil samples from each farm (field and sampling station) were weighed using the weighing balance, Precisa 12000D – SCS (Precisa Instruments AG, Switzerland) (Fig. 6C), emptied onto drying boards (Fig. 6A, B), and then placed on open surfaces on the tabletop and exposed to air (care was taken to ensure that samples were not contaminated or exposed to direct sunlight). The samples were air-dried for three (3) days and then the dry weight was recorded. Bulk density data was prepared on Excel spreadsheet and shared with UK team members for further data analysis.



Figure 6: Soil samples dried on drying boards and exposed to air at the table top in the ARC – Small Grain soil laboratory. **A)** Wet soil samples organised on a table on Day 1 of drying after weighing; and **B)** dry sample on Day 3 before weighing. **(C)** Soil samples wet- and dry masses were determined using the weighing balance, Precisa 12000D – SCS (Precisa Instruments AG, Switzerland). Photos by: Teboho Mofokeng, AFRICAP RA.

4. Results and discussion

Seasonality: According to our observations, almost all selected farms were engaged in the production of crops in combinations of maize and beans; or maize and soybeans; maize alone or soybeans / beans alone. All farms practiced seasonal monocropping and to a lesser extent rotations between maize and beans were practiced. Rotations in this pattern were observed during the March/April sampling season in commercial farms. Production of crops in most farms was affected by the country-wide above average rainfall (0 – 2000mm) experienced in the season July 2020-March 2021. Due to floods that came with heavy rains, some fields were not planted, whereas in other areas farmers anticipated a loss and therefore decided to wait for winter crop production, hence fallowed lands were observed.

Conversely, for some farms which were planted before the rains started in October 2020, the crop stands showed stunted growth because of soil water logging and subsequent nutrient leaching. This negatively impacted crop productivity within those affected farms, hence low yields could be expected. On the other hand, some farms, particularly smallholder farms, lost their crops to overgrown weeds because they deprived their crops of the necessary care and tending management operations like weeding and control of pests and diseases during the rains.

Through this survey, outcomes for insect monitoring on commercial and smallholder farms which practiced conventional agriculture (CT) were compared to conservation agricultural fields (CA) in all selected sampling sites across the entire study area (Appendix 3). Relative to the three preceding sampling seasons, the March / April season recorded high disease prevalence on both maize and soybeans (Appendix 4 & 5). On the other hand, abundance of ground dwelling insects was lower than in the previous seasons. It could be argued that some small insect species were killed or washed away with heavy rains (Moran and Hoffmann 1987); or killed due to lack of soil oxygen in water-saturated soils. This resulted in a decline in insect populations as compared to the previous seasons.

Conservation agriculture practices: Commercial CA farmers mainly practiced cover cropping to allow livestock integration in the crop fields. In contrast, small-scale CA framers had cover crops for use as animal feed. Some of the small farmers also used manure (n-10) and intercropping (n=9). We assessed how these activities affected biodiversity by comparing richness and abundance of pests, predators, decomposers, and pollinators among the contrasting farms (i.e., CA vs CT). On commercial CA farms where cover cropping, low till and livestock integration were common activities, richness, and abundance of the invertebrate communities, including that of pests and predators, were lower than CT farms (Figure 7). This is a surprising result as CA is often expected to have positive associations with biodiversity (de Pedro et al. 2020). Further, we also found that fields which used manure and did intercropping had greater species richness and abundance.

Specifically, use of manure was associated with greater pest and decomposer diversity and abundance, whereas intercropping promoted diversity and abundance of predators suggesting that intercropping may increase biocontrol and reduce pest pressures.



Figure 7: Association of CA and CT farms with different functional groups and contrasting production models – small- and large-scale farms.

On comparing soil carbon between CA and CT farms of both small and largescale production types, we found that CA farms had lower % carbon and higher bulk density (Figure 8). This finding is in contrast with the general understanding from the wider literature that CA and specifically cover cropping is associated with an increase in soil carbon (Poeplau and Don 2015). The lower soil carbon in CA farms may be due to the priming effect i.e., rapid addition of plant material (low C:N ratio) leading to accelerated C decomposition (Fontaine et al. 2004) or more likely due to the greater spatial heterogeneity at sampling sites.



Figure 8: CA farms with cover crops showing negative associated with Soil organic carbon (%C). Open circles indicate % carbon at sampling points.

Effect of landscape: On testing the effect on landscape structure, we found positive effects of landcover heterogeneity and non-crop habitat on biodiversity as well as soil carbon. Specifically, we measured landscape diversity by analyzing land cover maps of South Africa obtained at 10 m resolution (Phiri et al. 2020). We calculated landcover richness (patch richness) by identifying all the possible distinct landcover patches in the region (crop, grasses, trees, shrubs, and waterbody) within a 500m radius from the sampling field in each farm. We also estimated the proportion of land covered by the different landcovers.

We found that landcover richness and farm-level crop richness had a positive effect on species richness (figure 9-left) and ecosystem services, especially from predators and decomposers. Also, grass cover was positively related with % carbon at 15cm and 30 cm depths (figure 9-right).



Figure 9: Biodiversity response to increasing patch/landcover richness (left panel) and positive effect of grass cover on soil carbon (right panel)

5.Conclusions

Based on our observations there more abundant canopy (flying) insects than ground dwellers regardless of the farming practices and the systems. This could be attributed to the extent of crop hygiene engagement as it was observed that most crops on smallholder farms were overgrown with weeds. Some of these weeds could have potentially harbored beneficial insects, such as pollinators, as well as insect pests or disease vectoring insects. Commercial farms which practiced conservation agriculture had better crop yield and quality as compared to smallholder farms in conservation agriculture. This underscores the importance of deploying efficient agricultural management practices and biosecurity measures at all farming levels to ensure sustainable food production. Our study also highlighted the importance of farm richness and landcover diversity in increasing agrobiodiversity and associated ecosystem services.

We recommend the following policy and management implications:

- Promote diversity within and between farms, and among landscapes by encouraging crop and farm diversification and maintenance of non-crop habitat patches.
- Maintaining non-crop habitat patches within agricultural landscapes may have better outcomes for soil quality and biodiversity than cover cropping with livestock integration.
- There is a need for longer-term monitoring to better understand trade-offs between expected outcomes livestock fodder or grazing, soil conservation, and biodiversity (pests and biocontrol).
- More case studies and long-term observations are needed across different socioecological geographies to better understand land reform trajectories and how they shape landscape structure and biodiversity.

References:

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APPENDICES

Appendix 1: Study area consisting of different localities of Clarens, Cornelia, Vrede, Bethlehem and Qwaqwa areas for undertaking the AFRICAP agroecological research. Representation of different farming practices as conservation – (CA); and conventional agriculture (CT) on both commercial and smallholder systems.

	Seasonal observations during monitoring									
					January /Fe	bruary 2020			May/June	e 2020
		Farming				Planting			Planting	
Farm	Field	practice	Locality	Coordinates	Field Crop (Focal & bordering)	time (date)	Observations	Field Crop (Focal & bordering)	time (date)	Observations
1	1	СТ	Clarens	S28.397305E28.384828	Maize bordering with dry beans	Data not		Dry maize bordered with dry beans		
	2	СТ	Clarens	S28.397305E28.384828	Sovbeans - grassland combination	available		Dry soybeans - grassland combination	N/A	Only field 2 soybean was harvested, but two
	3	CT	Clarens	S28.397305E28.384828	Maize bordering with grass	(N/A)	Data not available (N/A)	Maize bordered with grassland		maize fields were not harvested yet
		01	ciarcity		mane bordering mangrass	(,	butter for available (11/14)	marze bordered margrassiana		
2	1	CA	Clarons	S28 547454E28 417767	Maize borderin with grazing grass			Dry maize bordered with reads/ grassland		
2	1	CA	Clarens	C20.547454E20.417767	Maize borderin with grazing grass	N/A	N/A	Dry maize bordered with reeasing	N/A	Crops were very dry since harveting was delayed
-	2	CA	Clarens	320.347434L20.417707	warze bordering with reeds/grass			Dry marze bordered with grassiand		
				000 517151500 117707						
3	1	СТ	Clarens	S28.54/454E28.41//6/	Maize bordering with sedge & shrubs			Dry maize bordered with grassland		
					Maize bordering psuedo replicated	N/A	N/A	Dry maize bordering psuedo replicated	N/A	Crops were very dry since harveting was delayed
	2	CT	Clarens	S28.547454E28.417767	with maize on farm 2 field 1			with maize on farm 2 field 1		
4	1	CA	Cornelia	S27.23936E28.91536	Maize bordering with pasture	NI/A	N/A	Dry maize bordering with pasture	N/A	Crops were year day since harveting was delayed
	2	CA	Cornelia	S27.23936E28.91536	Maize bordering with fallow	11/4	17/4	Dry maize bordering with fallow	N/A	crops were very dry since harveting was delayed
5	1	СТ	Cornelia	S27.23936E28.91536	Maize bordering with pasture			Dry maize bordering with pasture		Crops were very dry since harveting was delayed
	2	CA	Cornelia	S27.23936E28.91536	cover crop bordering with grass	N/A	N/A	cover crop bordering with grass	N/A	Cover crop almost grazed up
6	1	CA	Vrede	S27 25277E29 01841						
	2	CA	Vrede	S27 25277E29 01841	Maize bordering with grassland	N/A	N/A	Maize stumps bordered with grassland	N/A	Signs of livestock grazing on maize fields observed
	2	CA	vieue	021.20211223.01041						
_				007.05077500.04044						
/	1	CA	Vrede	S27.25277E29.01641	Maize bordering with grassland	N/A	N/A	Maize stumps bordered with grassland	N/A	Signs of livestock grazing on maize fields observed
	2	CA	Vrede	S27.25277E29.01841						
8	1	CT	Ascent	S27.22475E29.0743	Maize bordering with pasture	NI/A	N/A	Maize stumps bordered with pasture	N/A	Signs of livestock grazing on maize fields observed
	2	CT	Ascent	S27.22475E29.0743	Maize bordering with grassland			Maize stumps bordered with grassland		
9	1	CA	Ascent	S27.22475E29.0743	Soya bordering with grassland	NI/A	N/A	Soya bordering with grassland	N/A	Signs of livestock grazing on soybeans and maize
	2	CA	Ascent	S27.22475E29.0743	Maize bordering with grassland	IN/A	IN/A	Dry maize bordered with grassland	IN/A	fields observed
12	1	CA	Clarens	S28.37736E28.38407	Maize bordering with pasture			Dry maize bordering with pasture		Signs of livestock grazing on maize field observed.
	2	CA CA	Clarens	S28 37736E28 38407	Soupeans bordering with grassland	N/A	N/A	Dry soybeans bordering with grassland	N/A	soybean barvested
	2	CA	Clarens	020.01100220.00401	Soybeans bordering with grassiand			bry soybeans bordening with grassiand		soybeannaivested
10				007 000004500 040407						
13	1	CT	warden	S27.590934E29.012107	Maize bordering with grassland	N/A	N/A	Dry maize bordered with grassland	N/A	Signs of livestock grazing on maize fields
	2	СТ	Warden	S27.590934E29.012189	Maize bordering with grassland			-		observed; field ready for manure application
14	1	CA	Warden	S27.565827E29.040854	Marine bendering with second and	21/2	N /A	Devention beneficial with encodered	21/2	Field 2 added since the previous field 2 identified
	2	CA	Warden	S27.565317E29.040858	waize bordering with grassiand	IN/A	N/A	bry maize bordered with grassiand	N/A	by Modise & Elliot was not found
16	1	CA	Warden	S28.103685E28.552610	Maize bordering with sova			Dry maize bordering with soybeans		
	2	CA	Warden	S28 085218E28 534487	Maize bordering with sova			Sova bordering with fallow		Maize not harvested, but soybeans and beans
-	3	CA	Warden	S28 085106E28534449	Sova bordering with grassland	N/A	N/A	Dry maize bordering with soybeans	N/A	were harvested already
-	4	CT	Wardon	020,000100220004440	Dry beens bordering with fallow			Dry hears bordering with soybeans		incre nurrested uncoup.
	4	CI	warden	320.000003E20.535045	bry beans bordering with failow			bry beans bordering with soybeans		
47		~	Beath let a sec	000 400440500 040475	Martine Incode state with fall and			Device the band of a south fallow		Materia and the shares and
1/	1	CA	Bethlehem	520.162416E20.310475	Maize bordering with fallow			Dry maize bordering with fallow		Maize was aiready narvested
	2	CI	Betnienem	S28.162416E28.310475	Soya bordering with grassland/wheat	N/A	N/A	Not sample due to field mechanisation	N/A	crop was detroyed before traps could b installed
-	3	СТ	Bethlehem	S28.162416E28.310475	Maize bordering with fallow			Dry maize bordering with fallow		Maize for cultivar evaluation still standing
21	1	СТ	Qwaqwa	S28.64607E28.83623	Data not available (N/A)	N/A	N/A	Maize bordering with grassland	N/A	Maize grown
22	1	CA	Qwaqwa	S28.64446E28.84286	N/A	NI/A	N/A	Maize bordering with beans	N/A	Maize grown with weeds
	2		Qwaqwa	S28.64450E28.84298	N/A	IN/A	N/A	Maize bordering with fallow	N/A	
23	1	CT	Qwaqwa	S28.64540E28.84330				Maize bordering with fallow		Maize grown with weeds and fallow
	2		Qwagwa	S28.64534E28.84346	N/A	N/A	N/A	Maize bordering with grassland	N/A	, in the second se
-								0 0		
24	1	CA	Owagwa	S28 64260E28 84573				Maize bordering with mixed vegles		Intercropping of maize, beeans and spinach
	2	- CA	Quaguna	S28 64250E28 84548	N/A	N/A	N/A	Roans bordering with Maizo	N/A	Reason with spinach intergrouped
-	2		Qwaqwa	020.04230220.04340				Bearls bordering with Maize		beans with spinaci intercropped
			0	000 0000000 00000						11 I I I I I I I I I I I I I I I I I I
25	1	CA	Qwaqwa	520.05022E20.05092	N/A	N/A	N/A	Maize bordering with beans		Maize grown with weeds
-	2		Qwaqwa	328.65602E28.85085	-			-	N/A	
-										
26	1	СТ	Qwaqwa	S28.61543E28.82926	N/A	N/A	N/A	Maize bordering with fallow/lucern	N/A	Maize grown and fallow of lurcene
L	2		Qwaqwa	S28.61488E28.82965			- 477	Beans bordering with maize		Bean plot and maize plot adjacent
27	1		Qwaqwa	S28.60870E28.85565	NI/A	NI/A	N/A	Did not comple at all	N/A	Did not cample at all
	2		Qwaqwa	S28.60838E28.85552	IN/A	IN/A	IN/A	ord not sample at an	IN/A	Did not sample at an
28	1	CA	Qwaqwa	S28.63440E28.86567	N/A	N/A	N/A	Maize bordering with beans	N/A	Mixture of Maize, beans and spinach
1	-									
29	1	ст	Qwagwa	S28.61781E28.88557				Maize bordering with grassland		Maize very dry awaiting harvesting
	2	СТ	Owanwa	S28.61925E28 88520				Maize bordering with grassland		Maize very dry awaiting harvesting
	2	CT	Owagwa	S28 61641E28 88529	N/A	N/A	N/A	Maize bordering with grassland	N/A	Maize very dry awaiting harvesting
	3	CT	Owagiva	S28 61277E28 80604				Sova bordering with pasture		Save dried out
	4	CI	waywa	020.01211020.00004				soya oordening with pasture		Soya uneu out
		<i></i>		C00 C0740E00 04070				Martine In and a transmittle 1		A defense on the second se
32	1	CA	uwaqwa	328.60/40E28.848/0	N/A	N/A	N/A	Maize bordering with beans	N/A	waize grown with weeds
	2	CA	Qwaqwa	528.60/0/E28.848/0				soya pordering with grassland		soya not grown well, almost dry
				000 000005						
34	1	CT	Qwaqwa	S28.62328E28.89874	N/A	N/A	N/A	Beans bordering with grassland	N/A	Beans not well grown with weeds
	2	СТ	Qwaqwa	S28.62316E28.89954				Maize bordering with fallow		Maize grown
36	1	CA	Qwaqwa	S28.56244E28.83123	N/A	N/A	N/A	Beans bordering with fallow	N/A	Beans nearly drying out
	2	CA	Qwaqwa	S28.56246E28.83252	IN/A	IN/A	IN/A	Beans bordering with lurcene	IN/A	Beans nearly drying out
								_		
37	1	CA	Qwagwa	S28.62812E28.81398				Maize bordering with grassland		Mixture of maize and beans
	2	CA	Owagwa	S28.62828E28 81349	N/A	N/A	N/A	Beans bordering with maize	N/A	Brans grown well
	-	Cort								0
41		CT	Owagene	S28 5639E28 80072				Maizo hordoring with fallow		Maize grown well
41	1	CT	Qwaqwa	S28 56184E20 00050	N/A	N/A	N/A	Reaps bordering with fallow	N/A	Reasons not well grown
	2	CT	uwaqwa	320.00104E28.89956				Bears bordering with fallow		Bearls not well grown
		-		000 00000000 01000						
43	1	СТ	Qwaqwa	528.63206E28.84037	N/A	N/A	N/A	Maize bordering with beans	N/A	Maize well grown, beans and spinach
44	1	CT	Qwaqwa	S28.63113E28.84103	N/A	N/A	N/A	Maize bordering with grassland	N/A	Maize well grown with weeds

Appendix 1: Study area consisting of different localities......continued.

Seasonal observations during monitoring										
					October/November 2020			March/April 2021		
Farm	Field	Farming	Locality	Coordinates	Field Crop (Focal & bordering)	Planting time (date)	Observations	Field Crop (Focal & bordering)	Planting time (date)	Observations
1	1	СТ	Clarens	S28.397305E28.384828		()			Dec-20	
	2	СТ	Clarens	S28.397305E28.384828	Maize stumps bordering with grassland		Maize harvested	Maize - grassland combination	Oct-20	
	3	СТ	Clarens	S28.397305E28.384828		N/A			Dec-20	All fields of this planted maize
2	1	CA	Clarens	S28.547454E28.417767	Soybean bordering with grassland		Maize hanvorted	Soybean bordering with grassland	Doc 20	Cover crop planted in March
	2	CA	Clarens	S28.547454E28.417767	Maize bordering with grassland	N/A	Marzenarvesteu	Maize bordering with grassland	Dec-20	No cover crop planted yet
3	1	ст	Clarens	S28.547454E28.417767			N/A	soybean	Nov-20	
_	2	СТ	Clarens	S28.547454E28.417767	Not sampled	N/A		,		Both fields rotated maize with soybean
4	1	CA	Cornelia	S27.23936E28.91536			Maize harvested	soybean	Nov-20	Deth fields set to design with south and
	2	CA	comena	321.23330220.31530	Marze stumps bordering with grassland	IN/A				Both helds rotated maize with soybean
5	1	СТ	Cornelia	S27.23936E28.91536			Maize harvested	Maize	Nov-20	
	2	CA	Cornelia	S27.23936E28.91536	Maize stumps bordering with grassland	N/A	Male navested	Fallow		Field last planted winter crop in May 2019
6	1	CA	Vrede	S27.25277E29.01841				Sovbean		
	2	CA	Vrede	S27.25277E29.01841	Maize stumps bordering with grassland	N/A	Maize harvested	Soybean	Oct-20	Soybean harvested on our collection day
				007 05077500 04044						
7	1	CA	Vrede	S27.25277E29.01841 S27.25277E29.01841	Maize stumps hordering with grassland	N/A	Maize harvested	Harvested soybean	Oct-20	Southean hanvested on both fields
-	2	<u> </u>	vieue	021.20211220.01041	Marze stamps bordering with grassiand	11/0				Soybean harvested on both helds
8	1	ст	Ascent	S27.22475E29.0743	Maize stumps bordering with pasture	N/A	Maize harvested	Fields not accessible and therefore not	Nov-20	Fields not sampled
	2	СТ	Ascent	S27.22475E29.0743	Maize stumps bordering with grassland	IN/A	Walze harvesteu	sampled	100-20	rielus not sampleu
				007 00475500 0740						
9	1	CA	Ascent	S27.22475E29.0743 S27.22475E29.0743	Maize stumps bordering with grassland	N/A	Maize harvested	Maize	Nov-20	Previously planted soybean
	-	-	Asten							
12	1	CA	Clarens	S28.37736E28.38407	Maize stumps bordering with grassland	N/A	Maize harvesred	Soybean	Nov-20	Previously planted maize
	2	CA	Clarens	S28.37736E28.38407			Soya harvested	Maize	Dec-20	Previously planted soybean
13	1	СТ	Warden	S27.590934E29.012187						
	2	СТ	Warden	S27.590934E29.012189						
14	1	CA	Wardon	\$27 565827E29 040854						
14	2	CA	Warden	S27.5653173E29.040858	No longer sampled. Monitoring was			No longer sampled. Monitoring was		No longer sampled. Monitoring was
					stopped	N/A	No longer sampled	stopped	N/A	stopped
16	1	CA	Warden	S28.103685E28.552610						
-	2	CA	Warden	S28.085218E28.534487						
	4	CT	Warden	S28.080683E28.535843						
17	1	CA	Bethlehem	S28.162416E28.310475	Fallow bordered with soya		Maize harvested	Maize bordered with soybean	Oct-20	wheat - soybean rotation
-	3	СТ	Bethlehem	S28.162416E28.310475	Maize bordering with fallow	IN/A	N/A Harvested maize	Maize bordering with fallow	Oct-20	Maize monocropped for cultivar evaluation
	_									
										Crop showed stunted growth due to water
21	1	СТ	Qwaqwa	S28.64607E28.83623	Previously planted maize		Soil tilled	Vegetable bordered with pasture	Nov-20	logging
22	1	CA	Qwaqwa	S28.64446E28.84286	Previously planted maize		Soil tilled	Maize bothered with fallow	Nov-20	Maize overgrown with weeds
	2		Qwaqwa	S28.64450E28.84298	Not sampled	N/A	Data not available	Field no longer sampled	N/A	Field no longer sampled
			0	C00 64640E00 94000	Deputy where the stand sectors		the second sector and fallows	Materia Galleria escriptionation	Nov. 20	Martin and a state of the second state of the
23	2	CI	Qwaqwa	S28.64534E28.84346	Not sampled	N/A	Data not available	Field no longer sampled	NOV-20	Field no longer sampled
			2					·····		·····
24	1	CA	Qwaqwa	S28.64260E28.84573	Maize stumps with mixed vegies	N/A	Maize harvested	Maize bordered with maize	Nov-20	No rotation practiced
-	2		Qwaqwa	520.04250E20.04540	Maize bordered with green peas		Peas narveted	Vegetables to be planted later	N/A	Land still full of weeds
25	1	CA	Qwaqwa	S28.65822E28.85092	Previously planted maize		Soil tilled	Maize bordered with fallow	Nov-20	Only one field constant
	2		Qwaqwa	S28.65802E28.85085	Not sampled	N/A	N/A	Field no longer sampled	N/A	only one field sampled
26	1	CT	0	S38 61643E38 93036	Drawingely planted mains		Cail sillad	Maine grandland border combination		Maine group tell with 2 cohe per plant
20	2	CI	Qwaqwa	S28.61488E28.82965	data not available	N/A	N/A	Maize - grassland border combination	Nov-20	Rotation - previously planted beans
								0		
27	1	CT	Qwaqwa	S28.60870E28.85565	No longer sampled	N/A		No longer sampled	N/A	N/A
	2	СТ	Qwaqwa	520.00030E28.85552			N/A			
28	1	CA	Qwaqwa	S28.63440E28.86567	Previously planted maize		Land awaiting planting	Beans bordered with vegetables	AL	Beans overgrown with weeds
		CA	Qwaqwa	S28.63440E28.86567	Previous planted vegetables	N/A	Land awaiting planting	Maize bordered with vegetables	Nov-20	Slugs observed on maize field
			0	S28 61781E29 99557						
29	2	СТ	Qwaqwa	S28.61925E28.88520						
	3	СТ	Qwaqwa	S28.61641E28.88529	Previously planted maize in first season	N/A	Maize showing stunted growth	n Never planted - no the tractor	Nov-20	Field monitored as fallow
	4	СТ	Qwaqwa	S28.61277E28.89504						
22	1	CA	Owacowo	S28 60740E28 84870	Previously planted maize			Maize bordered with vorotables		Crops showing stunted growth lond in an
32	2	CA	Qwaqwa	S28.60707E28.84870	Previously planted beans	N/A	Soil tilled	Maize - bean border combination	Nov-20	steep terrain
34	1	СТ	Qwaqwa	S28.62328E28.89874	Previously planted maize	N/A	Soil tilled	Maize bordered with grassland	Nov-20	Maize overgrown with weeds
	2	СТ	Qwaqwa	326.02310E28.89954				-		
36	1	CA	Qwaqwa	S28.56244E28.83123	Presidential and a standard strength		o-statiled	Previously grown barley	Nov. 20	Crops could not survive on waterlooged
	2	CA	Qwaqwa	S28.56246E28.83252	Previously planted dry beans	N/A	Son thea	Vegetables	NOV-20	soil conditions
27		C*	0	S28 62812E29 91209				Maiza bardarad with mains		
3/	2	CA	Qwaqwa Qwagwa	S28.62828E28.81349	Previously planted maize	N/A	Left as fallow	Maize - porcered with maize Maize - grassland border combination	Nov-20	Maize overgrown with weeds
								e		
41	1	СТ	Qwaqwa	S28.5639E28.89972	Fallow and beans	N/A	Small bean seedlings	Monitoring no longer allowed on this	N/A	Monitoring no longer allowed on this farm
	2	СТ	Qwaqwa	S28.56184E28.89956		1977		farm		
43	1	СТ	Qwagwa	S28.63206E28.84037	Soya bodering with mixed vegetables	N/A	Soil prepared for planting	Maize bordered with Green beans	Nov-20	Maize borne 2 - 3 cobs / plant
					,		, . ,			
44	1	СТ	Qwaqwa	S28.63113E28.84103	Previously planted maize	N/A	Soil tilled	Maize bordered with grassland	Nov-20	Maize overgrown with weeds

Appendix 2a: Sticky trap reference collection which entailed identified specimens' information with sample reference code, order, family, species, body size and the functional feeding group (FFG).

Ref.				Dimensions (mm)	
Code	Order	Family	Species	L x B	FFG
1	Diptera	Tephritidae	sp.1	7 x 3	Fruit
2	Coleoptera	Melyridae	sp.1	4 X 0.5	Adults-Predator on larvae of Meloidae; larvae-decaying plant material and leaf litter
3	Diptera	Phoridae	sp.1	4 X 1	Adults-Nectar (pollinator): larvae-decaying matter
4	Diptera	Tachinidae	sp.1	4 X 1	Adults-Nectar (pollinator); larvae-parasitic on insects
5	Diptera	Sciaridae	sp.1	1.5 X 0.5	Rotting plant matter
6	Diptera	Phoridae	sp.2	2 X 1	Parasite on blood
7	Diptera	Muscidae	sp.1	5 X 2.5	Adults-Nectar: larvae-organic matter
8	Diptera	Tachinidae	sp.2	5 X 2	Adults-Nectar (pollinator): larvae-parasitic on insects
9	Diptera	Phoridae	sp.3	2 X 1	Adults-Nectar (pollinator): larvae-decaving matter
10	Diptera	Tachinidae	sp.3	2 x 1	Adults-Nectar: larvae-internal parasites of insects
11	Diptera	Stratiomviidae	sp 1	2 X 1	Adults-predator: larvae-leaf litter
12	Hymenoptera	Braconidae	sp.1	2 X 1	Parasitoids
13	Dintera	Stratiomviidae	sp.1	2208	Adults-predator: larvae-leaf litter
15	Diptera	Mycetonhilidae	sp.2	2 X 1	Fruiting bodies/fungi
16	Diptera	Empididae	sp 1	2 × 1	Predators
19	Diptera	Cecidomviidae	sp.1	1 X 0 3	Herbivores
22	Diptera	Muscidae	sp.1	15 x 2	Adults-Nectar: Jarvae-organic matter
22	Hymenontera	Pompilidae	sp. 2	2×05	Predators
25	Aranese	Fomphidae	3 snarias	5 x 3	Predators
25	Colooptora	Molyridao	Astylus atromaculatus	12 × 5	Adults pollon: lange decaying vogetable matter
20	Umoportora	Dtoromolidao	Astylus utromuculutus	2 2 1 5	Deresiteide
27	Hymenoptera	Fermisidae	sp. 1-wingless species	3 × 1.3	Parasitolius
29	Hymenoptera Cala antara	Pormicidae	sp. 1	3 X 1	Scaverigers
22	Coleoptera	Chaves and idea	sp.1	1.5 X 0.5	Predators
33	Coleoptera	Chrysomelidae	sp.1	1.5 X 0.5	Herbivores
35	Diptera	Sepsidae	sp.1	3 X 1	Dung and carcasses
36	Diptera	Tachinidae	sp.4	2×1	Adults-Nectar; larvae-internal parasites of insects
37	Diptera	Tabanidae	sp.1	6 X 2	Adults-Nectar; larvae-organic matter
39	Diptera	Empididae	sp2	5 X 2	Predators
40	Diptera	Tachinidae	sp.5	2×1	Adults-Nectar; larvae-internal parasites of insects
41	Diptera	Empididae	sp.3	2×1	Dung and carcasses
42	Diptera	Agromyzidae	sp.1	2 x 1	Leaf miners
43	Hymenoptera	Braconidae	sp.2	3 X 1	Parasitoids
44	Homoptera	Dictyopharidae	sp.1	2 x 1	Herbivores
45	Diptera	Empididae	sp.4	1.5 x 0.5	Predators
46	Diptera	Tachinidae	sp.6	3 x 1.5	Adults-Nectar; larvae-internal parasites of insects
47	Diptera	Tachinidae	sp.7	3.5 x1.5	Adults-Nectar; larvae-internal parasites of insects
48	Coleoptera	Erotylidae	sp.1	3 x 1.5	Saprophagus
49	Coleoptera	Erotylidae	sp.2	2 x 1	Saprophagus
50	Homoptera	Aphididae	sp.1	2 x 1	Herbivores
51	Homoptera	Miridae	sp.1	3 x 1	Herbivores
52	Hymenoptera	Tiphiidae	sp.1	2 x 0.5	Parasitoids
53	Coleoptera	Bostrichidae	sp.1	2 x 1	Borers
54	Homoptera	Cixiidae	sp.1	2 x 0.7	Herbivores
55	Homoptera	Cicadellidae	sp.1	2 x 1	Herbivores
56	Diptera	Calliphoridae	sp.1	11 x 4	Corpses
57	Diptera	Muscidae	sp.3	6 x 2	Adults-Nectar; larvae-organic matter
58	Diptera	Syrphidae	sp.1	6 x 3	Adults-Nectar and pollen; larvae-predators
59	Diptera	Syrphidae	sp.2	7 x 3	Adults-Nectar and pollen; larvae-predators
60	Hymenoptera	Ichneumonidae	sp.1	7 x 2	Parasitoids
61	Hymenoptera	Ichneumonidae	sp.2	7 x 2	Parasitoids
62	Diptera	Empididae	sp.5	2 x 0.8	Predators
63	Diptera	Tabanidae	sp.3	3 x 1	Adults-Nectar; larvae-internal parasites of insects
65	Hymenoptera	Ichneumonidae	sp.3	4.5 x 1	Parasitoids
66	Diptera	Phoridae	sp.4	1.5 x 1	Adults-Nectar (pollinator); larvae-decaying matter
68	Homoptera	Cicadellidae	sp.2	1 x 0.7	Herbivores
69	Homoptera	Lygaeidae	sp.1	2 x 0.8	Seeds
70	Diptera	Tephritidae	sp.2	3 x 1	Fruit
72	Diptera	Calliphoridae	Lucilia sericata	2 x 1	Feeds on corpses
73	Diptera	Calliphoridae		10 x 4	
77	Hymenoptera	Pompilidae	sp.2	18 x 5	Predators
78	Coleoptera	Mordellidae	sp.1	4 x1	Adults-nectar; larvae-rotting wood
79	Hymenoptera	Braconidae	sp.3	4 x1	Parasitoids
80	Hymenoptera	Formicidae	sp.2	5 x 1	Scavengers
81	Hymenoptera	Pompilidae	sp.3	2.5 x 1	Predators
82	Coleoptera	Tenebrionidae	Trigonopus	16 x 4	Roots/plant detritus
83	Coleoptera	Anthicidae	sp.1	9 x 4	Adults-Predator on larvae of Meloidae; larvae-decaying plant material and leaf litter
84	Hymenoptera	Braconidae	sp.4	3 x 1	Parasitoids
85	Hymenoptera	Pteromalidae	sp.2	2.5 x 1	Parasitoids
86	Diptera	Phoridae	sp.5	1.5 x 0.5	Adults-Nectar (pollinator); larvae-decaying matter
87	Diptera	Agromyzidae	sp.2	4 x 1.5	Leaf miners
88	Diptera	Same as 6		1 x 0.5	Adults-Nectar (pollinator); larvae-decaying matter
89	Diptera	Empididae	sp.6	3.5 x 1.5	Predators
90	Diptera	Mycetophilidae	sp.2	2.5 x 2	Fruiting bodies/fungi

Appendix 2a: Sticky trap reference collection which entailed identified specimens.... (continued).

21	Diptera	Drosophiliidae	sp.1	2.5 x 1	Adults-rotting fruit: larvae-veast
92	Dintera	Phoridae	sn 6	15x1	Adults-Nectar (pollinator): larvae-decaving matter
04	Diptera	Phonidae	sp.0	21	Adults Nexter (pollinator), larvae decaying matter
94	Diptera	Phoridae	sp.7	2 X 1	Aduits-Nectar (politinator); iarvae-decaying matter
95	Homoptera	Cicadellidae	sp.3	4 x 1	Herbivores
96	Homoptera	Psyllidae	sp.1	2 x 1	Herbivores
98	Coleoptera	Coccinellidae	Harmonia vigintiduomaculat	2 x 0.8	Predators
99	Coleoptera	Trogossitidae	sp.1	7 x 6	Predators
101	Hymenoptera	Braconidae	sp.5	1 x 0.5	Parasitoids
104	Dintera	Tenhritidae	sn 3	35 x 1 5	Fruit
104	Diptera	Tephnicude	sp.5	3.3 X 1.5	Presidente
106	Hymenoptera	Eurytomidae	sp.1	2 x 0.5	Parasitolos
110	Diptera	Tephritidae	sp.5	2 x 0.5	Fruit
112	Diptera	Tephritidae	sp.6	2 x 1	Fruit
113	Diptera	Tephritidae	sp.7	8 x 2	Fruit
114	Coleoptera	Carabidae	sp.1	2 x 1	Predators
115	Homontera	Anhididae	sn 2	10 x /	Herbivores
110	Tomoptera	Apinuluae	5p.2	1074	Adulta a stan lance habitures
118	Lepidoptera	Pieridae	sp.1	5 X 2	Adults-nectar; larvae nerbivores
119	Diptera	Phoridae	sp.8	17 x 4	Adults-Nectar (pollinator); larvae-decaying matter
120	Diptera	Chironomidae	sp.1	2 x 0.5	Adults-do not feed; larvae-organic matter
121	Homoptera	Cicadellidae	sp.4	6 x 2	Herbivores
122	Homoptera	Cicadellidae	sp.5	6 x 1	Herbivores
126	Coleontera	Stanbylinidae	en 2	1 × 0.5	Drodators
120		staphymnuae	sp.2	1 X 0.5	Predators
127	coleoptera	Anthicidae	sp.2	2 X 1	Aduits-Predator on larvae of Meloidae; larvae-decaying plant material and leaf litter
130	Diptera	Asilidae	sp.1	4 x 2	Predators
131	Hymenoptera	Pteromalidae	sp.3	3 x 1	Parasitoids
132	Diptera	Syrphidae	sp.3	1.5 x 0.5	Adults-Nectar and pollen; larvae-predators
133	Diptera	Mycetophilidae	sp.3	6 × 3	Fungus
124	Diptora	Coratopogonidao	op 1	5 4 3	Adults blood parasitos: Lanza organis matter
134	Diptera	ceratopogonidae	<i>sp.1</i>	5 X 2	Adurts-produ parasites, Larvae-organic matter
135	Diptera	Mycetophilidae	sp.4	3 X 1	Adults-blood parasites; Larvae-organic matter
136	Hymenoptera	Specidae	sp.1	2 x 0.5	Parasites
137	Homoptera	Cicadellidae	sp.6	2 x 1	Herbivores
139	Coleoptera	Staphylinidae	sp.3	5 x 2	Predators
145	Dintera	Muscidae	sp A	3 v 1	Adults-Nectar: Janvae-organic matter
147	Dipteru	Taskatidaa	5p.4	5.41	
147	Diptera	Tephritidae	sp.8	4 X Z	Fruit
149	Diptera	Piophilidae	sp.1	5 x 1	Protein matter
150	Diptera	Drosophiliidae	sp.2	5 x 2	Adults-rotting fruit; larvae-yeast
152	Hymenoptera	Ichneumonidae	sp.4	3 x 1	Parasitoids
156	Diptera	Asilidae	sp.2	1.5 x 0.5	Predators
157	Diptora	Culicidae		5 x 2	Adults-nectar and pollen: lange-aquatic
157	Diptera		sp.1	3.2	Addits-nectal and polien, la vae-aquatic
158	Diptera	Syrphidae	sp.4	3 X 1	Adults-Nectar and pollen; larvae-predators
160	Hymenoptera	Pteromalidae	sp.4	3 x 2	parasitoids
161	Diptera	Empididae	Hilarempis	1 x 0.5	Predators
162	Hymenoptera	Pteromalidae	sp.5	4 x 2	Parasitoids
160	nymenoptera	rteromanuae			
103	Blattodea	Blatellidae	sp.1	3 x 1	Organic material
164	Blattodea	Blatellidae	sp.1	3 x 1 2 5 x 1 5	Organic material Predators
164	Blattodea Diptera	Blatellidae Asilidae	sp.1 sp.3	3 x 1 2.5 x 1.5	Organic material Predators Predators
163 164 165	Blattodea Diptera Diptera	Blatellidae Asilidae Dolichopodidae	sp.1 sp.3 sp.1	3 x 1 2.5 x 1.5 2 x 1	Organic material Predators Predators
163 164 165 166	Blattodea Diptera Diptera Homoptera	Blatellidae Asilidae Dolichopodidae Cicadellidae	sp.1 sp.3 sp.1 sp.7	3 x 1 2.5 x 1.5 2 x 1 6 x 2	Organic material Predators Predators Herbivores
163 164 165 166 167	Blattodea Diptera Diptera Homoptera Diptera	Blatellidae Asilidae Dolichopodidae Cicadellidae Muscidae	sp.1 sp.3 sp.1 sp.7 sp.5	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1	Organic material Predators Predators Herbivores Adults-Nectar; larvae-organic matter
163 164 165 166 167 168	Blattodea Diptera Diptera Homoptera Diptera Coleoptera	Blatellidae Dolichopodidae Cicadellidae Muscidae Melyridae	sp.1 sp.3 sp.1 sp.7 sp.5 sp.2	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1	Organic material Predators Herbivores Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-carnivores
163 164 165 166 167 168 169	Blattodea Diptera Diptera Homoptera Diptera Coleoptera Diptera	Blatellidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae	sp.1 sp.3 sp.1 sp.7 sp.5 sp.2 sp.9	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2	Organic material Predators Predators Herbivores Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit
163 164 165 166 167 168 169 171	Blattodea Diptera Diptera Homoptera Diptera Coleoptera Diptera Diptera	Asilidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae	sp.1 sp.3 sp.1 sp.7 sp.5 sp.2 sp.9 sp.1	3×1 2.5×1.5 2×1 6×2 3×1 2×1 5×2 8×3	Organic material Predators Predators Herbivores Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung
163 164 165 166 167 168 169 171	Blattodea Diptera Diptera Homoptera Diptera Diptera Diptera Diptera Diptera	Blatellidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae Piophilidae	sp.1 sp.3 sp.1 sp.7 sp.5 sp.2 sp.9 sp.1 sp.1 sp.9 sp.1	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 12 x 4	Organic material Predators Predators Herbivores Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Dratein matter
163 164 165 166 167 168 169 171 173	Blattodea Diptera Homoptera Diptera Coleoptera Diptera Diptera Diptera	Blatellidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae Piophilidae	sp.1 sp.3 sp.1 sp.7 sp.5 sp.2 sp.9 sp.1 sp.2 sp.2 sp.2 sp.2 sp.2 sp.2 sp.2 sp.2	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 2 x 1	Organic material Predators Predators Herbivores Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Erwite Fruit
163 164 165 166 167 168 169 171 173 177	Blattodea Diptera Diptera Homoptera Diptera Coleoptera Diptera Diptera Diptera Diptera	Retorinindae Blatellidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae Piophilidae Tephritidae	sp.1 sp.3 sp.1 sp.7 sp.5 sp.2 sp.9 sp.1 sp.2 sp.10	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 10 x 4	Organic material Predators Predators Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Fruit
163 164 165 166 167 168 169 171 173 177 178	Animopera Blattodea Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera	Asilidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae Piophilidae Tephritidae Unidentified	sp.1 sp.3 sp.1 sp.7 sp.5 sp.2 sp.9 sp.1 sp.2 sp.1 sp.2 sp.10	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 10 x 4 5 x 2	Organic material Predators Predators Herbivores Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Fruit
163 164 165 166 167 168 169 171 173 177 178 179	Blattodea Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Hymenoptera	Blatellidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae Piophilidae Unidentified Unidentified	sp.1 sp.3 sp.1 sp.7 sp.5 sp.2 sp.9 sp.1 sp.2 sp.10 sp.2 sp.5	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 10 x 4 5 x 2 3 x 1	Organic material Predators Predators Herbivores Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Fruit Protein matter Protein matter Parasitoids
163 164 165 166 167 168 169 171 173 177 178 179 180	Ninterpetra Blattodea Diptera Diptera Coleoptera Diptera Diptera Diptera Diptera Diptera Hymenoptera Diptera	Asilidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae Piophilidae Tephritidae Unidentified Unidentified	sp.1 sp.3 sp.1 sp.7 sp.5 sp.2 sp.9 sp.1 sp.2 sp.1 sp.2 sp.10 sp.5 sp.2 sp.5 sp.2	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 10 x 4 5 x 2 3 x 1 3 x 1	Organic material Predators Predators Predators Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Fruit Pruit Pruit Parasitoids
163 164 165 166 167 168 169 171 173 177 178 179 180 201	Ninterpotera Blattodea Diptera Diptera Coleoptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera	Asilidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae Piophilidae Tephritidae Unidentified Unidentified Sarcophagidae	sp.1 sp.3 sp.1 sp.7 sp.5 sp.2 sp.9 sp.1 sp.2 sp.10 sp.5 sp.2 sp.10 sp.5 sp.2 sp.10 sp.5 sp.2 sp.1	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 10 x 4 5 x 2 3 x 1 3 x 1 10 x 4	Organic material Predators Predators Herbivores Adults-Pollen; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Fruit Parasitoids Decaving organic material
163 164 165 166 167 168 169 171 173 177 178 177 178 179 180 201 202	Infinite protecta Blattodea Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera	Asilidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae Piophilidae Tephritidae Unidentified Unidentified Sarcophagidae Sensidae	sp.1 sp.3 sp.1 sp.7 sp.5 sp.2 sp.9 sp.1 sp.2 sp.1 sp.2 sp.10 sp.5 sp.2 sp.2 sp.1 sp.5 sp.2 sp.1 sp.5 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.2 sp.1 sp.2 sp.2 sp.2 sp.2 sp.2 sp.2 sp.2 sp.2	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 10 x 4 5 x 2 3 x 1 3 x 1 10 x 4 2 x 2 3 x 1 3	Organic material Predators Predators Predators Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Fruit Parasitoids Decaying organic material Dung and carrasses Dung and carrasses
163 164 165 166 167 168 169 171 173 177 178 179 180 201 203 205	Ninterpotera Blattodea Diptera Diptera Diptera Coleoptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera	Asilidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae Piophilidae Tephritidae Unidentified Unidentified Unidentified Sarcophagidae Sepsidae	sp.1 sp.3 sp.1 sp.7 sp.5 sp.2 sp.9 sp.1 sp.2 sp.10 sp.5 sp.2 sp.10 sp.5 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.2 sp.1 sp.2 sp.2 sp.1 sp.2 sp.2 sp.1 sp.2 sp.2 sp.2 sp.2 sp.2 sp.2 sp.2 sp.2	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 10 x 4 5 x 2 3 x 1 3 x 1 10 x 4 3 x 1 10 x 4 3 x 1 2 x 1 3	Organic material Predators Predators Predators Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Fruit Parasitoids Decaying organic material Dung and carcasses Description Decaying organic material Dung and carcasses Decaying organic material Decaying organic m
163 164 165 166 167 168 169 171 173 177 178 179 180 201 203 205	Ninterpotera Blattodea Diptera Diptera Coleoptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera	Retrontinue Blatellidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae Piophilidae Tephritidae Unidentified Unidentified Unidentified Sarcophagidae Sepsidae Eurytomidae	sp.1 sp.3 sp.1 sp.7 sp.5 sp.2 sp.1 sp.2 sp.10 sp.2 sp.1 sp.2 sp.5 sp.2 sp.10 sp.2 sp.1 sp.2	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 10 x 4 5 x 2 3 x 1 3 x 1 10 x 4 3 x 1 2 x 1 2 x 1	Organic material Predators Predators Predators Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Fruit Parasitoids Decaying organic material Dung and carcasses Parasites Fruit
163 164 165 166 167 168 169 171 173 177 178 179 180 201 203 205 206	Ninterpotera Blattodea Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Coleoptera	Retrontinue Blatellidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae Piophilidae Tephritidae Unidentified Unidentified Sarcophagidae Sepsidae Eurytomidae Coccinellidae	sp.1 sp.3 sp.7 sp.5 sp.2 sp.3 sp.1 sp.5 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 10 x 4 5 x 2 3 x 1 3 x 1 10 x 4 5 x 2 3 x 1 3 x 1 2 x 1 2 x 2 3 x 1 2 x 1 2 x 2 3 x 1 2 x 2 3 x 1 2 x 1 2 x 2 3 x 1 2	Organic material Predators Predators Herbivores Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Fruit Parasitoids Decaying organic material Dung and carcasses Parasites Predators
163 164 165 166 167 168 169 171 173 177 178 179 180 201 203 205 206 208	Infinite presentation Blattodea Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Coleoptera Coleoptera Coleoptera	Recontinue Blatellidae Asilidae Dolichopodidae Cicadellidae Muscidae Muscidae Tephritidae Scathophagidae Piophilidae Tephritidae Unidentified Unidentified Unidentified Sarcophagidae Sepsidae Eurytomidae Coccinellidae	sp.1 sp.3 sp.1 sp.7 sp.5 sp.9 sp.1 sp.2 sp.10 sp.5 sp.2 sp.1 sp.1 sp.1 sp.1 sp.1 sp.1	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 10 x 4 5 x 2 3 x 1 3 x 1 10 x 4 3 x 1 2	Organic material Predators Predators Herbivores Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Fruit Parasitoids Decaying organic material Dung and carcasses Parasites Predators Seeds, leguminous plants
163 164 165 166 167 168 169 171 173 177 178 179 180 201 203 205 206 208 210	Ninterpeta Blattodea Diptera Diptera Coleoptera Diptera Diptera Diptera Diptera Diptera Hymenoptera Diptera Diptera Diptera Coleoptera Coleoptera Coleoptera	Recontinue Blatellidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae Piophilidae Tephritidae Unidentified Unidentified Sarcophagidae Sepsidae Eurytomidae Coccinellidae Bruchidae	sp.1 sp.3 sp.1 sp.7 sp.5 sp.9 sp.1 sp.2 sp.5 sp.2 sp.10 sp.2 sp.1 sp.2 sp.1 sp.5 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.1 sp.1 sp.1 sp.1 sp.5	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 10 x 4 5 x 2 3 x 1 10 x 4 3 x 1 10 x 4 3 x 1 2 x 1 2 x 1 2 x 1 4 x 1	Organic material Predators Predators Herbivores Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Fruit Decaying organic material Dung and carcasses Pareatites Paredators Seeds, leguminous plants Parasitoids
163 164 165 166 167 168 169 171 173 177 178 179 180 201 203 205 206 208 211	Ninterpotera Blattodea Diptera Diptera Coleoptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Coleoptera Coleoptera Coleoptera Hymenoptera Diptera	Recontinued Blatellidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae Piophilidae Unidentified Unidentified Unidentified Sarcophagidae Sepsidae Eurytomidae Coccinellidae Bruchidae	sp.1 sp.3 sp.7 sp.5 sp.2 sp.9 sp.10 sp.2 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.5 sp.5 sp.5 sp.5 sp.5 sp.5 sp.5 sp.5 sp.5	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 10 x 4 5 x 2 3 x 1 10 x 4 3 x 1 10 x 4 3 x 1 2 x 1 2 x 1 2 x 1 2 x 1 4 x 1 4 x 1	Organic material Predators Predators Herbivores Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Fruit Parasitoids Decaying organic material Dung and carcasses Parasites Predators Seeds, leguminous plants Parasitoids Fruitie bodies/fungi
163 164 165 166 167 168 169 171 173 177 178 179 180 201 203 205 206 208 210 211 213	Infinite presentation Blattodea Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Coleoptera Coleoptera Coleoptera Diptera Diptera	Recontinued Blatellidae Asilidae Dolichopodidae Cicadellidae Muscidae Muscidae Tephritidae Scathophagidae Piophilidae Tephritidae Unidentified Unidentified Unidentified Sarcophagidae Sepsidae Eurytomidae Coccinellidae Bruchidae Ichneumonidae	sp.1 sp.3 sp.1 sp.7 sp.5 sp.2 sp.9 sp.1 sp.2 sp.10 sp.5 sp.2 sp.1 sp.2 sp.1 sp.5 sp.2 sp.1 sp.5 sp.1 sp.2 sp.1 sp.5 sp.5 sp.5 sp.5	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 10 x 4 5 x 2 3 x 1 3 x 1 10 x 4 3 x 1 2 x 1 2 x 1 2 x 1 2 x 1 2 x 1 4	Organic material Predators Predators Herbivores Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Fruit Darasitoids Decaying organic material Dung and carcasses Parasites Predators Seeds, leguminous plants Parasitoids Fruiting bodies/fungi
163 164 165 166 167 168 169 171 173 177 178 179 180 201 203 205 206 208 210 211 211 221	Ninterpotera Blattodea Diptera Diptera Coleoptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Coleoptera Coleoptera Coleoptera Diptera Hymenoptera Diptera	Recontinued Blatellidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae Piophilidae Tephritidae Unidentified Unidentified Unidentified Sarcophagidae Sepsidae Eurytomidae Coccinellidae Bruchidae Ichneumonidae Mycetophilidae	sp.1 sp.3 sp.1 sp.7 sp.5 sp.2 sp.1 sp.2 sp.10 sp.5 sp.2 sp.10 sp.5 sp.2 sp.1 sp.5 sp.1 sp.5 sp.1 sp.5	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 10 x 4 5 x 2 3 x 1 10 x 4 3 x 1 10 x 4 3 x 1 2	Organic material Predators Predators Herbivores Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Fruit Parasitoids Decaying organic material Dung and carcasses Predators Seeds, leguminous plants Parasitoids Fruiting bodies/fungi Scavengers
163 164 165 166 167 168 169 171 173 177 178 179 180 201 203 205 206 208 210 211 212 214	Ninterpotera Blattodea Diptera Diptera Coleoptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Coleoptera Coleoptera Coleoptera Hymenoptera Diptera Hymenoptera Coleoptera Coleoptera Coleoptera	Recontinue Blatellidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae Piophilidae Tephritidae Unidentified Unidentified Unidentified Sarcophagidae Sepsidae Eurytomidae Coccinellidae Bruchidae Ichneumonidae Mycetophilidae Formicidae	sp.1 sp.3 sp.7 sp.5 sp.2 sp.9 sp.1 sp.2 sp.10 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.5 sp.5 sp.5 sp.5 sp.5 sp.5 sp.5 sp.5 sp.3	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 10 x 4 5 x 2 3 x 1 10 x 4 3 x 1 10 x 4 3 x 1 2 x 1 2 x 1 2 x 1 4 x 1 4 x 1 4 x 1 2 x 1	Organic material Predators Predators Herbivores Adults-Pollen; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Fruit Parasitoids Decaying organic material Dung and carcasses Parasites Parasites Predators Seeds, leguminous plants Parasitoids Fruitig bodies/fungi Scavengers Adults-Portator on larvae of Meloidae; larvae-decaying plant material and leaf litter
163 164 165 166 167 168 169 171 173 177 178 179 180 201 203 205 206 208 210 211 212 214	Nymenoptera Blattodea Diptera Diptera Coleoptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Coleoptera Coleoptera Coleoptera Hymenoptera Coleoptera Coleoptera Hymenoptera Coleoptera Hymenoptera Coleoptera Hymenoptera Coleoptera Hymenoptera	Recontinue Blatellidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae Piophilidae Tephritidae Unidentified Unidentified Unidentified Sarcophagidae Sepsidae Eurytomidae Coccinellidae Bruchidae Ichneumonidae Mycetophilidae Formicidae Anthicidae	sp.1 sp.3 sp.7 sp.5 sp.2 sp.9 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.5 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.5 sp.5 sp.3 sp.3 sp.2	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 10 x 4 5 x 2 3 x 1 3 x 1 10 x 4 5 x 2 3 x 1 3 x 1 10 x 4 3 x 1 2 x 1 2 x 1 2 x 1 2 x 1 4 x 1 4 x 1 4 x 1 2	Organic material Predators Predators Herbivores Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Fruit Parasitoids Decaying organic material Dung and carcasses Parasites Predators Seeds, leguminous plants Parasitoids Fruiting bodies/fungi Scavengers Adults-Predator on larvae of Meloidae; larvae-decaying plant material and leaf litter Herbivores
163 164 165 166 167 168 169 171 173 177 178 179 180 201 203 205 206 208 210 211 212 214 215 216	Ninterpotera Blattodea Diptera Diptera Oiptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Coleoptera Coleoptera Hymenoptera Diptera Hymenoptera Coleoptera Hymenoptera Coleoptera Hymenoptera Hymenoptera Hymenoptera Hymenoptera Hemiptera	Recontinued Blatellidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae Piophilidae Tephritidae Unidentified Unidentified Unidentified Unidentified Sarcophagidae Sepsidae Eurytomidae Coccinellidae Bruchidae Ichneumonidae Mycetophilidae Formicidae Psyllidae Pyrthocoridae	sp.1 sp.3 sp.7 sp.5 sp.2 sp.9 sp.1 sp.2 sp.10 sp.5 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.5 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.5 sp.1 sp.5 sp.1 sp.5 sp.5 sp.5 sp.5 sp.3 sp.2 sp.1	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 10 x 4 5 x 2 3 x 1 10 x 4 3 x 1 10 x 4 3 x 1 2	Organic material Predators Predators Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Fruit Darasitoids Parasitoids Dung and carcasses Pareates Paredators Seeds, leguminous plants Parasitoids Fruiting bodies/fungi Scavengers Adults-Predator on larvae of Meloidae; larvae-decaying plant material and leaf litter Herbivores
163 164 165 166 167 168 169 171 173 177 178 179 180 201 203 205 206 208 210 211 212 214 215 216 218	Nymenoptera Blattodea Diptera Diptera Coleoptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Coleoptera Coleoptera Coleoptera Hymenoptera Coleoptera Hymenoptera Coleoptera Hymenoptera Coleoptera Hymenoptera Diptera	Recontinue Blatellidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae Piophilidae Tephritidae Unidentified Unidentified Sarcophagidae Sepsidae Eurytomidae Coccinellidae Bruchidae Horuenonidae Mycetophilidae Formicidae Anthicidae Psyllidae	sp.1 sp.3 sp.1 sp.7 sp.5 sp.9 sp.1 sp.2 sp.10 sp.5 sp.2 sp.10 sp.5 sp.2 sp.1 sp.5 sp.1 sp.2 sp.1 sp.5 sp.5 sp.5 sp.5 sp.5 sp.3 sp.2 sp.1 sp.2 sp.1 sp.2 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.7	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 10 x 4 5 x 2 3 x 1 10 x 4 3 x 1 10 x 4 3 x 1 2 x 1 2 x 1 2 x 1 2 x 1 2 x 1 4 x 1 4 x 1 4 x 1 2 x 1 5 x 2 2 5 x 2 2 5 x 2 2 5 x 1 5 x 2 2 5 x 1 5 x 2 2 5 x 2 5 x 2 2 5 x 1 5 x 2 2 5 x 2 5 x 2 2 5 x 1 5 x 2 2 5 x 2 5 x 2 2 5 x 1 5 x 2 2 5 x 2 5 x 2 2 5 x 1 5 x 2 2 5 x 2 2 5 x 1 5 x 2 1 5 x 1 1 5 x 2 1 5 x 1 1 5 x	Organic material Predators Predators Predators Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Fruit Parasitoids Decaying organic material Dung and carcasses Parasites Predators Seeds, leguminous plants Parasitoids Fruiting bodies/fungi Scavengers Adults-Predator on larvae of Meloidae; larvae-decaying plant material and leaf litter Herbivores Herbivores Predators
163 164 165 166 167 168 169 171 173 177 178 179 180 201 203 205 206 208 210 211 212 214 215 216 218 219	Nymenoptera Diptera Diptera Coleoptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Coleoptera Coleoptera Coleoptera Hymenoptera Diptera Hymenoptera Coleoptera Hymenoptera Diptera Hymenoptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera	Retrontinue Blatellidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae Piophilidae Tephritidae Unidentified Unidentified Unidentified Sarcophagidae Sepsidae Eurytomidae Coccinellidae Bruchidae Ichneumonidae Mycetophilidae Formicidae Anthicidae Psyllidae Pyrhocoridae	sp.1 sp.3 sp.7 sp.5 sp.2 sp.9 sp.1 sp.2 sp.10 sp.2 sp.1 sp.2 sp.1 sp.5 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.5 sp.3 sp.3 sp.3 sp.1 sp.3 sp.3 sp.1 sp.7 sp.1 sp.3 sp.3 sp.4 sp.7 sp.7 sp.9	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 10 x 4 5 x 2 3 x 1 10 x 4 5 x 2 3 x 1 10 x 4 5 x 2 3 x 1 2 x 1 3	Organic material Predators Predators Herbivores Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Fruit Parasitoids Decaying organic material Dung and carcasses Parasites Predators Seeds, leguminous plants Parasitoids Fruiting bodies/fungi Scavengers Adults-Predator on larvae of Meloidae; larvae-decaying plant material and leaf litter Herbivores Herbivores Predators Adults-Nectar (pollinator): larvae-decaying matter
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163 164 165 166 167 168 169 171 173 177 178 179 180 201 203 205 206 208 210 211 212 214 215 216 218 219 220 221 222 223 224	Nymenoptera Diptera Diptera Coleoptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Coleoptera Coleoptera Hymenoptera Coleoptera Hymenoptera Coleoptera Homoptera Diptera Homoptera Diptera Hemiptera Diptera Coleoptera Hemiptera Diptera	Perionalitate Blatellidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae Piophilidae Tephritidae Unidentified Unidentified Unidentified Sarcophagidae Sepsidae Eurytomidae Coccinellidae Bruchidae Bruchidae Nycetophilidae Formicidae Psyllidae Pyrrhocoridae Empididae Phoridae Phoridae Phoridae Pyrrhocoridae Empididae Piorniciae Piorniciae Piorniciae Piorniciae Piorniciae Piorniciae Piorniciae Piorniciae Elateridae	sp.1 sp.3 sp.1 sp.7 sp.5 sp.2 sp.9 sp.10 sp.2 sp.10 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.2 sp.1 sp.5 sp.5 sp.5 sp.5 sp.5 sp.5 sp.3 sp.4 sp.1 sp.4 sp.1 sp.1 sp.1 sp.1 sp.3 sp.4 sp.1 sp.1	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 10 x 4 5 x 2 3 x 1 10 x 4 3 x 1 10 x 4 3 x 1 2 x 1 3 x 1 8 x 2 5 x 2 2 5 x 1 3 x 1 8 x 2 6 x 1.5 4 x 1.5 6 x 2 11 x 3	Organic material Predators Herbivores Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Fruit Parasitoids Pecaying organic material Dung and carcasses Parasitoids Predators Seeds, leguminous plants Parasitoids Fruitig bodies/fungi Scavengers Adults-Predators Adults-Nectar (pollinator); larvae-decaying matter Herbivores predators Adults-Nectar (pollinator); larvae-decaying matter herbivores Adults-Foliage, flower petals, pollen, Larvae-plant roots, bulbs, tubers
163 164 165 166 167 168 169 171 173 177 178 179 180 201 203 205 206 208 210 211 212 214 215 216 218 219 220 221 222 223 224 226	Nymenoptera Diptera Diptera Oiptera Oiptera Oiptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Diptera Oiptera Coleoptera Coleoptera Hymenoptera Coleoptera Hymenoptera Coleoptera Hymenoptera Diptera Homoptera Diptera Hemiptera Diptera Hemiptera Diptera Hemiptera Diptera Homoptera Coleoptera Hemiptera Diptera	Pictonialidae Blatellidae Asilidae Dolichopodidae Cicadellidae Muscidae Melyridae Tephritidae Scathophagidae Piophilidae Tephritidae Unidentified Unidentified Unidentified Unidentified Sarcophagidae Sepsidae Eurytomidae Coccinellidae Bruchidae Ichneumonidae Mycetophilidae Formicidae Pyrrhocoridae Pyrhocoridae Pyrrhocoridae Pyrrhocoridae Pyrrhocoridae Pyrrhocoridae Pyrrhocoridae Pyrrhocoridae Pyrrhocoridae Pyrralidae Porosidae Elateridae	sp.1 sp.3 sp.7 sp.5 sp.2 sp.9 sp.1 sp.2 sp.10 sp.2 sp.1 sp.5 sp.3 sp.3 sp.3 sp.2 sp.1 sp.4 sp.1 sp.4 sp.1 sp.4 sp.1 sp.4 sp.1 sp.3	3 x 1 2.5 x 1.5 2 x 1 6 x 2 3 x 1 2 x 1 5 x 2 8 x 3 13 x 4 10 x 4 5 x 2 3 x 1 10 x 4 5 x 2 3 x 1 10 x 4 3 x 1 10 x 4 3 x 1 2 x 1 3 x 1 10 x 4 3 x 1 2 x 1 3 x 1 8 x 2 2 5 x 1 3 x 1 8 x 2 6 x 1.5 6 x 2 11 x 3 4 x 1	Organic material Predators Herbivores Adults-Nectar; larvae-organic matter Adults-Pollen; larvae-carnivores Fruit Dung Protein matter Fruit Decaying organic material Dung organic material Dung organic material Dung organic material Dung and carcasses Parasitoids Seeds, leguminous plants Parasitoids Fruiting bodies/fungi Scavengers Adults-Nectar (pollinator); larvae-decaying matter Herbivores Adults-Roet (pollinator); larvae-decaying matter herbivores Adults-Foliage, flower petals, pollen, Larvae-plant roots, bulbs, tubers Predators Adults-Foliage, flower petals, pollen, Larvae-plant roots, bulbs, tubers

Appendix 2a: Sticky trap reference collection which entailed identified specimens.... (continued).

228	Neuroptera	Chrysopidae	Ceratochrysa antica	7 x 1	Adults-Predator on aphids, pollen; Larvae-predator on aphids
231	Diptera	Stratiomyiidae	sp.3	2 x 1	Adults-predator; larvae-leaf litter
232	Hemiptera	Lygaeidae	sp.2	3 x 1	Seeds
233	Neuroptera	Nemopteridae	sp.1	5 x 1.5	predators
236	Diptera	Piophilidae	sp.3	3 x 1	protein matter
237	Hymenoptera	Eumenidae	sp.1	5 x 1	predators
238	Diptera	Asilidae	sp.5	5 x 2	predators
239	Diptera	Tephritidae	sp. 11	4 x 2	Fruit
240	Diptera	Empididae	sn 8	3 x 1	predators
242	Hymenoptera	Eormicidae	sp 5	5 x 1	scavengers
245	Dintera	Drosophiliidae	sp.4	3 x 1	Adults-rotting fruit: Januae-veast
2/19	Orthontera	Acrididae	sp.+	15 x 5	Herbivores
250	Dintera	Stanhylinidae	sp.1	2 x 1	
250	Lenidontera	Pyralidae	sp.4	10 x 3	Aduts-do not feed: Larvae-all plant parts and grain
252	Hymenontera	Pteromalidae	sp.f	45x1	Parasitoids
254	Coleontera	Melvridae	sn 3	2 x 1	Adults-pollen: larvae-decaving vegetable matter
254	Thycapoptora	Thrips	sp.5	15×01	Flower and loaf fooding
200	Diptora	Sonsidao	sp.1	1.5 x 0.1	Dung and carraces
203	Colooptora	Sepsidae	sp.4 Hinnodamia variagata	4.3 X 1	Dulig and carcasses
274	Umonontora	Eormicidae	an 6	4 X 2.J	Servenger
270	Hymenoptera	Presenidae	sp.o	3 X Z	Scavengers Descriteride
278	Hymenoptera	Braconidae	sp.o	2 X 1	Parasitolos
279	Diptera	Sepsidae	sp.3	3.5 X I	polien
280	Hymenoptera	Melittidae	sp.1	7.5 X 3	Dung and carcasses
281	Diptera	Sepsidae	sp.5	2.5 X 1	Adults-Nectar; larvae-organic matter
282	Diptera	Muscidae	sp.6	/ x 2.5	Decaying organic material
283	Diptera	Sarcopnagidae	sp.2	9x3	predators
284	Diptera	Dolichopodidae	Condylostylus stenurus	4 x 1.5	herbivores (gall causing)
285	Diptera	Cecidomyiidae	sp.2	4 x 1	Herbivores
286	Homoptera	Cicadellidae	sp.8	2 x 0.5	seed parasite
288	Hymenoptera	Eurytomidae	sp.1	1 x 0.5	herbivore on grass, reeds and cereal crops
289	Lepidoptera	Crambidae	sp.1	7.5 x 1.5	plant parasite
290	Hymenoptera	Eucharitidae	sp.1	1.5 x 0.5	plant parasite
291	Hymenoptera	Eucharitidae	sp2	2 x 0.5	parasite of lepidoptera larvae
292	Hymenoptera	Braconidae	Apanteles acraea	1 x 0.5	plant parasite
293	Hymenoptera	Pteromalidae	sp.7	1.5 x 0.5	parasitoid
294	Hymenoptera	Eucharitidae	sp.3	1 x 0.5	Adults-Nectar/larvae-insect parasites
295	Hymenoptera	Sphecidae	sp.1	3.5 x 1	Scavengers
296	Hymenoptera	Formicidae	sp.7	1.5 x 0.5	seed parasite
297	Hymenoptera	Eurytomidae	sp.2	1 x 0.5	Parasitoid
299	Hymenoptera	Chalcididae	sp.1	1.5 x 0.5	Adults-Nectar/larvae-insect parasites
302	Hymenoptera	Sphecidae	sp.2	6 x 2	Adults-Nectar/larvae-insect parasites
303	Hymenoptera	Sphecidae	sp3	6.5 x 1.5	Herbivores
306	Homoptera	Fulgoridae	sp.1	4.5 x 1	predators
307	Hymenoptera	Vespidae	sp.1	6.5 x 1	predators
308	Hymenoptera	Pompilidae	sp.4	11 x 2.5	Parasitoid
309	Hymenoptera	Evaniidae	sp.1	6 x 2	Rotting matter
310	Diptera	Heleomyzidae	Suilla picta	9.5 x 4	Fruit
311	Diptera	Tephritidae	sp.12	5 x 2	Parasite on Heliocoverpa armigera
312	Diptera	Tachinidae	Dejeania sp.	11.5 x 6	Females-blood; males-nectar and plant juices
313	Diptera	Culicidae	Culex sp.	2 x 0.5	Females-blood; males-nectar and plant juices
314	Diptera	Culicidae	sp.1	6 x 1.5	Herbivores
315	Hemiptera	Miridae	sp.2	2 x 1	Saprophagus
316	Coleoptera	Erotylidae	sp.3	1.5 x 0.5	Grain (Maize/Rice)
317	Coleoptera	Curculionidae	Sitophilus sp.	3.5 x 1.5	Fruit
318	Diptera	Tephritidae	Ceratitis capitata	3 x 1	Adults-pollen/Larvae-predators
319	Coleoptera	Melvridae	sp.4	4 x 1.5	Parisitoids
320	Hymenoptera	Ichneumonidae	sp.6	19.5 x 2	Nectar, pollen/predators
321	Coleoptera	Cleridae	sp.1	3.5 x 1 5	predators
322	Coleoptera	Carabidae	sn 2	4x7	parasites
322	Dintera	Pyrgotidae	sn 1	55x2	Parasitoid
323	Hymenontera	Braconidae	sn 8	6 x 1 5	i arastora
325	Blattodea	Termitidae	sn 1	3 5 v 1	
323	biditoued	reminuae	sp.1	3.J X 1	

Appendix 2b: Pitfall reference collection which entailed identified specimens' information with sample reference code, order, family, species, body size and the functional feeding group (FFG).

				Dimensions (mm)	
Ref. Code	Order	Family	Species	L x B	FFG
1	Coleoptera	Carabidae	sp.1	10 x 3	Predators
2	Coleoptera	Tenebrionidae	Somaticus aeneus	15 x 4	Scavengers
3	Coleoptera	Elateridae	Cardiotarsus acuminatus	7 x 3	Herbivores
4	Coleoptera	Carabidae	sp. 2	10 x 3	Predators
5	Diptera	Asilidae	sp.1	10 x 1	Predators
0	Coleoptera	Staphylipidao	sp. 2	10 X 2	Predators
7	Coleoptera	Dermestidae	larvae	10 x 2	Dry animal matter
9	Diptera	Muscidae	sp.1	5 x 1	Adults-Nectar: larvae-organic matter
10	Hemiptera	Anthocoridae	Orius	5 x 1	Predators
11	Coleoptera	Staphylinidae	sp.1	5 x 1	Predators
12	Class: Chilopoda	Scolopendridae	sp.1	10 × 2	Predators
13	Coleoptera	Tenebrionidae	Psorodes tuberculata	10 x 3	Scavengers
14	Class: Arachnida	Araneae	sp.1	2 x 1	Predators
15	Coleoptera	Carabidae	sp.3	10 × 3	Predators
17	Coleoptera	Scarabaeidae	Heteronychus arator	7 x 4	Herbivores
18	Hymenoptera	Pompilidae	sp.1	11 × 3	Parasitoids
19	Class: Arachnida	Araneae	sp. 2	5 x 3	Predators
20	Hymenoptera	Formicidae	sp.1	5 x 2	Scavengers
21	Hymenoptera	Gasteruptiidae	sp.1	11 x 2	Parasitoids
22	Dermaptera Class Diplopodo	Labiduridae	Labiaura riparia	25 X 3	Predators Detritus feeders
25	class Diplopoda		sp.1	55 X Z	Detritus reeders
		Scarabaeidae: sub			
		family			
24	Coleoptera	Scarabaeinae	Metacatharsius sp.1	10 x 3	Decomposers:dung
		family			
25	Coleontera	Scarabaginag	Metacatharsius laticallis	6 - 4	Decomposersidung
25	Coleoptera	Historidae	sp.1	0 X 4 2 V 1	Predators
20	Coleoptera	Melvridae	Astylus atromaculatus	12 × 4	Adults-Pollen: Larvae-Decaving vegetable matter
21	coreoptera	Carabidaa	Astylas atromacalatas	12 7 4	Address Forreit, Larvae-Decaying vegetable matter
		carabidae; sub			
20	Coleontera	Cicindelinao	Loophyra	13 4 2	Predators
20	Lepidoptora	Noctuidae	Leucania	12 4 2	Herbivores
29	Colooptera	Carabidae Janua -	cp 1	15 × 4	Brodators
30	Coleoptera	Carabidae larvae	sp.1	15 x 4	Predators
31	Orthoptera	Gryllidae	Acanthogryllus fortipes	1/x5	Herbivores
32	Lepidoptera	Noctuidae	sp.1	20 x 5	Herbivores
33	Collembola	Entomobryoidea	sn 1	1 x 0 5	Organic feeders
34	Class Diplopoda	Entomobryoidea	sp.1	80 × 7	Detritus feeders
35	Class: Chilopoda		sp.2	45 x 4	beantas reedens
36	Anura		sp.2	40 x 15	Predators
37	Orthoptera	Gryllidae	Gryllus bimaculatus	35 x 7	Organic feeders
38	Orthoptera	Lentulidae	sp.1	25 x 5	Herbivores
39	Coleoptera	Carabidae	sp.1	22 x 8	Predators
40	Diptera	Calliphoridae	Chrysomya marainalis	10 x 4	Adults-pollen: Larvae-decaving animal matter
41	Lepidoptera	larvae	sp.1	15 x 3	Herbivores
	Class: Bentilia: Order				
42	Scuamata		sn 1	15 x 2	Predators
43	Scopiones	Buthidae	sp.1	28 x 8	Predators
44	Class: Chilopoda	batmade	sp.3	25 x 5	Predators
45	Orthoptera	Anostostomatidae	Libanasidus vittatus	45 x 5	Organic feeders
46	Coleoptera	Scarabaeidae	Dipognatha aggates	15 x 8	Herbivores
47	Coleoptera	Carabidae	Graphipterus sp.	13 × 5	Predators
48	Hymenoptera	Sphecidae	sp1	16 x 3	Predators
49	Coleoptera	Coccinellidae	Hippodamia variegata	5 x 3	Predators
50	Coleoptera	Scarabaeidae	Heteronychus arator larvae	20 x 4	Organic feeders
51	Coleoptera	Carabidae	Crepidogaster bioculata	11 × 3	Predators
52	Coleoptera	Tenebrionidae	Zophosis testudinaria	11 × 3	Detritus feeders
53	Coleoptera	Scarabaeidae	Hypopholis sommeri	10 × 4	Herbivores
54	Hymenoptera	Colletidae	sp1	9 x 2	Pollen/Nectar
55	Blattodea	Blattidae	Pseudoderopeltis albilatera	6 x 2	Scavengers
56	Diptera	Tachinidae	Dejeania sp.	15 x 5	Adults-Nectar; larvae-parasites on insects
58	Hymenoptera	Formicidae	sp.2	2 x 0.5	Scavengers
59	Diptera	Sarcophagidae	sp.1	7 x 3	Decaying organic matter
60	Orthoptera	Gryllotalpidae	Gryllotalpa africana	10 x 4	Plant roots
61	Coleoptera	Curculionidae	Sciobius sp.	7 x 2	Foliage feeders
62	Homoptera	Cicadellidae	sp.1	13 x 4	Herbivores
63	Coleoptera	Silphidae	i nantophilus mutilatus	25 x 5	Carrion
64	Diptera	Syrphidae	spi	6 x 2	Aduits-Nectar/Pollen; Larvae-predators
65	Unidentified			25 x 7	
66	Squamata	Leptotyphlopidae	Leptotyphlops scutifrons	1.5 × 1	Predators
67	Diptera	Calliphoridae	Lucilia sericata	10 x 4	Pests on sheep; larvae burrow into skin
68	Hymenoptera	Pompilidae	Tachypompilus ignitus	25 x 7	Predators
69	Coleoptera	Dermestidae	sp.1	2 x 0.8	Adults-Pollen/nectar; larvae-dry animal material
70	Coleoptera	Coccinellidae	Harmonia vigintiduomaculata	4 x 3	Predators
71	Orthoptera	Acrididae	Orthoctha dasycnemis	15 x 3	Herbivores
72	Araneae	a: 1.11:1	sp.1	6 x 3	Predators
73	Homoptera	Cicadellidae	sp.2	5 x 2	Herpivores
74	Hymenoptera	Formicidae	sp.3	3 x 0.5	Scavengers
/5	Diptera	Empididae	sp.1	5 x 2	Nectar/ Predators
/6	Diptera Ortheastern	wuscidae	sp.2	6 X 2	Aduits-Nectar; larvae-organic matter
77	Uninoptera	Acrididae	Locustana paraalina (solitary pha	22 X 4	Herbivores Bellen (Nester
/8	nymenoptera	Apidae	Apis menijerā Epicospilus sa	13 X 3	Porterly Nectar Deresite ids
/9	nymenoptera	Deptetor	encospilus sp.	5 X 2	Parasitolos
80	Hemiptera	Pentatomidae	sp.1	6 X 4	Herbivores
81	Colooptera	Emplaidae	sp.2	2 X 1	Nectary Predators
82	Coreoptera	AppriyIInidae	sp.s	8 X 1	Harbiveres
83	Colooptora	Chrysomolidae	sp.1	0.5 X 0.1	Prodotors
84	Coreoptera	Thrips	sp.1	3X1	Flower and loaf for ding
00	Diptera	Cecidomviidaa	sp.1	1 2 0 2	Herbivores
00	Diptera	Drosophiliidaa	sp.1	25 1	Adults-rotting fruit: Janvae-veast
0/	Orthoptors	Goullidao	Sp.1	2.3 X 1	Organic foodors
90	Hymenontora	Pteromalidao	en 1	15205	narasitoid
00	Class: Gastropoda	rteromanuae	sp.1	16 4	Herbivores
50	class, castropoua		0012	10 / 4	nersitores

Appendix 3: Some indicators from insect monitoring on commercial and smallholder farms which practice conventional agriculture (CT) were compared to conservation agricultural fields (CA) in all selected sampling sites across the entire study area.



Appendix 4: Some general observations showing signs of nutrient deficiencies and disease prevalence on both maize and soybeans.



Appendix 5: General overview of land management practices (CT vs CA) in crop farming as observed among different commercial and smallholder farms across the study area.



Research in Collaboration between AFRICAP - University of Leeds, UK and the Agricultural Research Council of South Africa (Small Grain)





Research Team

