

NATIONWIDE SURVEY OF PESTS AND DISEASES OF CEREAL AND GRASS SEED CROPS IN NEW ZEALAND.

1. ARTHROPODS AND MOLLUSCS

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ABSTRACT

A national survey of four cereal and two grass seed crops was conducted by the New Zealand Plant Protection Centre (NZPPC) from October 1995 to February 1996. Approximately 85,000 plants were inspected at 332 sites in the main cereal growing areas of New Zealand. In addition to the previously known invertebrate species associated with cereal and grass seed crops, 93 new organism-host associations were recorded for wheat (21 primary pests), 85 new associations for barley (22 primary pests), 40 new associations for oats (8 primary pests), 25 new associations for ryecorn (3 primary pests), 57 new associations for ryegrass (15 primary pests) and 29 new associations for brome grass (5 primary pests). Cereal thrips (*Limothrips cerealium*), wheat sheath miner (*Cerodontha australis*) and Argentine stem weevil (*Listronotus bonariensis*) were the most common pests found in this survey. *Chamaemyia polystigma*, a predatory fly new to New Zealand, was recorded on barley, brome grass and ryegrass. One undescribed species of Thysanoptera was found on wheat from Mid Canterbury.

Keywords: cereals, grasses, pests, survey, New Zealand.

INTRODUCTION

From October 1995 to February 1996, MAF Quality Management New Zealand Plant Protection Centre (NZPPC) conducted a survey of pests and diseases on four cereal and two grass seed crops. The survey was part of an ongoing plant pest surveillance program operated by the Ministry of Agriculture and Forestry. Such a survey aims to detect any pests/diseases new to New Zealand, as well as previously known pests with altered hosts or distributions. Comprehensive lists of organisms (pest lists) known to occur in New Zealand are important in setting import standards and negotiating trade conditions for export crops. This paper documents the arthropods and molluscs found during the cereal and grass seed survey. New pests, new organism-host associations and distributions of pests for each crop are listed. Findings for viruses, fungi and bacteria are recorded in Braithwaite *et al.* (1996; 1998).

MATERIALS AND METHODS

Four cereal crops, barley (*Hordeum vulgare*), oats (*Avena sativa*), ryecorn (*Secale cereale*) and wheat (*Triticum aestivum*), and two grass seed crops, brome grass (*Bromus* spp.) and ryegrass (*Lolium* spp.) were included in this survey. The survey was designed according to the procedure given by Dymock and Holder (1996). Sampling occurred throughout crop development at 332 sites in the main cereal and grass seed growing areas of New Zealand. The number of sites was apportioned among crops on the basis of their hectares of production and import/export values of each crop grown nationally (Statistics New Zealand 1994). Distribution of sites is given in results tables. The sites were chosen from grower lists provided by MAF Quality Management field officers and relevant grower associations and supplemented by local knowledge.

Sampling was designed to detect pests infesting greater than 1% of plants at a particular site with 90% confidence. To meet this criterium, at least 256 plants were examined in detail at each site, from a minimum of ten points per site. In addition, the edges of the field and any areas of unusual plant growth were examined and sampled. Invertebrate pests were collected by hand, aspirator, sweep-net, dissection of plants (stem and leaves) and by soil sieving. Identifications were carried out in a laboratory using binocular and compound microscopes. Where possible, identifications of specimens were carried out to species level. The associations of invertebrate and mollusc species with host plants were classified into eight categories: primary pest, potential primary pest, secondary pest, saprophyte, predator, parasite, casual and unknown, as defined in Table 1. Organism-host associations new to New Zealand were validated by another practising specialist from New Zealand or overseas. The results were compared with lists of known pest-host associations and distributions prepared from published and unpublished sources (Manson 1959; Anon 1981; Spiller and Wise 1982; NZ Plant Protection Centre records) for each of the six crops surveyed. All the records from this survey are available in the Plant Pest Information Network (PPIN) database (Beal 1997).

RESULTS AND DISCUSSION

The number and nature of organism-host associations for each of the surveyed crops are presented in Table 1.

TABLE 1: Number of association records for arthropods and molluscs recorded for the four cereal and two grass seed crops.

Nature of association ¹	Barley	Brome grass	Oats	Rye-corn	Rye-grass	Wheat	Total
Primary	41	11	20	11	25	40	148
Potential primary	1	1	2		2	2	8
Secondary	1	1		1		1	4
Saprophyte	11	5	7	4	8	13	48
Predator	21	5	5	6	11	18	66
Parasite	1		1		1	3	6
Casual	20	5	5	4	15	26	75
Unknown	11	7	13	7	10	15	63
Total	107	35	53	33	72	118	418

¹Definitions: Primary = the organism is able to invade and gain sustenance from intact tissues of this plant; Potential primary = the biology of this organism on this host is unknown, the part of the plant where this organism was found and the biology of that family/genus on other hosts suggest a primary relationship; Secondary = this organism infests and gains sustenance from tissues of this plant once already damaged/overripe; Saprophyte = the organism gains sustenance from rots/fungi growing on this host, or in/on decaying plant/animal material; Predator/Parasite = life stage(s) of this organism are known to live off and gain sustenance from another organism associated with this host plant; Casual = any organism that occurs accidentally or as a hitch-hiker or passenger and is not known to gain sustenance from the tissues of this host plant; Unknown = there is no known information on the biology and hosts of this organism, its significance to this host is unknown.

Barley (*Hordeum vulgare*)

Two slug species, eight mite species, two spider species and 95 insect species were identified from samples from barley crops (Table 2). Twenty-two of these species were previously recorded from barley and 85 species were recorded for the first time. The nature of the organism-host association was determined for all newly recorded

TABLE 2: Distribution of arthropods and molluscs on barley.

Order	Species name	Family	Nature of association	District ¹ and number of sites surveyed									
				HB	WI	WN	NC	MC	SC	DN	SL	Total	
				1	13	3	17	38	11	11	10	104	
Slugs													
Stylommatophora													
	<i>Deroceus reticulatum</i> *	Limacidae	Primary	1					2	2		5	
	<i>Milax sowerbyi</i>	Milacidae	Primary							1		1	
Mites													
Astigmata													
	<i>Tyrophagus longior</i>	Acaridae	Secondary						1			1	
	<i>Hirstiosoma novae-hollandiae</i>	Hirstiosomatidae	Predator			1						1	
Mesostigmata													
	<i>Pergamasus</i> sp.	Parasitidae	Predator					1			1	2	
Prostigmata													
	<i>Anystis baccharum</i>	Anystidae	Predator					1				1	
	<i>Bdellodes agrestis</i>	Bdellidae	Predator					1				1	
	<i>Bdellodes lapidaria</i>	Bdellidae	Predator					1				1	
	<i>Penthaleus major</i>	Penthaleidae	Primary					1				1	
	<i>Bryobia</i> sp.	Tetranychidae	Primary					1				1	
Spiders													
Aranea													
	<i>Eriophora pustulosa</i>	Araneidae	Predator					1				1	
Opiliones													
	<i>Phalangium opilio</i>	Phalangidae	Predator					1				1	
Insects													
Collembola													
	<i>Hypogastrura</i> sp.	Hypogastruridae	Saprophyte					1				1	
	<i>Isotomurus chiltoni</i>	Isotomidae	Saprophyte					1				1	
	<i>Bourletiella arvalis</i>	Sminthuridae	Unknown			1	11	3			4	19	
	<i>Bourletiella hortensis</i>	Sminthuridae	Unknown				7	2			2	11	
	<i>Sminthurus denisii</i>	Sminthuridae	Unknown				1		1			2	
	<i>Sminthurus viridis</i> *	Sminthuridae	Unknown	1			4				1	6	
Dermaptera													
	<i>Forficula auricularia</i>	Forficulidae	Unknown					1				1	
Orthoptera													
	<i>Pteronemobius</i> sp.	Gryllidae	Primary	1	1					1		3	
Hemiptera													
	<i>Rhopalimorpha obscura</i>	Acanthosomatidae	P. primary				1					1	
	<i>Pinus laevis</i>	Adelgidae	Casual					1				1	
	<i>Acyrtosiphon kondoi</i>	Aphididae	Casual			2						2	
	<i>Acyrtosiphon pisum</i>	Aphididae	Casual				1					1	
	<i>Aulacorthum solani</i>	Aphididae	Casual							1		1	
	<i>Cavariella aegopodii</i>	Aphididae	Casual				1					1	
	<i>Macrosiphum euphorbiae</i> *	Aphididae	Primary						1			1	
	<i>Metopolophium dirhodum</i> *	Aphididae	Primary		3	2	7				2	14	
	<i>Rhopalosiphum padi</i> *	Aphididae	Primary		5	1	5			1	4	16	
	<i>Sitobion nr. fragariae</i> *	Aphididae	Primary		1	1			1	2		5	
	<i>Philaenus spumarius</i>	Cercopidae	Primary	1	4		1	2		2		10	
	<i>Arawa</i> sp.	Cicadellidae	Unknown				1					1	
	<i>Zygina zealandica</i>	Cicadellidae	Primary				1	1				2	
	<i>Kikihia muta</i>	Cicadidae	Casual			1						1	
	<i>Oliarus oppositus</i>	Cixiidae	Primary			1						1	
	<i>Nysius huttoni</i> *	Lygaeidae	Primary				2	8	4			14	
	<i>Calocoris norvegicus</i> *	Miridae	Unknown	1	3				1			5	
	<i>Chaetodus</i> sp.	Miridae	Primary		1							1	
	<i>Sidnia kinbergi</i>	Miridae	Unknown				1	1				2	
	<i>Nabis kinbergii</i>	Nabidae	Predator	1	1		1					3	
	<i>Psylla</i> sp.	Psyllidae	Unknown					1				1	
	<i>Trioxa curta</i>	Psyllidae	Casual				1					1	
Thysanoptera													
	<i>Aeolothrips fasciatus</i>	Aeolothripidae	Predator				3	1	1			5	
	<i>Haplothrips niger</i>	Phlaeothripidae	Casual					1				1	
	<i>Anaphothrips obscurus</i>	Thripidae	Primary	1	1	1						4	
	<i>Apterothrips septicornis</i> *	Thripidae	Primary	1							1	2	
	<i>Aptinothrips rufus</i>	Thripidae	Primary					1				2	
	<i>Chirothrips manicatus</i>	Thripidae	Primary					4	3			7	
	<i>Limothrips cerealeum</i> *	Thripidae	Primary	1	7		11	25	8	4	6	62	

Table 2 continued

Order	Species name	Family	Nature of association	District ¹ and number of sites surveyed									
				HB	WI	WN	NC	MC	SC	DN	SL	Total	
				1	13	3	17	38	11	11	10	104	
	<i>Thrips obscuratus</i>	Thripidae	Casual					2	3			1	6
	<i>Thrips tabaci</i>	Thripidae	Primary			1	1	3	1				6
Neuroptera	<i>Micromus tasmaniae</i>	Hemeroptidae	Predator	1	1		2	6	1				11
Coleoptera	<i>Exapion ulicis</i>	Apionidae	Casual					1					1
	<i>Archeocrypticus topali</i>	Archeocrypticidae	Saprophyte						1				1
	<i>Clivina vagans</i>	Carabidae	Primary		1								1
	<i>Harpalus affinis</i>	Carabidae	Predator		1	2							3
	<i>Holcaspis angustula</i>	Carabidae	Predator								1		1
	<i>Holcaspis impiger</i>	Carabidae	Predator								1		1
	<i>Lecanomerus</i> sp.	Carabidae	Predator						1				1
	<i>Mecyclothorax rotundicollis</i>	Carabidae	Predator							1			1
	<i>Coccinella undecimpunctata</i>	Coccinellidae	Predator		2	2	3	15	3				25
	<i>Graphognathus leucoloma</i> *	Curculionidae	Primary			2							2
	<i>Listronotus bonariensis</i> *	Curculionidae	Primary		4	1	4	12	2	2			25
	<i>Sitona discoideus</i>	Curculionidae	Casual				1						1
	<i>Agrypus variabilis</i> *	Elateridae	Primary		1								1
	<i>Conoderus</i> spp.*	Elateridae	Primary			1							1
	<i>Aridius bifasciatus</i>	Lathridiidae	Saprophyte					2		1			4
	<i>Corticaria hirtalis</i>	Lathridiidae	Saprophyte		1		2	14	2	1	1		21
	<i>Costelytra zealandica</i> *	Scarabaeidae	Primary			1	2			2			5
	<i>Oryzaephilus mercator</i>	Silvanidae	Primary					1					1
	<i>Atheta</i> sp.	Staphylinidae	Saprophyte								1		1
	<i>Sepedophilus</i> sp.	Staphylinidae	Predator							1			1
Diptera	<i>Cerodontha angustipennis</i>	Agromyzidae	Primary			1							1
	<i>Cerodontha australis</i> *	Agromyzidae	Primary	1	11	3	10	22	7	7	3		64
	<i>Anthomyia punctipennis</i>	Anthomyiidae	Unknown				1						1
	<i>Delia platara</i> *	Anthomyiidae	Primary				1	3	2				6
	<i>Dilophus nigrostigma</i>	Bibionidae	Casual									1	1
	<i>Mayetiola destructor</i> *	Cecidomyiidae	Primary		2	1		1					4
	<i>Chamaemyia polystigma</i>	Chamaemyiidae	Predator						1				1
	<i>Gaurax flavoapicalis</i>	Chloropidae	Saprophyte		1			1					2
	<i>Hippelates insignificans</i>	Chloropidae	Unknown					1					1
	<i>Scaptomyza flava</i>	Drosophilidae	Casual					6	3				9
	<i>Scaptomyza fuscitarsis</i>	Drosophilidae	Unknown					6	3			1	10
	<i>Hydrellia enderbii</i>	Ephydriidae	Primary		1								1
	<i>Hydrellia tritici</i>	Ephydriidae	Primary				2			1			3
	<i>Psilopa hutoni</i>	Ephydriidae	Unknown		2		2	3	5	1	3		16
	<i>Scatella nelsoni</i>	Ephydriidae	Casual					1				1	2
	<i>Scatella nitidithorax</i>	Ephydriidae	Casual						1			1	2
	<i>Scatella nubeculosa</i>	Ephydriidae	Casual					2					2
	<i>Pocillohetaerella bilineata</i>	Lauxaniidae	Saprophyte				3	4	1	2	2		12
	<i>Lonchoptera furcata</i>	Lonchopteridae	Saprophyte						2	2	4		8
	<i>Megaselia</i> sp.	Phoridae	Saprophyte					1					1
	<i>Hybopygia varia</i>	Sarcophagidae	Casual		1	1	1						3
	<i>Lycoriella agraria</i>	Sciariidae	Saprophyte					3					3
	<i>Lasionemopoda hirsuta</i>	Sepsidae	Casual		1	2							3
	<i>Kimosina thomasi</i>	Sphaeroceridae	Casual				2	3	2		3		10
	<i>Melangyna novaezealandiae</i>	Syrphidae	Predator						1				1
	<i>Melanostoma fasciatum</i> *	Syrphidae	Predator		2	1	1	2	3	1	1		11
	<i>Syrphus</i> sp.	Syrphidae	Predator					1					1
Lepidoptera	<i>Orocrambus flexuosellus</i>	Crambidae	Primary		1								1
	<i>Orocrambus</i> sp.	Crambidae	Primary								1		1
	<i>Cosmitotes</i> sp.	Elachistidae	Primary				1						1
	<i>Wiseana</i> spp.*	Hepialidae	Primary					1					1
	<i>Helicoverpa armigera</i> *	Noctuidae	Primary							1			1
	<i>Mythimna separata</i> *	Noctuidae	Primary		1	2				2			5
	<i>Planotortrix excessana</i>	Tortricidae	Casual							1			1
Hymenoptera	<i>Aphidius</i> nr. <i>rhopalosiph</i>	Aphididae	Parasite					2					2

* - species previously recorded from barley "P. primary" - potential primary

¹ Two-letter district codes as after Crosby *et al.* (1976): HB, Hawke Bay; WI, Wanganui; WN, Wellington; NC, North Canterbury; MC, Mid Canterbury; SC, South Canterbury; DN, Dunedin; and SL, Southland.

species as: 22 primary pests, one potential primary pest, one secondary pest, 11 saprophytes, 20 predators, one parasite, 20 casuals and for nine species, the nature of the association was unknown. The most common primary pests on barley were wheat sheath miner, *Cerodontha australis* (found at 62% of sites); cereal thrips, *Limothrips cerealium* (60% of sites); Argentine stem weevil, *Listronotus bonariensis* (24% of sites); cereal aphid, *Rhopalosiphum padi* (15% of sites); another aphid, *Metopolophium dirhodum* (14% of sites) and wheat bug, *Nysius huttoni* (14% of sites).

The predatory fly, *Chamaemyia polystigma* (Diptera: Chamaemyiidae) is reported for the first time in New Zealand. One adult fly was found in a sweep-net sample from Mid Canterbury. In North America larvae of this fly prey upon a mealybug found on ryegrass (Sluss and Foote 1973). In New Zealand, it may prey on *Balanococcus poae* (Pearson, pers. com.) living on ryegrass in pastures.

Brome Grass (*Bromus* spp.)

Three mite and 32 insect species were identified in brome grass samples (Table 3). Six of the identified species had been previously recorded and 29 species were recorded for the first time. The nature of the organism-host association was determined for all new records as: five primary pests, one potential primary pest, one secondary pest, five saprophytes, five predators, five casuals and for seven species, the nature of the association was unknown. The most common primary pests on brome grass were cereal thrips (78% of sites); wheat sheath miner (44% of sites); wheat bug (33% of sites); timothy thrips, *Chirothrips manicatus* (33% of sites); Hessian fly, *Mayetiola destructor* (33% of sites) and Argentine stem weevil (33% of sites). Also, one adult predaceous fly, *Chamaemyia polystigma*, was found in a sweep-net sample from Mid Canterbury.

Oats (*Avena sativa*)

One mite, 51 insect and one slug species were identified on oats (Table 4). Of these species, 13 had been previously recorded from this host and 40 species were recorded for the first time. The nature of the organism-host association was determined for all new species recorded on oats as: eight primary pests, one potential primary pest, seven saprophytes, one parasite, five predators, five casuals and for 13 species the nature of the association was unknown. The most common primary pests on oats were cereal thrips (70% of sites); wheat sheath miner (35% of sites); cereal aphid (22% of sites); Argentine stem weevil (13% of sites); grass grub, *Costelytra zealandica* (13% of sites); grain aphid, (13% of sites); *Metopolophium dirhodum* (13% of sites); yellow pasture leafhopper, *Zygina zealandica* (13% of sites); American grass thrips, *Anaphothrips obscurus* (13% of sites) and timothy thrips (13% of sites).

Ryecorn (*Secale cereale*)

Two mite and 31 insect species were identified on ryecorn (Table 5). Eight of the identified species were previously reported on ryecorn. Twenty-five species were recorded for the first time in association with ryecorn. The nature of the organism-host association was determined for new species recorded. Three species were primary pests, one was a secondary pest, four were saprophytes, six predators, four casuals and for seven species, the nature of the association was unknown. The most common pest species on ryecorn were cereal thrips (80% of sites), wheat sheath miner (70% of sites) and wheat bug (40% of sites).

Ryegrass (*Lolium* spp.)

One slug, three mite and 68 insect species were identified from ryegrass samples (Table 6). Fifteen of the identified species were previously recorded on ryegrass and 57 species collected in the survey were recorded for the first time. Fifteen of the new organism-host associations were classified as primary pests, one as a potential primary pest, eight as saprophytes, one as a parasite, ten as predators and 14 as casuals. For eight species, the nature of the association was unknown. The most common pests on ryegrass were wheat sheath miner (72% of ryegrass sites); cereal thrips (59% of sites); Argentine stem weevil (48% of sites); wheat bug (35% of sites); cereal aphid (35% of sites); grain aphid (24% of sites) and *Apterothrips secticornis* (21% of sites). *Chamaemyia polystigma* was found in a sweep-net sample from Mid Canterbury.

TABLE 3: Distribution of arthropods and molluscs on brome grass.

Order Species name	Family	Nature of association	District ¹ and number of sites surveyed				
			MC 5	SC 4	Total 9		
Mites							
Astigmata:							
<i>Caloglyphus</i> sp.	Acaridae	Secondary	1				1
Mesostigmata:							
<i>Parasitus</i> sp.	Parasitidae	Predator		1			1
Prostigmata:							
<i>Penthaleus major</i>	Eupodidae	Primary	1				1
Insects							
Collembola:							
<i>Bourletiella arvalis</i>	Sminthuridae	Unknown	2				2
<i>Sminthurus viridis</i>	Sminthuridae	Unknown	1	2			3
Hemiptera:							
<i>Acyrtosiphon kondoi</i>	Aphididae	Casual	1				1
<i>Metopolophium dirhodum</i> *	Aphididae	Primary	1				1
<i>Rhopalosiphum padi</i>	Aphididae	Primary	2				2
<i>Sitobion nr. fragariae</i> *	Aphididae	Primary	2				2
<i>Arava</i> sp.	Cicadellidae	Unknown	1	2			3
<i>Nysius huttoni</i>	Lygaeidae	Primary	2	1			3
Thysanoptera:							
<i>Apterothrips septicornis</i>	Thripidae	P. primary		1			1
<i>Chirothrips manicatus</i> *	Thripidae	Primary	3				3
<i>Limothrips cerealium</i> *	Thripidae	Primary	4	3			7
Coleoptera:							
<i>Exapion ulicis</i>	Apionidae	Casual	1				1
<i>Coccinella undecimpunctata</i>	Coccinellidae	Predator	2	1			3
<i>Listronotus bonariensis</i> *	Curculionidae	Primary	3				3
<i>Sitona discoideus</i>	Curculionidae	Casual	1				1
<i>Aridius bifasciatus</i>	Lathridiidae	Saprophyte	1				1
<i>Corticaria hirtalis</i>	Lathridiidae	Saprophyte	4	3			7
Diptera:							
<i>Cerodontha australis</i>	Agromyzidae	Primary	3	1			4
<i>Anthomyia punctipennis</i>	Anthomyiidae	Unknown	1				1
<i>Calliphora quadrimaculata</i>	Calliphoridae	Casual	1				1
<i>Mayetiola destructor</i> *	Cecidomyiidae	Primary	3				3
<i>Chamaemyia polystigma</i>	Chamaemyiidae	Predator	1				1
<i>Gaurax neozelandicus</i>	Chloropidae	Saprophyte	1				1
<i>Scaptomyza fuscitarsis</i>	Drosophilidae	Unknown	1	1			2
<i>Hydrellia tritici</i>	Ephydriidae	Primary	1				1
<i>Psilopa huttoni</i>	Ephydriidae	Unknown	2				2
<i>Poecilohetaerella bilineata</i>	Lauxaniidae	Saprophyte	3				3
<i>Lonchoptera furcata</i>	Lonchopteridae	Saprophyte	2	1			3
<i>Kimosina thomasi</i>	Sphaeroceridae	Casual	2	1			3
<i>Melangyna novaezelandiae</i>	Syrphidae	Predator	1	2			3
<i>Melanostoma fasciatum</i>	Syrphidae	Predator	2	4			6
<i>Leptotarsus</i> sp.	Tipulidae	Unknown		1			1

* - species previously recorded from brome grass

"P. primary" - potential primary

¹ Two-letter district codes as defined in footnote, Table 2.**TABLE 4: Distribution of arthropods and molluscs on oats.**

Order Species name	Family	Nature of association	District ¹ and number of sites surveyed									
			HB 1	WI 1	WN 1	NC 2	MC 3	SC 6	DN 2	SL 7	Total 23	
Slugs												
Stylommatophora:												
<i>Deroceras reticulatum</i> *	Limacidae	Primary						1	1			2
Mites												
Prostigmata:												
<i>Penthaleus major</i> *	Penthaeidae	Primary									1	1

Table 4 continued

Order	Species name	Family	Nature of association	District ¹ and number of sites surveyed									
				HB	WI	WN	NC	MC	SC	DN	SL	Total	
				1	1	1	2	3	6	2	7	23	
Insects													
Collembola:													
	<i>Isotomurus chiltoni</i>	Isotomidae	Saprophyte								1	1	
	<i>Bourletiella arvalis</i>	Sminthuridae	Unknown					1			5	6	
	<i>Bourletiella hortensis</i>	Sminthuridae	Unknown					1	1			2	
	<i>Sminthurus viridis</i>	Sminthuridae	Unknown					2	1		1	4	
Orthoptera:													
	<i>Teleogryllus commodus</i> *	Gryllidae	Primary	1								1	
Hemiptera:													
	<i>Metopolophium dirhodum</i> *	Aphididae	Primary		1		1		1			3	
	<i>Rhopalosiphum padi</i> *	Aphididae	Primary					1	2		2	5	
	<i>Stobion nr. fragariae</i> *	Aphididae	Primary		1	1			1			3	
	<i>Zygina zealandica</i>	Cicadellidae	Primary			1			1	1		3	
	<i>Nysius huttoni</i> *	Lygaeidae	Primary				1	1				2	
	<i>Calocoris norvegicus</i>	Miridae	Unknown		1				1		1	3	
Thysanoptera:													
	<i>Haplothrips niger</i>	Phlaeothripidae	Casual						1			1	
	<i>Anaphothrips obscurus</i>	Thripidae	Primary		1				2			3	
	<i>Apterothrips secticornis</i>	Thripidae	P. primary								1	2	
	<i>Aptinothrips rufus</i>	Thripidae	Primary						1			1	
	<i>Chirothrips manicatus</i>	Thripidae	Primary					1	1			3	
	<i>Limothrips cerealium</i> *	Thripidae	Primary	1			2	3	5	1	4	16	
	<i>Thrips tabaci</i> *	Thripidae	P. primary	1					1			2	
Neuroptera:													
	<i>Micromus tasmaniae</i>	Hemerobiidae	Predator			1		1	1	1		4	
Coleoptera:													
	<i>Coccinella undecimpunctata</i>	Coccinellidae	Predator				1	3	2			6	
	<i>Listronotus bonariensis</i> *	Curculionidae	Primary					1			1	3	
	<i>Aridius bifasciatus</i>	Lathridiidae	Saprophyte									1	
	<i>Corticicaria hirtalis</i>	Lathridiidae	Saprophyte						4			5	
	<i>Costelytra zealandica</i> *	Scarabaeidae	Primary					1	1	1		3	
Diptera:													
	<i>Cerodontha angustipennis</i>	Agromyzidae	Primary		1							1	
	<i>Cerodontha australis</i>	Agromyzidae	Primary		1	1		3	2		1	8	
	<i>Mayetiola destructor</i> *	Cecidomyiidae	Primary	1					1			2	
	<i>Conioscincella badia</i>	Chloropidae	Unknown						1			1	
	<i>Conioscincella speighti</i>	Chloropidae	Unknown						1			1	
	<i>Hippelates insignificans</i>	Chloropidae	Unknown						1			1	
	<i>Scaptomyza fuscitarsis</i>	Drosophilidae	Unknown								1	1	
	<i>Scaptomyza flava</i>	Drosophilidae	Casual					1	1			2	
	<i>Hydrellia</i> sp.	Ephydriidae	Unknown		1							1	
	<i>Hydrellia tritici</i>	Ephydriidae	Unknown		1				1			2	
	<i>Psilopa huttoni</i>	Ephydriidae	Unknown						2			2	
	<i>Scatella nitidifrons</i>	Ephydriidae	Casual								1	1	
	<i>Scatella nitidithorax</i>	Ephydriidae	Casual						2			2	
	<i>Poecilohetaerella bilineata</i>	Lauxaniidae	Saprophyte						1			1	
	<i>Lonchoptera furcata</i>	Lonchopteridae	Saprophyte						3		1	4	
	<i>Hypobygia varia</i>	Sarcophagidae	Casual						1		1	2	
	<i>Lycoriella agraria</i>	Sciaridae	Saprophyte				1					1	
	<i>Kimosina thomasi</i>	Sphaeroceridae	Saprophyte		1			1	2		2	6	
	<i>Melangyna novaezealandiae</i>	Syrphidae	Predator						1			1	
	<i>Melanostoma fasciatum</i>	Syrphidae	Predator		1				1			2	
	<i>Anabarhynchus luridus</i>	Therevidae	Predator					1				1	
	<i>Leptotarsus</i> sp.	Tipulidae	Unknown						1			1	
Lepidoptera:													
	<i>Orocrambus cyclopicus</i>	Crambidae	Primary				1					1	
	<i>Orocrambus flexuosellus</i>	Crambidae	Primary						2			2	
	<i>Zizina otis labradus</i>	Lycanidae	Unknown			1						1	
	<i>Mythimna separata</i> *	Noctuidae	Primary								1	1	
Hymenoptera:													
	<i>Aphidius</i> sp.	Aphididae	Parasite		1							1	

* - species previously recorded from oats

"P. primary" - potential primary

¹ Two-letter district codes as defined in footnote, Table 2.

TABLE 5: Distribution of arthropods and molluscs on ryecorn.

Order Species name	Family	Nature of association	District ¹ and number of sites surveyed		
			MC 9	SC 1	Total 10
Mites					
Astigmata:					
<i>Tyrophagus similis</i>	Acaridae	Secondary	1		1
Prostigmata:					
<i>Bdellodes</i> sp.	Bdellidae	Predator	1		1
Insects					
Collembola:					
<i>Bourletiella arvalis</i>	Sminthuridae	Unknown	2		2
<i>Bourletiella hortensis</i>	Sminthuridae	Unknown	1		1
<i>Sminthurus viridis</i>	Sminthuridae	Unknown	1		1
Hemiptera:					
<i>Metopolophium dirhodum</i>	Aphididae	Primary	1		1
<i>Rhopalosiphum padi</i> *	Aphididae	Primary	1		1
<i>Philaenus spumarius</i>	Cercopidae	Primary	2		2
<i>Zygina zealandica</i> *	Cicadellidae	Primary	1		1
<i>Nysius huttoni</i> *	Lygaeidae	Primary	4		4
<i>Calocoris norvegicus</i>	Miridae	Unknown	1		1
Thysanoptera:					
<i>Limothrips cerealium</i> *	Thripidae	Primary	8		8
<i>Thrips obscuratus</i>	Thripidae	Casual	1		1
Neuroptera:					
<i>Micromus tasmaniae</i>	Hemerobiidae	Predator	1		1
Coleoptera:					
<i>Exapion ulicis</i>	Apionidae	Casual	2		2
<i>Lecanomerus</i> sp.	Carabidae	Predator	1		1
<i>Coccinella undecimpunctata</i>	Coccinellidae	Predator	4		4
<i>Listronotus bonariensis</i> *	Curculionidae	Primary	2		2
<i>Sitona discoideus</i>	Curculionidae	Casual	1		1
<i>Aridius bifasciatus</i>	Lathridiidae	Saprophyte	3		3
<i>Corticaria hirtalis</i>	Lathridiidae	Saprophyte	4		4
<i>Costelytra zealandica</i> *	Scarabaeidae	Primary	1		1
Diptera:					
<i>Cerodontha australis</i> *	Agromyzidae	Primary	7		7
<i>Anthomyia punctipennis</i>	Anthomyiidae	Unknown	1		1
<i>Delia platura</i>	Anthomyiidae	Primary	1		1
<i>Mayetiola destructor</i> *	Cecidomyiidae	Primary	1		1
<i>Scaptomyza fuscitarsis</i>	Drosophilidae	Unknown	1		1
<i>Psilopa huttoni</i>	Ephydriidae	Unknown	3		3
<i>Poecilohetaerella bilineata</i>	Lauxaniidae	Saprophyte	2		2
<i>Lonchoptera furcata</i>	Lonchopteridae	Saprophyte	2		2
<i>Kimosina thomasi</i>	Sphaeroceridae	Casual	2		2
<i>Melangyna novaezealandiae</i>	Syrphidae	Predator	1		1
<i>Melanostoma fasciatum</i>	Syrphidae	Predator	2		2

* - species previously recorded from ryecorn ¹ Two-letter district codes as defined in footnote, Table 2.

TABLE 6: Distribution of arthropods and molluscs on ryegrass.

Order Species name	Family	Nature of association	District ¹ and number of sites surveyed				
			WI 1	NC 5	MC 16	SC 4	DN 3
Slugs							
Stylommatophora:							
<i>Deroceras reticulatum</i>	Limacidae	Primary	1		3		4
Mites							
Prostigmata:							
<i>Anystis baccharum</i> *	Anystidae	Predator		1			1
<i>Bdellodes lapidaria</i>	Bdellidae	Predator		1			1
<i>Penthaeus major</i> *	Penthaleidae	Primary			1	1	2
Insects							
Collembola:							
<i>Bourletiella arvalis</i> *	Sminthuridae	Unknown	2	2	2	1	7
<i>Bourletiella hortensis</i>	Sminthuridae	Unknown			1	1	2
<i>Sminthurus viridis</i> *	Sminthuridae	Unknown		2	1	2	5
Hemiptera:							
<i>Pineus laevis</i>	Adelgidae	Casual			1		1
<i>Acyrtosiphon kondoi</i>	Aphididae	Casual			1		1

Table 6 continued

Order	Species name	Family	Nature of association	District ¹ and number of sites surveyed					
				WI	NC	MC	SC	DN	Total
				1	5	16	4	3	29
	<i>Acyrtosiphon pisum</i>	Aphididae	Casual		1	3			4
	<i>Cavariella aegopodii</i>	Aphididae	Casual		1				1
	<i>Metopolophium festucae</i>	Aphididae	Primary			1	2	1	4
	<i>Rhopalosiphum padi*</i>	Aphididae	Primary	1	5	4			10
	<i>Sitobion nr. fragariae</i>	Aphididae	Primary	1	2	4			7
	<i>Zygina zealandica*</i>	Cicadellidae	Primary	1	2	1	1		5
	<i>Nysius huttoni</i>	Lygaeidae	Primary	2	4	2	2		10
	<i>Nysius</i> sp.	Lygaeidae	Primary		1				1
	<i>Calocoris norvegicus</i>	Miridae	Unknown		1		2		3
	<i>Sidnia kinbergi</i>	Miridae	Unknown	1			1		2
	<i>Nabis kinbergii</i>	Nabidae	Predator		3				3
Thysanoptera:									
	<i>Haplothrips niger*</i>	Phlaeothripidae	Casual		1				1
	<i>Anaphothrips obscurus*</i>	Thripidae	Primary		1		1		2
	<i>Apterothrips septicornis*</i>	Thripidae	P. primary	1	4	1			6
	<i>Aptinothrips rufus</i>	Thripidae	Primary		1		1		1
	<i>Chirothrips manicatus</i>	Thripidae	Primary		3				3
	<i>Limothrips cerealium*</i>	Thripidae	Primary	4	9	4			17
	<i>Thrips obscuratus</i>	Thripidae	Casual	1	2				3
	<i>Thrips tabaci</i>	Thripidae	P. primary		2		1		3
Neuroptera:									
	<i>Micromus tasmaniae</i>	Hemeroibiidae	Predator	1	1		1		3
Coleoptera:									
	<i>Exapion ulicis</i>	Apionidae	Casual		1				1
	<i>Clivina vagans</i>	Carabidae	Primary	1	2				3
	<i>Mecyclothorax rotundicollis</i>	Carabidae	Predator		1				1
	<i>Metaglymma monolifer</i>	Carabidae	Predator					1	1
	<i>Atrichatus ochraceus</i>	Chrysomelidae	Unknown		1				1
	<i>Coccinella leonina</i>	Coccinellidae	Predator	1					1
	<i>Coccinella undecimpunctata</i>	Coccinellidae	Predator	4	11		3	1	19
	<i>Listronotus bonariensis*</i>	Curculionidae	Primary	1	10		1	2	14
	<i>Agrypnus variabilis</i>	Elateridae	Primary		1				1
	<i>Aridius bifasciatus</i>	Lathridiidae	Saprophyte		4	1	5		5
	<i>Corticicara hirtalis</i>	Lathridiidae	Saprophyte	1	8		1	1	11
	<i>Pselaphus</i> sp.	Pselaphidae	Casual	1					1
	<i>Costelytra zealandica*</i>	Scarabaeidae	Primary		1	1			2
Diptera:									
	<i>Cerodontha australis*</i>	Agromyzidae	Primary	1	4	10	4	2	21
	<i>Liriomyza chenopodii</i>	Agromyzidae	Casual			2			2
	<i>Anthomyia punctipennis</i>	Anthomyiidae	Unknown	1			1		2
	<i>Delia platara</i>	Anthomyiidae	Primary		1				1
	<i>Dilophus nigrostigma</i>	Bibionidae	Casual	2				1	3
	<i>Mayetiola destructor</i>	Cecidomyiidae	Primary	2			1		3
	<i>Chamaemyia polystigma</i>	Chamaemyiidae	Predator		1				1
	<i>Drosophila</i> sp.	Drosophilidae	Saprophyte					1	1
	<i>Scaptomyza fuscitarsis</i>	Drosophilidae	Unknown	1	3		1		5
	<i>Scaptomyza flava</i>	Drosophilidae	Casual		2				2
	<i>Hydrellia enderbii</i>	Ephydriidae	Primary	1					1
	<i>Hydrellia</i> sp.	Ephydriidae	Primary				1		1
	<i>Hydrellia tritici*</i>	Ephydriidae	Primary		1				1
	<i>Psilopa huttoni</i>	Ephydriidae	Unknown	3	9		4		16
	<i>Scatella nelsoni</i>	Ephydriidae	Casual				3		3
	<i>Scatella nubeculosa</i>	Ephydriidae	Casual	1					1
	<i>Scatella</i> sp.	Ephydriidae	Casual		1				1
	<i>Poecilohetaerella bilineata</i>	Lauxaniidae	Saprophyte	1	7		2	1	11
	<i>Lonchoptera furcata</i>	Lonchopteridae	Saprophyte	1	3	10	2	2	18
	<i>Limnophilina nelsoni</i>	Muscidae	Unknown		1				1
	<i>Hybopygia varia</i>	Sarcophagidae	Casual		1				1
	<i>Lycoriella agraria</i>	Sciariidae	Saprophyte		1				1
	<i>Kimosina thomasi</i>	Sphaeroceridae	Saprophyte		5			1	6
	<i>Odontomyia chloris</i>	Stratiomyidae	Saprophyte	1			1		2
	<i>Melangyna novaezealandiae</i>	Syrphidae	Predator		1				1
	<i>Melanostoma fasciatum</i>	Syrphidae	Predator	1	3		2	1	7
Lepidoptera:									
	<i>Orocrambus</i> sp.	Crambidae	Primary						1
	<i>Graphania mutans</i>	Noctuidae	Primary		1				3
	<i>Mythimna separata*</i>	Noctuidae	Primary		2				2
Hymenoptera:									
	<i>Dinocampus coccinellae</i>	Braconidae	Parasite		1				1

* - species previously recorded from ryegrass "P. primary" - potential primary

¹ Two-letter district codes as defined in footnote, Table 2.

Wheat (*Triticum aestivum*)

Two slug species and 116 arthropod (nine mite, one spider and 106 insect) species were identified from wheat samples (Table 7). Twenty-five of the identified species were previously recorded and 93 species were recorded for the first time in association with wheat. The nature of the organism-host association was determined for new species recorded. There were 21 primary pests, one potential primary pest, one secondary pest, 13 saprophytes, three parasites, 17 predators and 24 casuals. For 13 species, the nature of the association was unknown. One undescribed species of thrips, family Phlaeothripidae (Thysanoptera: Tubulifera), was found in a sweep-net sample from Rakaia, Mid Canterbury. Specimens were deposited in the New Zealand Arthropod Collection. The most common pests found on wheat were cereal thrips (75% of sites), wheat sheath miner (59% of sites), Argentine stem weevil (34% of sites), wheat bug (17% of sites); grain aphid (16% of sites), another aphid, *Metopolophium dirhodum* (13% of sites) and grass grub (10% of sites). The incidence of some pests recorded in this survey on wheat, Hessian fly and Argentine stem weevil, was much lower than reported in the literature (Withers *et al.* 1995) for the same areas. Thrips population dynamics have shown some seasonal trends in the incidence of males and females (Bejakovich unpubl. data).

TABLE 7: Distribution of arthropods and molluscs on wheat.

Order	Species name	Family	Nature of association	District ¹ and number of sites surveyed										
				WI 12	WN 4	NC 53	MC 48	SC 19	DN 7	SL 14	Total 157			
Slugs														
Stylommatophora:														
	<i>Arion hortensis</i> *	Arionidae	Primary	1	1	1							3	
	<i>Deroceras reticulatum</i>	Limacidae	Primary			1	2	4			1		8	
Mites														
Astigmata:														
	<i>Tyrophagus longior</i>	Acaridae	Secondary					1					1	
Mesostigmata:														
	<i>Pergamasus</i> sp.	Parasitidae	Predator					1					1	
Prostigmata:														
	<i>Anystis baccharum</i>	Anystidae	Predator			2	1						3	
	<i>Bdellodes agrestis</i>	Bdellidae	Predator				1						1	
	<i>Bdellodes lapidaria</i>	Bdellidae	Predator				2						2	
	<i>Bdellodes</i> sp.	Bdellidae	Predator					1					1	
	<i>Penthaleus major</i> *	Penthaleidae	Primary				2						2	
	<i>Bryobia</i> sp. nr. <i>B. variabilis</i>	Tetranychidae	Primary					1					1	
	<i>Tydeus</i> sp.	Tydeidae	Primary					1					1	
Spiders														
Aranea:														
	<i>Clubiona</i> sp.	Clubionidae	Predator			1							1	
Insects														
Collembola:														
	<i>Hypogastrura</i> sp.	Hypogastruridae	Saprophyte	1		1	1						3	
	<i>Isotomurus chiltoni</i>	Isotomidae	Saprophyte					2	1	1	1	1	4	
	<i>Bourletiella arvalis</i>	Sminthuridae	Unknown			3	9	6	1	4	4	23		
	<i>Bourletiella hortensis</i>	Sminthuridae	Unknown				5	2		2	2	9		
	<i>Sminthurus viridis</i> *	Sminthuridae	Unknown	1		3	1	4	2	2	2	13		
Orthoptera:														
	<i>Phaulacridium marginale</i>	Acrididae	Primary	1									1	
	<i>Conocephalus</i> sp.	Tettigoniidae	Primary	1									1	
Hemiptera:														
	<i>Acyrtosiphon kondoi</i>	Aphididae	Casual			2							2	
	<i>Acyrtosiphon pisum</i> *	Aphididae	Casual			2	3						5	
	<i>Aphis gossypii</i> *	Aphididae	Casual			1							1	
	<i>Brevicoryne brassicae</i>	Aphididae	Casual						1				1	
	<i>Cavariella aegopodii</i>	Aphididae	Casual			1		1					2	
	<i>Euceraphis punctipennis</i>	Aphididae	Casual				1						1	
	<i>Metopolophium dirhodum</i> *	Aphididae	Primary	2	1	6	8	4					21	

Table 7 continued

Order	Species name	Family	Nature of association	District ¹ and number of sites surveyed									
				WI 12	WN 4	NC 53	MC 48	SC 19	DN 7	SL 14	Total 157		
	<i>Metopolophium festucae</i> *	Aphididae	Primary				1						1
	<i>Rhopalosiphum maidis</i> *	Aphididae	Primary				1						1
	<i>Rhopalosiphum padi</i> *	Aphididae	Primary	4	2	3	7	4	3	2	2		25
	<i>Sitobion nr. fragariae</i> *	Aphididae	Primary	1		5	2	4			1		13
	<i>Philaenus spumarius</i>	Cercopidae	Primary	2	1	4	3	2	1	1	1		14
	<i>Arawa</i> sp.	Cicadellidae	Unknown				1						1
	<i>Zygina zealandica</i>	Cicadellidae	Primary				3	3					6
	<i>Oliarus oppositus</i>	Cixiidae	Primary	2									2
	<i>Nysius huttoni</i> *	Lygaeidae	Primary			9	12	4			1		26
	<i>Calocoris norvegicus</i> *	Miridae	Unknown	2		4	3	5					14
	<i>Chaetodus</i> sp.	Miridae	Primary	1									1
	<i>Lincolnia lucernina</i>	Miridae	Unknown					1					1
	<i>Nabis kinbergii</i>	Nabidae	Predator				1						1
	<i>Cermatulus nasalis</i>	Pentatomidae	Unknown		1								1
	<i>Ctenarytaina eucalypti</i>	Psyllidae	Casual					1					1
Thysanoptera:													
	<i>Aeolothrips fasciatus</i>	Aeolothripidae	Predator			1	3						4
	<i>Haplothrips niger</i>	Phlaeothripidae	Casual			1	2	1					4
	<i>Nesothrips propinquus</i>	Phlaeothripidae	Primary			1							1
	<i>Anaphothrips obscurus</i>	Thripidae	Primary			1	4	2	1				8
	<i>Apterothrips seccicornis</i> *	Thripidae	P. primary	1		1	4						6
	<i>Aptinothrips rufus</i>	Thripidae	Primary					1			1		2
	<i>Aptinothrips stylifer</i>	Thripidae	Casual					1					1
	<i>Chirothrips manicatus</i>	Thripidae	Primary			1	5	2					9
	<i>Limothrips cerealium</i> *	Thripidae	Primary	6	3	36	42	15	3	12	1		117
	<i>Thrips obscuratus</i>	Thripidae	Casual			3	6	1			3		13
	<i>Thrips tabaci</i>	Thripidae	P. primary			4	2	3					9
	<i>Thrips vulgarissimus</i>	Thripidae	Casual				1	1					2
Neuroptera:													
	<i>Micromus tasmaniae</i>	Hemerobiidae	Predator	2		1	12	2					17
Coleoptera:													
	<i>Euclides suturalis</i>	Anthribidae	Primary			1							1
	<i>Exapion ulicis</i>	Apionidae	Casual	1		1	6						8
	<i>Clivina vagans</i>	Carabidae	Primary			1							1
	<i>Lecanomerus</i> sp.	Carabidae	Predator				1						1
	<i>Mecyclothorax rotundicollis</i>	Carabidae	Predator						1		1		2
	<i>Scopodes pustulatus</i>	Carabidae	Predator								1		1
	<i>Neoferonia</i> sp.	Carabidae	Predator					1					1
	<i>Atrichatus ochraceus</i>	Chrysomelidae	Unknown				3						3
	<i>Longitarsus fuliginosus</i>	Chrysomelidae	Unknown				1						1
	<i>Coccinella leonina</i>	Coccinellidae	Predator			1	1						2
	<i>Coccinella undecimpunctata</i>	Coccinellidae	Predator	1		8	22	6	1	3	4		41
	<i>Listronotus bonariensis</i> *	Curculionidae	Primary	4	1	24	19	3	2				53
	<i>Agrypnus variabilis</i> *	Elateridae	Primary			2	1						3
	<i>Conoderus</i> sp.	Elateridae	Primary	1									1
	<i>Ctenicera</i> sp.	Elateridae	Primary				1						1
	<i>Aridius bifasciatus</i>	Lathridiidae	Saprophyte			3	9	5			2		19
	<i>Corticaria serrata</i>	Lathridiidae	Saprophyte			1							1
	<i>Corticaria hirtalis</i>	Lathridiidae	Saprophyte	3		17	30	12	3	3			68
	<i>Costelytra zealandica</i> *	Scarabaeidae	Primary	1		3	9	2	1				16
	<i>Pyronota festiva</i>	Scarabaeidae	Casual	1									1
	<i>Atheta</i> sp.	Staphylinidae	Saprophyte						1				1
Diptera:													
	<i>Cerodontha australis</i> *	Agromyzidae	Primary	9	3	27	33	9	3	8			92
	<i>Anthomyia punctipennis</i>	Anthomyiidae	Unknown			1	7	4					12
	<i>Delia platura</i> *	Anthomyiidae	Primary				7	3					10
	<i>Neotamias melanopogon</i>	Asilidae	Casual			1							1
	<i>Dilophus nigrostigma</i>	Bibionidae	Casual				2						2
	<i>Lestodiplosis</i> sp.	Cecidomyiidae	Predator			1							1
	<i>Mayetiola destructor</i> *	Cecidomyiidae	Primary	2		6	5				1		14
	<i>Chironomus zealandicus</i>	Chironomidae	Casual			1							1
	<i>Hippelates insignificans</i>	Chloropidae	Unknown			1	1	1					3
	<i>Scaptomyza flava</i>	Drosophilidae	Casual			1	4	4			1		10
	<i>Scaptomyza fuscitarsis</i>	Drosophilidae	Unknown			1	3	5					9
	<i>Hydrellia</i> sp.	Ephydriidae	Primary	1									1
	<i>Hydrellia tritici</i> *	Ephydriidae	Primary	1		1		3					5

Table 7 continued

Order	Species name	Family	Nature of association	District ¹ and number of sites surveyed							
				WI	WN	NC	MC	SC	DN	SL	Total
				12	4	53	48	19	7	14	157
	<i>Psilopa huttoni</i>	Ephydriidae	Unknown	1		4	15	8		6	34
	<i>Scatella nitidithorax</i>	Ephydriidae	Casual					2		1	3
	<i>Scatella nelsoni</i>	Ephydriidae	Casual					1			1
	<i>Scatella nubeculosa</i>	Ephydriidae	Casual					1			1
	<i>Poecilohetaerella bilineata</i>	Lauxaniidae	Saprophyte			1	15	3		5	24
	<i>Lonchoptera furcata</i>	Lonchopteridae	Saprophyte	3			6	9		5	23
	<i>Limnophilina bivittata</i>	Muscidae	Unknown				1				1
	<i>Brevicornu flavum</i>	Mycetophilidae	Saprophyte				5				5
	<i>Mycetophila</i> sp.	Mycetophilidae	Saprophyte				1				1
	<i>Hybopygia varia</i>	Sarcophagidae	Casual				3	2			5
	<i>Lycoriella agraria</i>	Sciaridae	Saprophyte					1			1
	<i>Austrosimulium unicomne</i>	Simuliidae	Casual							2	2
	<i>Coproica hirtula</i>	Sphaeroceridae	Saprophyte				1				1
	<i>Kimosinathomasi</i>	Sphaeroceridae	Casual	1		5	10	2		2	20
	<i>Beris</i> sp.	Stratiomyidae	Unknown			1					1
	<i>Odontomyia chloris</i>	Stratiomyidae	Saprophyte	1				2			3
	<i>Melangyna novaezelandiae</i>	Syrphidae	Predator				1	2			3
	<i>Melanostoma fasciatum</i> *	Syrphidae	Predator	3			3	4			10
Lepidoptera:											
	<i>Nyctemera annulata</i>	Arctidae	Casual					1			1
	<i>Orocrambus flexuosellus</i>	Crambidae	Primary				1				1
	<i>Wiseana</i> sp.	Hepialidae	Primary				1				1
	<i>Agrotis ipsilon aneituma</i> *	Noctuidae	Primary	1	1		1				3
	<i>Mythimna separata</i> *	Noctuidae	Primary		3				1		4
	<i>Spodoptera litura</i> *	Noctuidae	Primary			1				1	2
	<i>Pieris rapae rapae</i>	Pieridae	Casual				1				1
	<i>Eudonia sabulosa</i>	Pylalidae	Primary				2				2
Hymenoptera:											
	<i>Aphidius rhopalosiphi</i>	Aphididae	Parasite				1				1
	<i>Apanteles</i> sp.	Braconidae	Parasite	1							1
	<i>Dinocampus coccinellae</i>	Braconidae	Parasite					1			1
	<i>Lasioglossum</i> sp.	Halictidae	Casual					1			1

* - species previously recorded from wheat "P. primary" - potential primary

¹ Two-letter district codes as after Crosby *et al.* (1976): WI, Wanganui; WN, Wellington; NC, North Canterbury; MC, Mid Canterbury; SC, South Canterbury; DN, Dunedin; and SL, Southland.

CONCLUSION

During this survey, 329 new plant and arthropod/mollusc associations were recorded, 79 of which were determined as primary or potential primary pests. The nature of organism-host association could not be determined for 57 species ("unknown") as no details on the organism biology on the host plant were available. Further research of these organisms on surveyed hosts is needed to clarify their pest status. One new, undescribed species of thrips (Thysanoptera: Phlaeothripidae) was found on a wheat sample from Rakaia, Mid Canterbury. The predatory fly, *Chamaemyia polystigma* (Diptera: Chamaemyiidae), was reported for the first time in New Zealand on barley, brome grass and ryegrass samples from Mid Canterbury (W. Pearson pers. comm.).

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