Red Imported Fire Ant Impacts on the Endangered Florida Grasshopper Sparrow

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Final Report

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Abstract: Red imported fire ants (*Solenopsis invicta*) invaded peninsular Florida more than 30 years ago. Highlands and Polk counties, Florida, were probably first invaded in the late 1960s. Since then, fire ants have continued both to spread and to increase in abundance. Experimental evidence has shown that red imported fire ants may have a detrimental impact on native species, both invertebrate and vertebrate, and that these impacts may be both direct and indirect. This segment of research was designed to determine if fire ants have a negative impact on Florida Grasshopper Sparrow (*Ammodramus savannarum floridanus*) populations at Avon Park Air Force Bombing Range, Florida. The sampling reported herein was conducted during June and October, 1997, and all analyses are restricted to data collected during those periods. As assessed by baits, fire ants were dominant on about half the sites, and absent from others. In particular, OQ Range sites tended to have fewer fire ants present, while Delta Trail sites were more heavily infested, although there were exceptions. June fire ant abundance was strongly negatively correlated with both native ant abundance ($r = -0.743$, $P = 0.006$) and native ant species richness ($r = -0.730$, $P = 0.007$). October fire ant abundance was strongly negatively correlated with both native ant abundance ($r = -0.690$, $P = 0.013$) and native ant species richness ($r = -0.736$, $P = 0.006$). The patterns of fire ant abundance as assessed by pitfalls were very similar to those determined from bait sampling. June fire ant abundance was negatively correlated ($P < 0.05$) with native ant richness, but other June comparisons were not statistically significant ($P > 0.05$). October fire ant abundance was negatively correlated ($P < 0.05$) with native ant richness and abundance, but other comparisons were not statistically significant ($P > 0.05$). There was no significant correlation between overall insect biomass as assessed by light traps and fire ant abundance as assessed by baits or pitfalls. Total biomass varied considerably among the two sample periods because of changes in overall insect abundance during different seasons. There was a negative spatial correspondence between fire ants and native invertebrates. Over most of the intensive study areas, there was a negative spatial relationship between fire ants and the abundance of native invertebrates. Over about 50% of the intensive study areas, there was a negative spatial relationship between fire ants and the abundance of Florida grasshopper sparrows, although the relationship was not as strong as that between fire ants and native invertebrates. Fire ant and native invertebrates were negatively correlated at grasshopper sparrow count locations ($r = -0.347$, $P = 0.03$). A multiple regression model was fit to the data, using fire ants and native invertebrates as independent variables, and grasshopper sparrow 100-m population estimates ($n = 39$) as the dependent variable. The influence of fire ants on grasshopper sparrows was negative while the influence of native invertebrates was positive. However, the overall model, while suggestive, was not significant ($r = 0.304$, $P = 0.17$). Fire ant abundance was a better (negative) predictor of sparrow populations ($P = 0.13$) than was invertebrate abundance ($P = 0.59$). The overall model and influence of fire ants on sparrow populations was suggestive of a negative influence warranting analyses of data for 1998 and 1999.

FORWARD

This report summarizes the activities under Segment C of Research Work Order (RWO) 175 of the Florida Cooperative Fish and Wildlife Research Unit. Specifically, this report summarizes the results of the 1997 fire ant sampling at Avon Park Air Force Range, and presents preliminary results from that sampling period concerning fire ant (*Solenopsis invicta*), native ant, and other invertebrate abundance on 12 study sites where Florida grasshopper sparrows (*Ammodramus savannarum floridanus*) are intensively studied. We also present a preliminary spatial analysis of the relationship between fire ants and invertebrates and fire ants and Florida grasshopper sparrows.

INTRODUCTION

Red imported fire ants invaded peninsular Florida more than 30 years ago. Highlands and Polk counties, Florida, were probably first invaded in the late 1960s. Since then, fire ants have continued both to spread and to increase in abundance (Wojcik 1994). More recently, experimental evidence has shown that red imported fire ants may have a detrimental impact on native species, both invertebrate and vertebrate, and that these impacts may be both direct and indirect.

Fire ants are associated with disturbance (Tschinkel 1988). Disturbance promotes fire ant habitat occupancy in two ways. First, in situations with closed canopies or a heavy

herbaceous layer, disturbance opens the canopy and allows light penetration. Second, disturbance may remove competitive ant species. Because the red imported fire ant is an aggressive colonizer of habitats, it can outcompete most other ant species for vacant habitat patches following disturbances of most kinds. Few native ants can compete with *S. invicta* and provide resistance to invasion. However, these species are, in general, poor colonizers and have slow growth rates, whereas *S. invicta* is an excellent colonizer and exhibits rapid population growth (Tschinkel 1993). Imported fire ants often are very visible in habitats that have been severely transformed by humans - pastures, yards and roadsides for example. However, they also may dominate in habitats where the influence of disturbance is more subtle, such as moderately grazed rangelands in Texas (Allen et al. 1995) and hardwood hammocks in the Florida Keys (Forys et al. 1997), or where there is no apparent human disturbance of the vegetation, such as the Marquesas Keys, an isolated archipelago west of Key West, Florida. Burning and grazing may constitute distubances of sufficient severity to promote fire ant invasion at Avon Park Air Force Bombing Range.

Biological invasions often exhibit a wave-like pattern of spread. Extremely high densities occur at the advancing front of an invasion for short periods of time, but the invader population stabilizes at lower densities shortly after passage of the initial wave of spread (e.g., Breitenmoser and Haller 1993). Such a situation has been suggested for fire ants, where it has been noted that high mound densities immediately follow a disturbance such as the plowing of a field, but that densities soon stabilize at lower levels (Lofgren and Williams 1985). However, this is more appropriately the case with monogyne

colonies infesting a previously uninfested habitat, and the decrease in density may reflect the results of intraspecific competition among incipient colonies. Long-term studies suggest that this may not be the pattern of infestation most common in the red imported fire ant. Wojcik (1994) documented the infestation of suburban Gainesville, Florida, over a 21-year period. From initial infestation to the present, fire ant abundance has steadily increased concomitant with a decline in several species of native ants. Sixteen years of data (K. Rice, *unpublished data*) in natural marsh habitats from coastal South Carolina also documents a long-term steady increase in fire ant abundance. Thus, while at short time scales with monogynous fire ants populations may appear to decrease and stabilize following an initial disturbance and infestation, at longer time intervals the pattern seems to be one of increase at both local and regional spatial scales.

Red imported fire ants are attracted to proteins, sugars and moisture. The attraction to protein sources is enhanced when immature brood is present in the colony (Sorensen et al. 1983), and the presence of high protein foods also enhances the production of brood. Brood production occurs primarily in the warmer months, and a colonies highest protein requirement may coincide with the breeding periods of many vertebrates, including grasshopper sparrows. Egg contents (Allen et al. 1997b) and newborn young of vertebrates are attractive sources of proteins and oils for foraging fire ants, as are insects (Vinson et al. 1967).

Research investigating direct fire ant impacts on vertebrates has focused mainly on birds. Recent work suggests that northern bobwhite (*Colinus virginianus*) are susceptible to fire

ant impacts (Allen et al. 1995), but that indirect impacts may be equally or more important than direct impacts. Direct impacts on wildlife have been documented for a wide variety of other species, although until recently documentation tended to be anecdotal. Negative impacts may be especially severe in breeding aggregations of vulnerable species. For example, waterbird nest mortality was as high as 100% on fire ant infested barrier islands (Drees 1994), although mortality varied and was lower for early-nesting birds.

In recent published documentation of population-level impacts by red imported fire ants on wildlife species (Allen et al. 1995, 1997a), the mechanism has not been identified, and the impact is likely to be multi-causal, a combination of direct, indirect, and cascading impacts.

Indirect impacts by fire ants on native vertebrates may be much more important than direct impacts, but remain little understood. Possible indirect impacts include reduced survival and weight gain resulting from envenomization, behavioral changes in the impacted species, changes in foraging patterns, changes in habitat use, reduced food availability, and community level changes resulting from trophic cascades.

Reduced survival resulting from fire ant stings has been documented only for northern bobwhite (Giuliano et al. 1996). Fire ant venom is unlike that of most other Hymenoptera, consisting primarily of alkaloids with hemolytic, cytotoxic, and necrotic properties (Brown 1972, Fox et al. 1982). The loss of digits and appendages, as well as

blinding, may result from fire ant envenomization of small vertebrates, and secondary infection also is possible.

Reduced weight gain resulting from the stings of red imported fire ants has been documented for both northern bobwhite (Giuliano et al. 1996) and American alligators (*Alligator mississippiensis*; Allen et al. 1997b). Reduced weight gain in juveniles may reduce long-term survival and reproduction. Behavioral changes, including altered activity patterns (Pedersen et al. 1996) and altered foraging patterns (Holtcamp et al. 1997) have been documented for small mammals and birds. Changes in foraging and activity patterns likely result from the irritation associated with fire ant stings. Whiting (1994) reported the abandonment of a nesting attempt by *Pseudemys texana* due to the irritation associated with stings.

Fire ant infestations may affect habitat use by vertebrates (Holtcamp et al. 1997, Killion et al. 1995). Possible mechanisms include avoidance of areas heavily infested with fire ants because of the irritation associated with fire ant stings, and altered food availability (i.e., insects) resulting from fire ant infestation. Where the optimal habitat of a native species and high fire ant densities co-occur, displacement of the vertebrate to sub-optimal habitat may have negative population-level impacts on the vertebrate species.

Reductions in available food need not lead to displacement of vertebrates, but may nonetheless reduce vertebrate populations. Fire ant impacts on insect species and communities are reasonably well documented (e.g., Porter and Savignano 1990),

although there is a bias toward determining impacts on species of economic, rather than ecological, importance. In insectivorous vertebrates, reduced food availability due to the presence of red imported fire ants may be expected to both increase territory (or home range) size and decrease recruitment. In the extreme case of food specialization where the food source is negatively affected by fire ants, population collapses may occur. This may be occurring in the Texas horned lizard (*Phrynosoma cornutum*) in south and eastern Texas. The Texas horned lizard feeds primarily on ants of the genus *Pogonomyrmex*, which are reduced by the red imported fire ant (Donaldson et al. 1994). The Texas horned lizard has largely been eliminated from the area of Texas that is infested with fire ants (Price 1990).

Understanding the direct impact of fire ants on native vertebrates, especially endangered species with limited geographic ranges, may be important in ensuring the long-term survival of those species which face increasing pressure in terms of further loss of habitat and erosion of habitat quality, in addition to the invasion of those habitats by destructive invasive species, such as the red imported fire ant. Indirect impacts by the fire ant may be equally important to vertebrate species, by reducing food supplies of insectivorous species, by "harassment" leading to the use of lower quality habitat, and by causing reduced survival and weight gain in individual vertebrates stung by fire ants. Understanding the influence of red imported fire ants on endangered native species such as the Florida Grasshopper Sparrow, and the influence of management practices such as the use and timing of prescribed burns, will help determine management decisions that may ensure the long-term survival of a viable population of Florida Grasshopper

Sparrows. Fire ants are common on grasshopper sparrow habitat at Avon park Air Force Range. However, their distribution is patchy. Some sites have very high fire ant densities but other sites have few or no fire ants present. This mosaic of habitat occupancy presents an ideal setting for non-intrusive, spatial analysis of fire ant impacts on the endangered grasshopper sparrow.

This segment of research was designed to determine if fire ants have a negative impact on Florida Grasshopper Sparrow populations at Avon Park Air Force Bombing Range, Florida. Site descriptions and information on grasshopper sparrow demography can be found in a companion report (Delany et al. 1998). The sampling reported herein was conducted during June and October, 1997, and all analyses are restricted to data collected during those periods. All results are preliminary, however, and sampling at Avon Park has continued through 1998 and into 1999 through a different administrative process. Some questions, such as the influence of fire on the process of fire ant invasion, and the influence of fire ants on grasshopper sparrow nest location and success, can not be answered until several years of data have been collected.

OBJECTIVES

The specific objectives of this aspect (Segment C of RWO175) of research were outlined as follows:

1). To determine the relative abundance of red imported fire ants on occupied and unoccupied grasshopper sparrow habitat at Avon Park Air Force Range.

2). To determine the relative abundance of red imported fire ants on the above habitats in relation to different burn regimes.

3). Determine seasonal variation in red imported fire ant distribution and abundance.

4). To determine the relationship between red imported fire ant abundance and the abundance of grasshopper sparrow prey.

As this is a multi-year project (with 1998 on funding through the Florida Game and Fresh Water Fish Commission) not all objectives were met by 1997 sampling. Again, this report focuses on the results of sampling conducted during 1997 only, and thus focuses on objectives number 1 and 4. Additionally, we provide preliminary spatial analyses of fire ant distributions in relation to invertebrate distribution, and fire ant distribution in relationship to grasshopper sparrow distribution.

METHODS

Bait samples: In late May and early June, 1997 (hereafter "June"), we established eight permanent sampling locations in each of the 12 existing intensive grasshopper sparrow study plots, AP1-AP12; a total of 96 sampling points. Those plots are described under

segment A of RWO 175 (Delany et al. 1998). Each sampling point was permanently marked with ½" metal conduit, and each location was captured with a GPS backpack unit. We also captured the plot corners of the 12 previously established grasshopper sparrow plots. In June, baits consisted of paired ground beef and honey baits. In October 1997 (and during 1998) we re-sampled the same locations. In October, we permanently switched to the use of a multiple species ant bait (USDA patent pending). At each sampling location in each plot we placed 2 baits separated by 2 meters, for a total of 192 samples. Baits were retrieved approximately 1 hour after placement. The use of multiple species ant bait instead of meat baits was based on trials conducted in Gainesville and at Avon Park that demonstrated the effectiveness and logistical superiority of the multiple species bait over meat baits (Wojcik et al., *In Review.*). These samples were used to determine the relative abundance of fire ants and native ants in the 12 grasshopper sparrow study plots. However, note that baits are most effective in determining dominant foraging species, and thus fire ant prevalence. Pitfalls are the preferred method of sampling overall ant (and other insect) communities in general, because with pitfalls the competitive ability of each species at concentrated food sources (i.e., baits) is irrelevant to its capture probability.

Pitfall samples: In June and October, 1997, we placed 2 pitfall traps at each permanent sampling location, separated by 2 meters, for a total of 192 pitfall samples. These samples provided additional data on the relative abundance of fire ants and native ants, and a sampling of other invertebrates. Test-tube pitfalls were placed in PVC sleeves that remain permanently in the ground on site, capped with cork stoppers when not in use.

This allows repeated sampling at the exact same locations over time. Pitfall traps were collected after 7 days.

Light trap samples: In June and October, 1997, light traps were used to collect information on overall insect biomass on the 12 intensive study plots. One light trap was placed near the center of each plot near sunset, and collected shortly after sunrise. These samples were transported to USDA, APHIS facilities in Gulfport, Mississippi, for measurement of volume (in CC's; an index of biomass), sorting, and invertebrate identification.

Spatial analysis: All grasshopper sparrow data used was from 1997 and provided by M. Delany (Segment A, RWO 175; Delany et al. 1998). For our preliminary analysis we used the index of abundance provided by Delaney, population estimation per 100-m radius around point count locations. These count sums were then 'joined' with the location (UTM coordinates) of count poles. The same procedure was used for ant and invertebrate data. Specifically, the number of fire ants recovered from meat baits (sum of both baits at each of 8 sample site/plot) and the number of invertebrates recovered from pitfall trap pairs was joined with the spatial location (UTM coordinates) of our permanently established counting locations.

For grasshopper sparrows, population estimates for a 100-m radius around each sampling point was used because all the sparrow data was spatially similar (i.e., spatially correlated); items such as the number of singing males observed displayed the same

spatial distribution as population estimates for a 100-m radius around poles. Fire ant counts from bait pairs were used because they provided the most data, and were spatially distributed in a manner very similar to the results from pitfall trapping. Total invertebrates was used because no single species provided enough data for spatial analysis.

We contoured the sample data (sparrow, fire ant, invertebrate) using the inverse distance weighted interpolation (IDW) in ARC/INFO GRID. Contouring allows for the characterization of the spatial distribution of the variables of interest, based on a series of samples (our data points).

The sparrow coverage was then used as the 'maskgrid' to determine the values for fire ants and invertebrates at the location of the grasshopper sparrow point location. This data was downloaded to a statistical package (Sigmastat) for multiple linear regression analysis. We also ran a correlation between fire ant abundance and native invertebrate abundance using contoured (interpolated) values at grasshopper sparrow point locations.

To visually inspect for spatial relationships between sparrows and fire ants and sparrows and invertebrates we normalized the contoured values in each coverage (sparrow, fire ant, invertebrate) by forcing the maximum value to 1 in each case. For those coverages to be comparable, they were normalized by recalculating abundance/population estimate values such that they fell between 0 and 1, so that a value of 1 was equivalent to the

highest abundance or population estimate. We then conducted the following subtractions of coverages:

Fire ants minus invertebrates

Fire ants minus grasshopper sparrows

The resulting coverages provided a spatial analysis of the degree of co-occurrence or lack thereof between fire ants and native invertebrates and between fire ants and Florida grasshopper sparrows.

RESULTS

Sample locations: Our sampling points were located on the previously established grasshopper sparrow grids (Segment A, RWO 175). The location of ant sampling points in relation to grasshopper sparrow grids is listed in Appendix I. The UTM locations of grasshopper sparrow plot corners are listed in Appendix II, and the UTM location of all permanent sampling locations are listed in Appendix III.

Bait samples: All ants recovered from the June and October, 1997, bait sampling period have been sorted and identified. The data is summarized in Table 1 and Table 2. Raw data from all samples within all plots may be found in Appendix IV and Appendix V. The data in Table 1 and Table 2 (and Appendix IV and V) reveals that fire ants were dominant on about half the sites, and absent from others. In particular, OQ Range sites tended to have fewer fire ants present, while Delta Trail sites were more heavily infested, although there were exceptions. June fire ant abundance was strongly negatively

correlated with both native ant abundance ($r = -0.743$, $P = 0.006$; Figure 1) and native ant species richness ($r = -0.730$, $P = 0.007$; Figure 2). October fire ant abundance was strongly negatively correlated with both native ant abundance ($r = -0.690$, $P = 0.013$; Figure 3) and native ant species richness ($r = -0.736$, $P = 0.006$; Figure 4).

Table 1. Relative abundance of fire ants and native ants (total number captured) in June, 1997, and species richness of native ants from Avon Park Grasshopper Sparrow Plots, as assessed by bait samples.

Plot Identification	Fire Ants	Native Ants	Native Ant Richness
AP-1	0	408	4
AP-10	0	346	8
AP-12	551	140	5
AP-4	1244	222	4
AP-5	235	290	4
AP-9	4152	0	0
AP-8	5970	58	3
AP-2	2044	372	6
AP-3	4974	0	0
AP-6	6871	14	1
AP-7	0	93	4
AP-11	5000	20	2

Table 2. Relative abundance of fire ants and native ants (total number captured), and species richness of native ants from Avon Park Grasshopper Sparrow Plots, as assessed by bait samples in October, 1997.

Plot Identification	**Fire Ants**	**Native Ants**	**Ant Species Richness**
AP-1	0	54	4
AP-2	57	39	5
AP-3	4773	0	1
AP-4	23	23	4
AP-5	0	25	4
AP-6	2069	0	1
AP-7	0	15	5
AP-8	583	39	3
AP-9	146	22	2
AP-10	0	52	6
AP-11	1737	5	2
AP-12	0	41	6

Figure 1

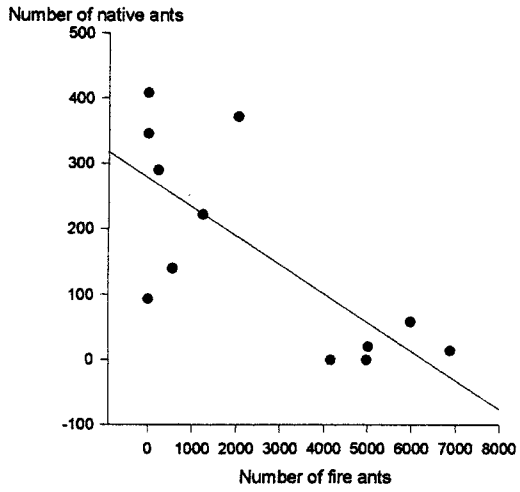
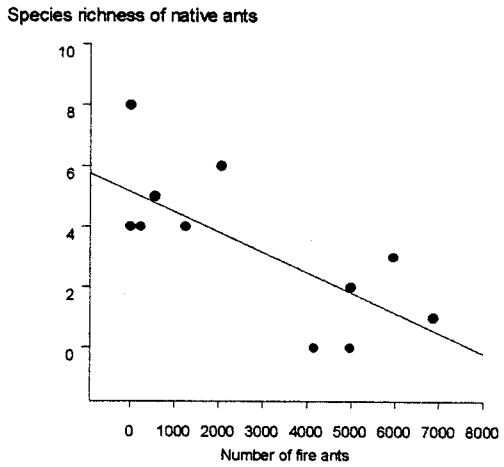


Figure 2



Figures 1 and 2. Relationship between fire ants and native ants in June, 1997. Figure 1 plots the number of fire ants on each grasshopper sparrow plot against the number of native ants. Figure 2 plots the number of fire ants on each grasshopper sparrow plot against the species richness of native ants. Both relationships were negatively correlated.

Figure 3.

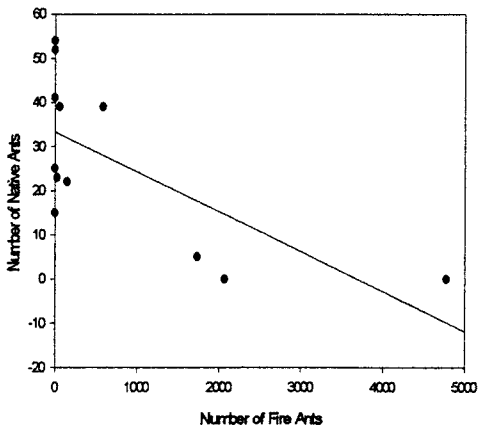


Figure 4.

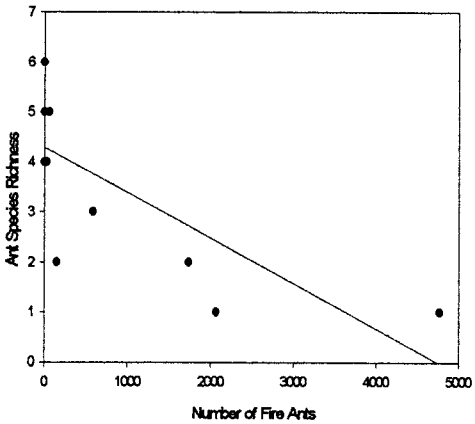


Figure 3 and 4. Relationship between fire ants and native ants in October, 1997. Figure 3 plots the number of fire ants on each Grasshopper Sparrow plot against the number of native ants. Figure 4 plots the number of fire ants on each grasshopper sparrow plot against the richness of native ants. Both relationships were negatively correlated.

Pitfall sampling: All pitfall trap samples from June and October 1997 have been sorted and identified. The patterns of fire ant abundance are very similar to those determined from bait sampling (Tables 3 and 4). June fire ant abundance was negatively correlated ($P < 0.05$) with native ant richness, but other June comparisons were not statistically significant ($P > 0.05$). October fire ant abundance was negatively correlated ($P < 0.05$) with native ant richness and abundance, but other comparisons were not statistically significant ($P > 0.05$). Non-ant invertebrate data from June pitfall sampling, at a gross taxonomic level, is listed in Table 5, and non-ant invertebrate data from October pitfall samples, at a gross taxonomic level, is listed in Table 6. Raw pitfall data for June and October samples may be found in Appendices VI and VII.

Table 3. Pitfall invertebrate samples, June 1997. The number of native ants (Native ant abundance), species richness of native ants, fire ant abundance (*S. invicta* abundance), non-ant abundance, and pooled grasshopper and cricket abundance recovered from pitfall traps.

Study plot	Native ant abundance	Native ant richness	*S. invicta* abundance	Non-ant insect abundance	Grasshopper and cricket abundance
AP-1	15	2	490	245	52
AP-2	121	9	83	130	29
AP-3	113	9	166	153	24
AP-4	468	10	0	165	23
AP-5	147	8	28	118	27
AP-6	51	9	376	101	51
AP-7	658	12	500	97	22
AP-8	112	12	147	193	44
AP-9	21	9	443	167	42
AP-10	38	6	751	249	34
AP-11	208	15	11	190	36
AP-12	250	12	1	194	39

Table 4. Pitfall invertebrate samples, October, 1997. The number of fire ants, ant species richness, native ant abundance, non-ant abundance (also refer to Table 3), and pooled grasshopper and cricket abundance recovered from pitfall traps during October, 1997 sampling.

Plot Identification	*S. invicta* abundance	Ant Species Richness	Native Ant Abundance	Total Abundance non-ant Insects	Grasshopper and Cricket Abundance
AP-1	0	9	217	237	119
AP-2	27	15	121	316	34
AP-3	279	1	0	277	121
AP-4	57	9	218	205	61
AP-5	27	10	272	269	128
AP-6	273	2	3	229	158
AP-7	1	10	239	171	55
AP-8	176	10	25	117	28
AP-9	188	7	32	210	71
AP-10	2	13	302	470	122
AP-11	463	7	7	249	82
AP-12	16	14	149	313	158

Table 5. Non-ant invertebrates captured by pitfall traps in June, 1997, Avon Park Air Force Range. Data is a summarization of eight samples on each grasshopper sparrow plot.

	Carabids	Staphylinids	Scarabs	Spiders	Earwigs	Tenebrionids	Isopods	Crickets	Caterpillers	Weevils	Misc.	Grasshoppers	totals
O.Q. Range, AP-1	23	0	0	23	0	12	0	51	0	0	135	1	245
O.Q. Range, AP-10	29	0	1	42	0	34	0	34	0	0	109	0	249
O.Q. Range, AP-12	17	0	6	38	0	6	0	39	0	0	88	0	194
O.Q. Range, AP-4	21	6	3	22	0	11	0	22	0	0	79	1	165
O.Q. Range, AP-5	10	16	3	38	0	3	0	26	0	0	21	1	118
O.Q. Range, AP-9	19	36	16	12	0	6	0	41	0	0	36	1	167
Delta Trail, AP-8	9	96	6	14	0	4	0	44	0	0	20	0	193
Delta Trail, AP-2	4	58	4	22	0	3	0	29	0	0	10	0	130
Delta Trail, AP-3	20	63	22	9	0	1	0	23	0	0	14	1	153
Delta Trail, AP-6	3	11	2	17	0	0	0	51	0	17	0	0	101
Delta Trail, AP-7	7	11	8	23	0	4	0	20	0	0	22	2	97
Delta Trail, AP-11	12	89	23	8	0	3	0	36	0	0	19	0	190

Table 6. Non-ant invertebrates captured by pitfall traps in October, 1997, Avon Park Air Force Range. Data is a summarization of eight samples on each Grasshopper Sparrow plot.

	Carabids	Staphylinids	Scarabs	Spiders	Tenebrionids	Crickets	Weevils	Misc.	Grasshoppers	TOTAL
AP-1	8	16	0	15	59	119	1	19	0	237
AP-2	4	183	0	35	34	33	11	15	1	316
AP-3	16	99	0	19	1	121	0	21	0	277
AP-4	13	59	1	15	15	61	0	41	0	205
AP-5	2	66	0	18	26	125	0	29	3	269
AP-6	33	7	0	20	0	158	0	11	0	229
AP-7	1	43	0	25	11	53	2	34	2	171
AP-8	9	46	1	20	2	28	2	9	0	117
AP-9	8	76	0	21	15	71	0	19	0	210
AP-10	5	26	0	36	251	118	6	24	4	470
AP-11	18	89	0	25	14	81	0	21	1	249
AP-12	6	52	0	20	50	157	0	27	1	313

Light trap samples: The volumetric measurement of recovered insect biomass is listed in Table 7. Species identification from light traps are available in Appendix VIII. There was no significant correlation between overall insect biomass and fire ant abundance as assessed by baits or pitfalls. Total biomass varied considerably among the 2 sample periods because of changes in overall insect abundance during different seasons.

Table 7. Recovered insect biomass from the first (3 and 4 June, 1997) and second (13 and 14 October, 1997) sampling periods on 12 grasshopper sparrow study plots, Avon Park Air Force Range.

	Recovered insect biomass, CC's	
Plot	June 1997	October 1997
AP1	120 cc	13 cc
AP2	25 cc	26 cc
AP3	140 cc	27 cc
AP4	460 cc	10 cc
AP5	550 cc	15 cc
AP6	210 cc	1 cc
AP7	340 cc	17 cc
AP8	180 cc	22 cc
AP9	400 cc	8 cc
AP10	200 cc	1 cc
AP11	150 cc	21 cc
AP12	240 cc	19 cc

Spatial analysis: The spatial distribution of fire ants on OQ and Delta Trail study sites may be found in Figure 1, top of page. Black dots represent the location of permanent fire ant and invertebrate sampling locations. Fire ants were most abundant to the north of Kissimmee Road, with the exception of sparrow plot AP7. Fire ants were rare or absent to the south of Kissimmee Road (Delata Trail), although a center of fire ant infestation exists in sparrow plot AP9. The spatial distribution of recovered invertebrates also may be found in Figure 1 (bottom Figure). Highest invertebrate abundance was south of Kissimmee Road (OQ Range). Exceptions were found on Delta Trail Sparrow plot AP8, where invertebrate abundance was high, and south of Kissimmee Road on plot AP9, where invertebrate abundance was low, corresponding with high fire ant abundance.

Figure 2 is the coverage of spatial correspondence between fire ants and native invertebrates. In that coverage, values of -1(green) occur where invertebrate abundance was high and fire ant abundance low, values of +1 (red) occur where invertebrate abundance was low and fire ant abundance was high. Both those cases indicate a negative spatial correlation between fire ants and native invertebrates. Values of 0 (gray) indicate areas with no relationship between fire ant and native invertebrate abundance. Over most of the intensive study areas, there was a negative relationship between fire ants and the abundance of native invertebrates.

The spatial distribution of fire ants on OQ and Delta Trail study sites is also given in Figure 3, top (a repeat of Figure 1, top). Black dots represent the location of permanent fire ant and invertebrate sampling locations. Fire ants were most abundant to the north of Kissimmee Road, with the exception of sparrow plot AP7. Fire ants were rare or absent to the south of Kissimmee Road, although a center of fire ant infestation exists in sparrow plot AP9. The spatial distribution of Florida grasshopper sparrows also may be found in Figure 3 (bottom of Figure). Red triangles represent the location of sparrow counting points (description in RWO 175 segment A). The highest population estimates for grasshopper sparrows were south of Kissimmee Road, with two localized centers of abundance on Delta Trail sites (Figure 3).

Figure 4 is the coverage of spatial correspondence between fire ants and Florida grasshopper sparrows. In that coverage, values of -1(blue) occur where sparrow abundance was high and fire ant abundance low, values of +1 (red) occur where sparrow

abundance was low and fire ant abundance was high. Both those conditions indicate a negative spatial correlation between fire ants and grasshopper sparrows. Values of 0 (gray) indicate areas with no relationship between fire ant and sparrow abundance. Over about 50% of the intensive study areas, there was a negative relationship between fire ants and the abundance of grasshopper sparrows, although the relationship was not as strong as that between fire ants and native invertebrates.

Fire ant and native invertebrates were negatively correlated at grasshopper sparrow count locations ($r = -0.347$, $P = 0.03$). The following multiple regression model was fit to the data, using fire ants and native invertebrates as independent variables, and grasshopper sparrow 100-m population estimates ($n = 39$) as the dependent variable:

Sparrows = 1.89 – (0.00161 * fire ant abundance) + (0.0252 * invertebrate abundance)

The influence of fire ants on grasshopper sparrows was negative while the influence of native invertebrates was positive. However, the overall model, while suggestive, was not significant ($r = 0.304$, $P = 0.17$). Fire ant abundance was a better predictor of sparrow populations ($P = 0.13$) than was invertebrate abundance ($P = 0.59$). The overall model and influence of fire ants on sparrow populations was suggestive of a negative influence warranting analyses of data for 1998 and 1999.

DISCUSSION

Fire ant distribution is not random across the Delta Trail and OQ Range study areas. Areas to the north of Kissimmee Road have much higher infestation rates. At a smaller scale, within plots, fire ants also were not randomly distributed among sampling points. Fire ants and native invertebrates were spatially non-randomly distributed in relationship to each other. Areas of high fire ant abundance supported a low abundance of native invertebrates. The relationship with grasshopper sparrows was less clear, but suggestive of a negative relationship. Additional data concerning sparrow nest location, and most importantly, nest success, will provide better answers regarding the effect of fire ants on grasshopper sparrows. Also, invertebrate data that better targets sparrow food items, namely grasshoppers, will be required. That data has been collected in 1998, and will be collected in 1999. A negative correlation did not exist between fire ant abundance as assessed by pitfalls and pooled grasshoppers and crickets as assessed by pitfalls, but the bulk of captures were of crickets and sample sizes were very low.

There was a significant negative relationship between fire ants and overall native ant abundance and native ant species richness. Fire ants reduced overall richness of native ants and reduced the numbers of native ants as collected by both pitfalls and baits.

The results we have presented are preliminary, as this research will continue into 1999. We have documented a negative relationship between fire ants and native ants and fire ants and native invertebrates. Spatial relationships between fire ants and grasshopper

sparrows are non-significant, but suggestive of a potential negative relationship, warranting more data and analysis. Analysis of sparrow territory locations and nest success may provide some answers regarding fire ant impacts on grasshopper sparrows, but a single year of data was insufficient for analysis.

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FIGURE LEGENDS

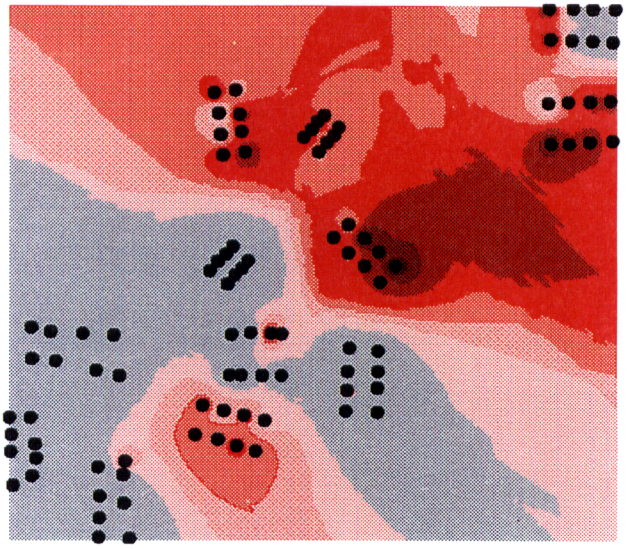
Figure 1. The spatial distribution of fire ants and native invertebrates on OQ and Delta Trail study sites, Avon Park Air Force Range. Black dots represent the location of permanent fire ant and invertebrate sampling points. Top, fire ant spatial distribution. Bottom, native invertebrate distribution. Darker colors represent areas of higher abundance.

Figure 2. The coverage of spatial correspondence between fire ants and native invertebrates. Green areas are where invertebrate abundance was high and fire ant abundance low, red areas occur where invertebrate abundance was low and fire ant abundance was high. Both those conditions indicate a negative spatial correspondence between fire ants and native invertebrates. Gray indicates areas with no relationship between fire ant and native invertebrate abundance. Over most of the intensive study areas, there was a negative relationship between fire ants and the abundance of native invertebrates.

Figure 3. The spatial distribution of fire ants and Florida grasshopper sparrows on OQ and Delta Trail study sites, Avon Park Air Force Range. Black dots represent the location of permanent fire ant sampling points, and red triangles represent the location of sparrow count points. Top, fire ant spatial distribution. Bottom, Florida grasshopper sparrow distribution. Darker colors represent areas of higher abundance.

Figure 4. The coverage of spatial correspondence between fire ants and Florida grasshopper sparrows. Blue areas are where sparrow abundance was high and fire ant abundance low, red areas occur where sparrow abundance was low and fire ant abundance was high. Both those conditions indicate a negative spatial correspondence between fire ants and native invertebrates. Gray indicates areas with no relationship between fire ant and native invertebrate abundance. Over about 50% of the intensive study areas, there was a negative relationship between fire ants and the abundance of Florida grasshopper sparrows.

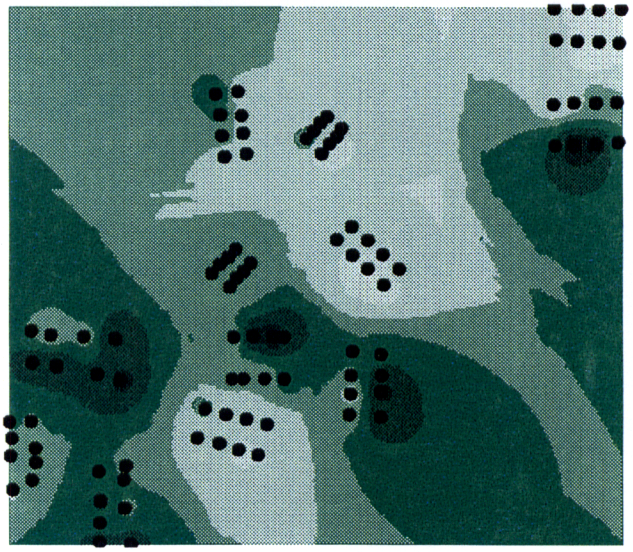
Red Imported Fire Ant Contours



- poles

red imported fire ants
- 0 - 142
- 142 - 285
- 285 - 427
- 427 - 569
- 569 - 712
- 712 - 854
- 854 - 996
- 996 - 1139
- 1139 - 1281

Invertebrate Contours

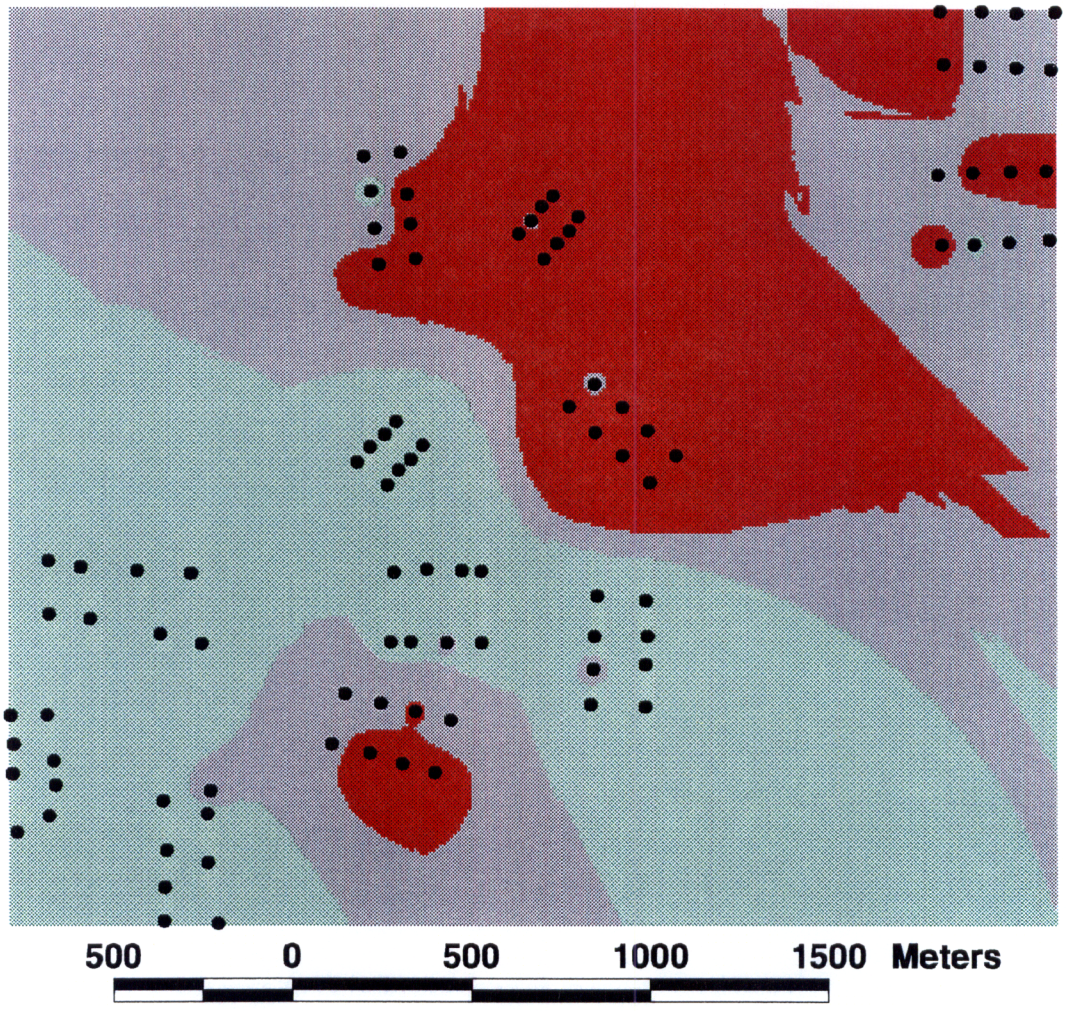


total invertebrates
- 0 - 6
- 6 - 12
- 12 - 18
- 18 - 25
- 25 - 31
- 31 - 37
- 37 - 43
- 43 - 49
- 49 - 55

500 0 500 1000 Meters

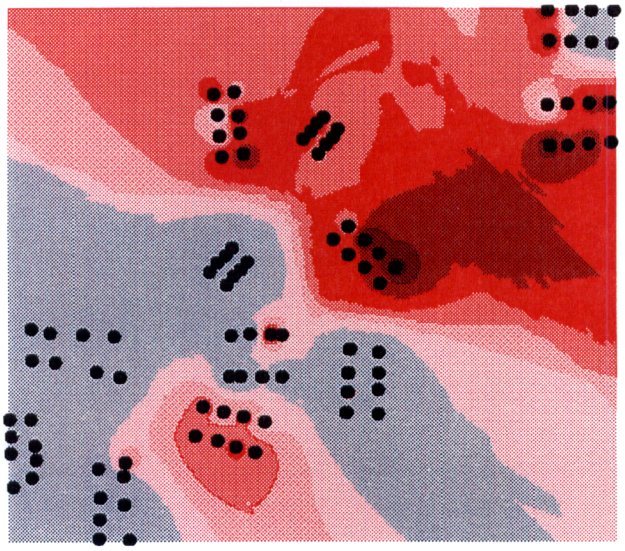
N
W E
S

Red Imported Fire Ants - Invertebrates



poles
invertebrates > ants
invertebrates = ants
ants > invertebrates

Red Imported Fire Ant Contours

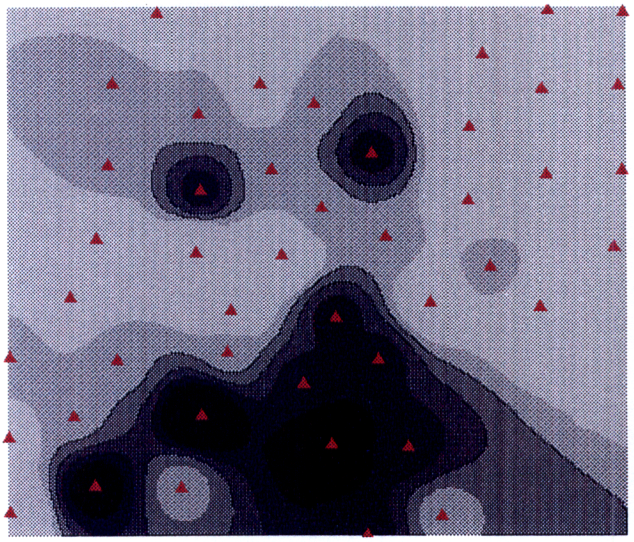


poles

red imported fire ants

- 0 - 142
- 142 - 285
- 285 - 427
- 427 - 569
- 569 - 712
- 712 - 854
- 854 - 996
- 996 - 1139
- 1139 - 1281

Grasshopper Sparrow Contours



poles

grasshopper sparrows

- 0
- 1
- 2
- 3
- 4
- 5
- 6

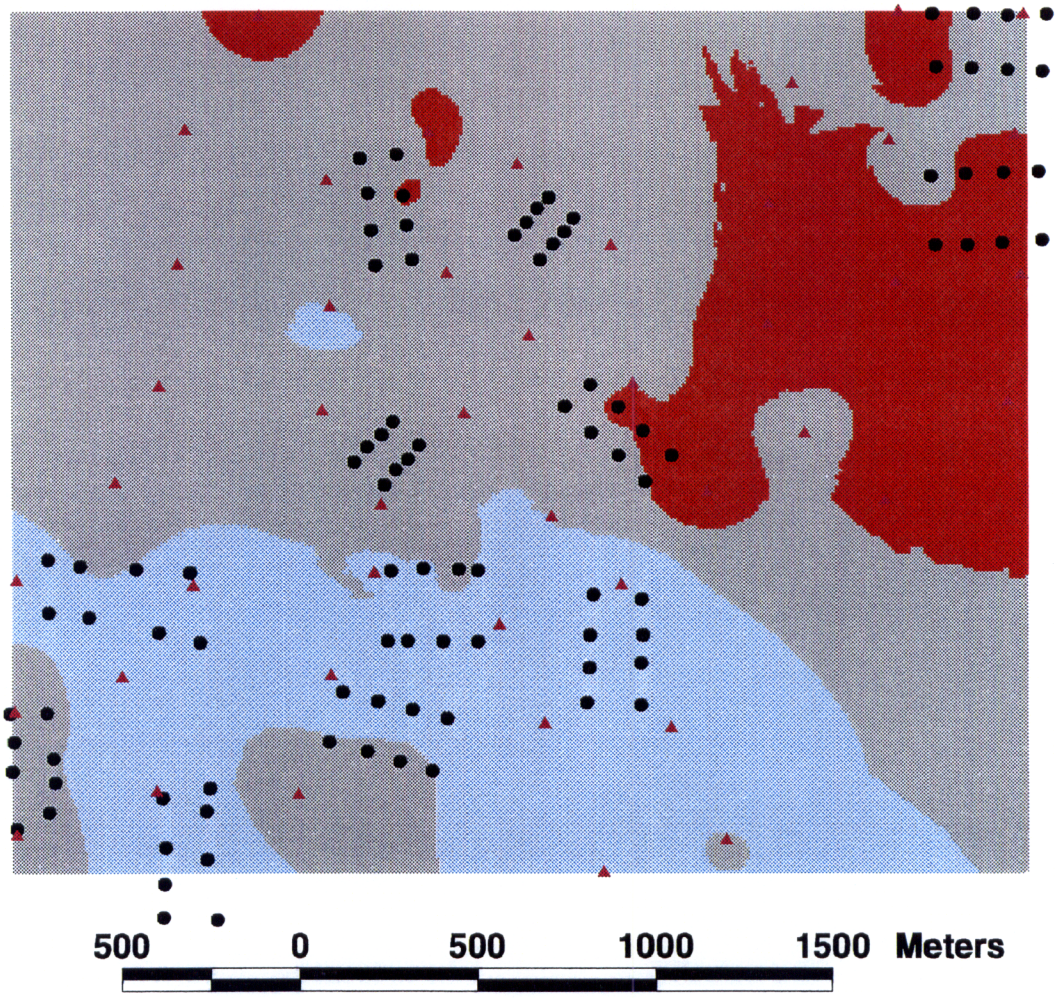
500 0 500 1000 Meters

N

W E

S

Red Imported Fire Ants - Grasshopper Sparrows



Appendix I. Location of permanent fire ant/insect sampling points on Avon Park Air Force Range in relation to grasshopper sparrow sampling points.

Sparrow Plot	USDA #	Sparrow Grid
AP1	1-8	NA
AP10	9-16	NA
AP12	17-21	NA
AP12	22	G2
AP12	23	E2
AP12	24	B2
AP4	25	B2
AP4	26	D2
AP4	27	F2
AP4	28	G2
AP4	29	G6
AP4	30	E6
AP4	31	C6
AP4	32	B6
AP5	33	B2
AP5	34	D2
AP5	35	F2
AP5	36	H2
AP5	37	H5
AP5	38	F5
AP5	39	D5
AP5	40	B5
AP9	41	B2
AP9	42	D2
AP9	43	F2
AP9	44	H2
AP9	45	H5
AP9	46	F5
AP9	47	D5
AP9	48	B5
AP8	49	G9
AP8	50	G7
AP8	51	G5
AP8	52	G3
AP8	53	C3
AP8	54	C5
AP8	55	C7
AP8	56	C9
AP2	57	F3
AP2	58	F5
AP2	59	F7
AP2	60	F9
AP2	61	C9
AP2	62	C7
AP2	63	C5
AP2	64	C3

Appendix I, continued.

AP3	65	B5
AP3	66	C5
AP3	67	D5
AP3	68	E5
AP3	69	F3
AP3	70	E3
AP3	71	D3
AP3	72	C3
AP6	73	G9
AP6	74	G7
AP6	75	G5
AP6	76	G3
AP6	77	E3
AP6	78	E5
AP6	79	E7
AP6	80	E9
AP7	81	B2
AP7	82	C2
AP7	83	D2
AP7	84	E2
AP7	85	E4
AP7	86	D4
AP7	87	C4
AP7	88	B4
AP11	89	C8
AP11	90	C6
AP11	91	C4
AP11	92	C2
AP11	93	E2
AP11	94	E4
AP11	95	E6
AP11	96	E8
ECHO T-1	97-116	NA
ECHO T-2	117-125	NA

Appendix II. UTM Plot corners for sparrow study plots.

Plot corner ID	x-coord	y-coord
1	467213.125	3055796.5
2	467459.2813	3055799.75
3	467460.9688	3055303
4	467212.5313	3055298.25
5	468225.6875	3056419.5
6	468226.4063	3056119
7	467880.1563	3056114.5
8	467874.9063	3056416.5
9	468085.5	3055773.25
10	467962.625	3055704.75
11	467673.7813	3055782.75
12	467752.8125	3056070.5
13	468137.1875	3055965.75
14	468422.0625	3056383
15	468402.0625	3055932.25
16	468707.6563	3055923.5
17	468719.8438	3056274.25
18	468623	3056377.75
19	468419.5	3056556.5
20	468202.5	3056760.5
21	468446.25	3057010
22	468593.4375	3056874.75
23	468785.3438	3056566.5
24	468574.2813	3057331.75
25	468378.0313	3057108.75
26	468149.75	3057309.5
27	468349.7813	3057532.75
28	468033.125	3057613
29	467730.4375	3057571.5
30	467782.8438	3057178.25
31	468080.25	3057217
32	467662.0313	3056748.25
33	467763.9375	3056862.75
34	468052.2813	3056880.25
35	468128.875	3056815.75
36	467893.3438	3056557.5
37	469861.5625	3058043.25
38	469359.625	3058062.25
39	469348.3438	3057763
40	469847.2813	3057740.25
41	469348.4063	3057194
42	469851.25	3057221.25

Appendix II continued.

Plot corner ID	x-coord	y-coord
43	469830.4063	3057614.25
44	469331.375	3057595.25
45	467113.9063	3055851.25
46	467114.75	3055604.25
47	466812.1875	3055620.5
48	466808.75	3056018.5
49	467009.75	3056028
50	467416.5313	3056421.25
51	467418.7188	3056115.25
52	466846.7188	3056133.5
53	466874.625	3056439.25
54	468811.1528	3056671.236

Appendix III. GPS (UTM) locations of sample points (8 per sparrow plot) within intensive study grasshopper sparrow plots (n=8).

Sample location ID	x-coordinate	y-coordinate
1.000	466934.031	3056411.500
2.000	467028.844	3056400.500
3.000	467186.125	3056390.750
4.000	467335.906	3056386.750
5.000	467362.469	3056188.000
6.000	467244.344	3056210.500
7.000	467048.781	3056262.000
8.000	466932.125	3056268.750
9.000	466829.750	3055983.750
10.000	466836.281	3055902.250
11.000	466838.313	3055815.750
12.000	466843.156	3055659.250
13.000	466940.375	3055705.250
14.000	466954.156	3055784.250
15.000	466953.594	3055852.500
16.000	466930.594	3055983.750
17.000	467389.188	3055770.250
18.000	467383.000	3055701.000
19.000	467383.375	3055565.500
20.000	467410.031	3055401.500
21.000	467262.500	3055402.500
22.000	467262.031	3055501.250
23.000	467262.281	3055598.500
24.000	467263.406	3055738.500
25.000	467928.250	3056367.500
26.000	468025.344	3056368.000
27.000	468123.938	3056368.250
28.000	468180.406	3056368.000
29.000	468176.844	3056165.250
30.000	468077.500	3056167.500
31.000	467978.125	3056167.250
32.000	467928.469	3056171.250
33.000	468471.594	3056334.000
34.000	468469.063	3056228.000
35.000	468464.313	3056130.750
36.000	468459.531	3056031.500
37.000	468611.563	3056028.000
39.000	468615.094	3056221.750
40.000	468610.094	3056324.500
41.000	467789.531	3056010.250
42.000	467885.063	3055985.000

Appendix III continued.

Sample location ID	x-coordinate	y-coordinate
43.000	467982.844	3055955.500
44.000	468079.125	3055930.000
45.000	468032.844	3055784.250
46.000	467941.813	3055812.250
47.000	467846.313	3055840.250
48.000	467748.531	3055866.750
49.000	469744.625	3057315.250
50.000	469636.969	3057309.750
51.000	469534.594	3057303.750
52.000	469448.031	3057304.000
53.000	469435.000	3057500.500
54.000	469532.094	3057504.750
55.000	469635.219	3057509.750
56.000	469735.313	3057513.250
57.000	469450.813	3057809.750
58.000	469550.156	3057805.500
59.000	469652.500	3057800.500
60.000	469749.594	3057797.500
61.000	469757.500	3057957.500
62.000	469655.125	3057952.000
63.000	469552.031	3057958.000
64.000	469439.156	3057958.500
65.000	468390.875	3057425.500
66.000	468359.938	3057391.250
67.000	468326.719	3057352.250
68.000	468293.500	3057316.500
69.000	468364.844	3057249.750
70.000	468397.313	3057288.500
71.000	468433.531	3057328.000
72.000	468458.469	3057364.750
73.000	468706.656	3056705.250
74.000	468630.813	3056771.500
75.000	468560.219	3056841.000
76.000	468484.375	3056905.000
77.000	468412.688	3056837.750
78.000	468484.781	3056770.000
79.000	468559.125	3056703.250
80.000	468635.719	3056629.750
81.000	467887.531	3056629.000
82.000	467917.750	3056668.500
83.000	467953.219	3056702.750
84.000	467984.156	3056738.000

Appendix III continued.

Sample location ID	x-coordinate	y-coordinate
85.000	467912.063	3056801.500
86.000	467876.594	3056765.250
87.000	467841.125	3056731.250
88.000	467804.125	3056690.500
89.000	467934.375	3057551.000
90.000	467950.625	3057434.250
91.000	467961.688	3057353.750
92.000	467977.219	3057252.500
93.000	467876.344	3057240.500
94.000	467861.531	3057338.500
95.000	467851.281	3057441.250
96.000	467834.219	3057538.750

Appendix IV. Bait sampling results, June 1997, Avon Park Air Force Range. All raw data is included. For each sampling location ("circle") two baits were placed. There were eight sampling locations in each grasshopper sparrow plot.

	Blank	Cardiocondyla ectopia	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole floridana	Pheidole morrisi	Pheidole moerens	Paratrechina concinna	Paratrechina longicornis	Paratrechina phantasma	Paratrechina parvula	**Solenopsis invicta**	Solenopsis globularia littoralis	Camponotus floridanus
O.Q Range, Block AP-1																
28-May-97																
circle 1, bait 1					1											
bait 2					3											
circle 2, bait 3	1															
bait 4					2		1									
circle 3, bait 5					1											
bait 6					1											
circle 4, bait 7						1										
bait 8						157										
circle 5, bait 9					1											
bait 10													8			
circle 6, bait 11	1															
bait 12						3										
circle 7, bait 13						2							2			
bait 14						222										
circle 8, bait 15																14
bait 16					3											
TOTALS	2	0	0	0	12	385	1	0	0	0	0	0	10	**0**	0	14

Appendix IV, continued	Blank	Cardiocondyla ectopia	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole floridana	Pheidole morrisi	Pheidole moerens	Paratrechina concinna	Paratrechina longicornis	Paratrechina phantasma	Paratrechina parvula	**Solenopsis invicta**	Solenopsis globularia littoralis	Camponotus floridanus
Delta Trail, AP-2																
29-May-97																
circle 57, bait 113														**450**		
bait 114														**569**		
circle 58, bait 115					1										1	
bait 116							72									
circle 59, bait 117	1															
bait 118							63									
circle 60, bait 119													4			
bait 120					4											
circle 61, bait 121					1						15					
bait 122			107													
circle 62, bait 123			90													
bait 124												3				
circle 63, bait 125											3					
bait 126											9					
circle 64, bait 127														**652**		
bait 128														**373**		
TOTALS	1	0	197	0	6	0	135	0	0	0	27	3	4	**2044**	1	0

Appendix IV, continued	Blank	Cardiocondyla ectopia	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole floridana	Pheidole morrisi	Pheidole moerens	Paratrechina concinna	Paratrechina longicornis	Paratrechina phantasma	Paratrechina parvula	**Solenopsis invicta**	Solenopsis globularia littoralris	Camponotus floridanus
Delta Trail, AP-3																
29-May-97																
circle 65, bait 129														**450**		
bait 130														**93**		
circle 66, bait 131														**459**		
bait 132														**283**		
circle 67, bait 133														**208**		
bait 134														**379**		
circle 68, bait 135														**494**		
bait 136														**317**		
circle 69, bait 137														**177**		
bait 138														**185**		
circle 70, bait 139														**306**		
bait 140														**402**		
circle 71, bait 141														**336**		
bait 142														**243**		
circle 72, bait 143														**44**		
bait 144														**598**		
TOTALS	0	0	0	0	0	0	0	0	0	0	0	0	0	**4974**	0	0

Appendix IV, continued	Blank	Cardiocondyla ectopia	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole floridana	Pheidole morrisi	Pheidole moerens	Paratrechina concinna	Paratrechina longicornis	Paratrechina phantasma	Paratrechina parvula	**Solenopsis invicta**	Solenopsis globularia littoralis	Camponotus floridanus
O.Q. Range, AP-4																
28-May-97																
circle 25, bait 49														**2**		
bait 50														**29**		
circle 26, bait 51						171										
bait 52						6										
circle 27, bait 53														**343**		
bait 54														**489**		
circle 28, bait 55														**203**		
bait 56														**5**		
circle 29, bait 57				3		1										
bait 58						14										
circle 30, bait 59														**35**		
bait 60														**137**		
circle 31, bait 61													1			
bait 62												6		**1**		
circle 32, bait 63												12				
bait 64						8										
TOTALS	0	0	0	3	0	200	0	0	0	0	0	18	1	**1244**	0	0

Appendix IV, continued	Blank	Cardiocondyla ectopia	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole floridana	Pheidole morrisi	Pheidole moerens	Paratrechina concinna	Paratrechina longicornis	Paratrechina phantasma	Paratrechina parvula	**Solenopsis invicta**	Solenopsis globularia littoralis	Camponotus floridanus
O.Q. Range, AP-5																
28-May-97																
circle 33, bait 65											9					
bait 66						129										
circle 34, bait 67	1															
bait 68						1										
circle 35, bait 69														**217**		
bait 70		19														
circle 36, bait 71	1															
bait 72	1															
circle 37, bait 73												25				
bait 74					2											
circle 38, bait 75	1															
bait 76	1															
circle 39, bait 77						1										
bait 78						1										
circle 40, bait 79						102										
bait 80						1								**18**		
TOTALS	5	19	0	0	2	235	0	0	0	0	9	25	0	**235**	0	0

Appendix IV, continued	Blank	Cardiocondyla ectopia	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole floridana	Pheidole morrisi	Pheidole moerens	Paratrechina concinna	Paratrechina longicornis	Paratrechina phantasma	Paratrechina parvula	**Solenopsis invicta**	Solenopsis globularia littoralis	Camponotus floridanus
Delt Trail, AP-6																
29-May-97																
circle 73, bait 145														**624**		
bait 146														**659**		
circle 74, bait 147														**574**		
bait 148														**420**		
circle 75, bait 149														**576**		
bait 150														**702**		
circle 76, bait 151														**376**		
bait 152																14
circle 77, bait 153														**461**		
bait 154														**352**		
circle 78, bait 155														**198**		
bait 156														**321**		
circle 79, bait 157														**197**		
bait 158														**606**		
circle 80, bait 159														**478**		
bait 160														**327**		
TOTALS	0	0	0	0	0	0	0	0	0	0	0	0	0	**6871**	0	14

Appendix IV, continued	Blank	Cardiocondyla ectopia	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole floridana	Pheidole morrisi	Pheidole moerens	Paratrechina concinna	Paratrechina longicornis	Paratrechina phantasma	Paratrechina parvula	**Solenopsis invicta**	Solenopsis globularia littoralris	Camponotus floridanus
Delta Trail, AP-7																
29-May-97																
circle 81, bait 161					8											
bait 162					2											
circle 82, bait 163					1											
bait 164					2											
circle 83, bait 165					6											
bait 166					2											
circle 84, bait 167					4											
bait 168					2											
circle 85, bait 169					3											
bait 170					4					4						
circle 86, bait 171					5					1						
bait 172					7											
circle 87, bait 173					1					1						
bait 174					2			1								
circle 88, bait 175																36
bait 176										1						
TOTALS	0	0	0	0	49	0	0	1	0	7	0	0	0	**0**	0	36

Appendix IV, continued **Delta Trail, AP-8**	Blank	Cardiocondyla ectopia	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole floridana	Pheidole morrisi	Pheidole moerens	Paratrechina concinna	Paratrechina longicornis	Paratrechina phantasma	Paratrechina parvula	**Solenopsis invicta**	Solenopsis globularia littoralis	Camponotus floridanus
circle 49, bait 97														**257**		
bait 98														**403**		
circle 50, bait 99														**938**		
bait 100					2						8					
circle 51, bait 101	1															
bait 102														**789**		
circle 52, bait 103														**400**		
bait 104														**714**		
circle 53, bait 105										44						
bait 106														**82**		
circle 54, bait 107														**498**		
bait 108														**156**		
circle 55, bait 109														**626**		
bait 110														**249**		
circle 56, bait 111														**449**		
bait 112														**409**		
TOTALS	1	0	0	0	2	0	0	0	0	44	8	0	0	**5970**	0	0

Appendix IV, continued	Blank	Cardiocondyla ectopia	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole floridana	Pheidole morrisi	Pheidole moerens	Paratrechina concinna	Paratrechina longicornis	Paratrechina phantasma	Paratrechina parvula	**Solenopsis invicta**	Solenopsis globularia littoralis	Camponotus floridanus
O.Q. Range, AP-9																
28-May-97																
circle 41, bait 81														**269**		
bait 82														**293**		
circle 42, bait 83														**79**		
bait 84														**237**		
circle 43, bait 85														**552**		
bait 86														**2**		
circle 44, bait 87														**195**		
bait 88														**17**		
circle 45, bait 89														**560**		
bait 90														**21**	13	
circle 46, bait 91														**425**		
bait 92														**323**		
circle 47, bait 93														**308**		
bait 94														**333**		
circle 48, bait 95														**280**		
bait 96														**258**		
TOTALS	0	0	0	0	0	0	0	0	0	0	0	0	0	**4152**	13	0

Appendix IV, continued	Blank	Cardiocondyla ectopia	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole floridana	Pheidole morrisi	Pheidole moerens	Paratrechina concinna	Paratrechina longicornis	Paratrechina phantasma	Paratrechina parvula	**Solenopsis invicta**	Solenopsis globularia littoralis	Camponotus floridanus
O. Q Range, Block AP-10																
28-May-97																
circle 9, bait 17					1							1				
bait 18			84													
circle 10, bait 19			54													
bait 20					3											
circle 11, bait 21							10									
bait 22					2											
circle 12, bait 23			111													
bait 24					2	2										
circle 13, bait 25	1															
bait 26									9							
circle 14, bait 27											21					
bait 28	1															
circle 15, bait 29					1											
bait 30									32							
circle 16, bait 31						1						3				
bait 32													8			
TOTALS	2	0	249	0	9	3	10	0	41	0	21	4	8	**0**	0	0

Appendix IV, continued	Blank	Cardiocondyla ectopia	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole floridana	Pheidole morrisi	Pheidole moerens	Paratrechina concinna	Paratrechina longicornis	Paratrechina phantasma	Paratrechina parvula	**Solenopsis invicta**	Solenopsis globularia littoralis	Camponotus floridanus
Delta Trail, AP-11																
29-May-97																
circle 89, bait 177														**164**		
bait 178														**220**		
circle 90, bait 179														**473**		
bait 180														**496**		
circle 91, bait 181														**484**		
bait 182														**254**		
circle 92, bait 183														**458**		
bait 184														**528**		
circle 93, bait 185														**636**		
bait 186														**178**		
circle 94, bait 187														**223**		
bait 188														**64**		
circle 95, bait 189					1											
bait 190								19								
circle 96, bait 191														**476**		
bait 192														**346**		
TOTALS	0	0	0	0	1	0	0	19	0	0	0	0	0	**5000**	0	0

Appendix IV, continued	Blank	Cardiocondyla ectopia	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole floridana	Pheidole morrisi	Pheidole moerens	Paratrechina concinna	Paratrechina longicornis	Paratrechina phantasma	Paratrechina parvula	**Solenopsis invicta**	Solenopsis globularia littoralis	Camponotus floridanus
O.Q. Range, AP-12																
28-May-97																
circle 17, bait 33														**210**		
bait 34														**341**		
circle 18, bait 35												5				
bait 36												1				
circle 19, bait 37						57										
bait 38												6				
circle 20, bait 39						1										
bait 40					6							8				
circle 21, bait 41						23										
bait 42					1											
circle 22, bait 43					2								1			
bait 44					1											
circle 23, bait 45					2		2									
bait 46					2	2										
circle 24, bait 47													8			
bait 48												11	1			
TOTALS	0	0	0	0	14	83	2	0	0	0	0	31	10	**551**	0	0

Appendix V.
Avon Park Air Force Base
Fl; Highlands Co.
Multiple Species Baits
13-14-Oct-1997

13-14-Oct-1997	Blank	Aphaeongaster flemingi	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole morrisi	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis geminata	Solenopsis invicta	Camponotus floridanus
AP-1												
circle 1, #1	1											
#2									3			
circle 2, #3	1											
#4	1											
circle 3, #5					2				2			
#6					3							
circle 4, #7					1							
#8	1											
circle 5, #9					7							
#10					2							
circle 6, #11						12						
#12												1
circle 7, #13	1											
#14	1											
circle 8, #15	1											
#16												21
TOTAL	**7**	**0**	**0**	**0**	**15**	**12**	**0**	**0**	**5**	**0**	**0**	**22**

13-14-Oct-1997	Blank	Aphaeongaster flemingi	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole morrisi	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis geminata	Solenopsis invicta	Camponotus floridanus
AP-2												
circle 57, #113	1											
#114											56	
circle 58, #115	1											
#116	1											
circle 59, #117												1
#118	1											
circle 60, #119					1							
#120					2							
circle 61, #121	1											
#122					1				3			
circle 62, #123											1	
#124								3				
circle 63, #125									21			
#126	1											
circle 64, #127												1
#128												6
TOTAL	**6**	**0**	**0**	**0**	**4**	**0**	**0**	**3**	**24**	**0**	**57**	**8**

13-14-Oct-1997	Blank	Aphaeongaster flemingi	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole morrisi	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis geminata	Solenopsis invicta	Camponotus floridanus
AP-3												
circle 65, #129											900	
#130											780	
circle 66, #131	1											
#132											626	
circle 67, #133											68	
#134											404	
circle 68, #135											375	
#136											668	
circle 69, #137	1											
#138											187	
circle 70, #139											297	
#140											464	
circle 71, #141											2	
#142											1	
circle 72, #143											1	
#144	1											
TOTAL	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4773**	**0**

13-14-Oct-1997	Blank	Aphaeongaster flemingi	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole morrisi	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis geminata	Solenopsis invicta	Camponotus floridanus
AP-4												
circle 25, #49					6							
#50					1				1			
circle 26, #51	1											
#52					1							
circle 27, #53					1				2			
#54					2				1			
circle 28, #55					1							
#56	1											
circle 29, #57					1							
#58	1											
circle 30, #59					2							
#60	1											
circle 31, #61										3		
#62										1		
circle 32, #63	1											
#64											23	
TOTAL	**5**	**0**	**0**	**0**	**15**	**0**	**0**	**0**	**4**	**4**	**23**	**0**

13-14-Oct-1997	Blank	Aphaeongaster flemingi	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole morrisi	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis geminata	Solenopsis invicta	Camponotus floridanus
AP-5												
circle 33, #65					3							
#66	1											
circle 34, #67	1											
#68	1											
circle 35, #69	1											
#70	1											
circle 36, #71					2							
#72					3							
circle 37, #73	1											
#74	1											
circle 38, #75	1											
#76												11
circle 39, #77	1											
#78			2						1			
circle 40, #79					2							
#80					1							
TOTAL	**9**	**0**	**2**	**0**	**11**	**0**	**0**	**0**	**1**	**0**	**0**	**11**

13-14-Oct-1997	Blank	Aphaeongaster flemingi	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole morrisi	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis geminata	Solenopsis invicta	Camponotus floridanus
AP-6												
circle 73, #145											144	
#146											346	
circle 74, #147	1											
#148	1											
circle 75, #149											9	
#150											9	
circle 76, #151											2	
#152											14	
circle 77, #153											33	
#154											350	
circle 78, #155											6	
#156											13	
circle 79, #157											193	
#158	1											
circle 80, #159											450	
#160											500	
TOTAL	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2069**	**0**

13-14-Oct-1997	Blank	Aphaeongaster flemingi	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole morrisi	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis geminata	Solenopsis invicta	Camponotus floridanus
AP-7												
circle 81, #161					3							
#162					2							
circle 82, #163	1											
#164	1											
circle 83, #165	1											
#166	1											
circle 84, #167					1				1			1
#168									1			
circle 85, #169						2						
#170						1	1					
circle 86, #171							1					
#172	1											
circle 87, #173	1											
#174					1							
circle 88, #175	1											
#176	1											
TOTAL	**8**	**0**	**0**	**0**	**7**	**3**	**2**	**0**	**2**	**0**	**0**	**1**

13-14-Oct-1997	Blank	Aphaeongaster flemingi	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole morrisi	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis geminata	Solenopsis invicta	Camponotus floridanus
AP-8												
circle 49, #97	1											
#98	1											
circle 50, #99	1											
#100	1											
circle 51, #101	1											
#102											211	
circle 52, #103											370	
#104											1	
circle 53, #105	1											
#106									12			
circle 54, #107	1											
#108	1											
circle 55, #109		26										
#110		1										
circle 56, #111											1	
#112	1											
TOTAL	**9**	**27**	**0**	**0**	**0**	**0**	**0**	**0**	**12**	**0**	**583**	**0**

13-14-Oct-1997	Blank	Aphaeongaster flemingi	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole morrisi	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis geminata	Solenopsis invicta	Camponotus floridanus
AP-9												
circle 41, #81	1											
#82	1											
circle 42, #83	1											
#84	1											
circle 43, #85												1
#86	1											
circle 44, #87												3
#88												18
circle 45, #89	1											
#90	1											
circle 46, #91											143	
#92	1											
circle 47, #93	1											
#94											1	
circle 48, #95											1	
#96											1	
TOTAL	**9**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**146**	**22**

13-14-Oct-1997	Blank	Aphaeongaster flemingi	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole morrisi	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis geminata	Solenopsis invicta	Camponotus floridanus
AP-10												
circle 9, #17	1											
#18									4			
circle 10, #19	1											
#20			1									
circle 11, #21							1		1			
#22												37
circle 12, #23					2				1			
#24	1											
circle 13, #25	1											
#26				3								
circle 14, #27	1											
#28	1											
circle 15, #29	1											
#30	1											
circle 16, #31					1							
#32					1							
TOTAL	**8**	**0**	**1**	**3**	**4**	**0**	**1**	**0**	**6**	**0**	**0**	**37**

13-14-Oct-1997	Blank	Aphaeongaster flemingi	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole morrisi	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis geminata	Solenopsis invicta	Camponotus floridanus
AP-11												
circle 89, #177											181	
#178											1	
circle 90, #179	1											
#180											189	
circle 91, #181											58	
#182											3	
circle 92, #183											360	
#184											252	
circle 93, #185											1	
#186											384	
circle 94, #187									5			
#188	1											
circle 95, #189	1											
#190											9	
circle 96, #191											80	
#192											219	
TOTAL	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**1737**	**0**

13-14-Oct-1997	Blank	Aphaeongaster flemingi	Conomyrma bureni	Forelius pruinosus	Odontomachus brunneus	Pheidole morrisi	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis geminata	Solenopsis invicta	Camponotus floridanus
AP-12												
circle 17, #33	1											
#34										1		
circle 18, #35							1					
#36					1							
circle 19, #37									2			
#38							1					
circle 20, #39					1							
#40					1							
circle 21, #41												11
#42					2							
circle 22, #43	1											
#44						1						
circle 23, #45	1											
#46					1							
circle 24, #47									18			
#48	1											
TOTAL	**4**	**0**	**0**	**0**	**6**	**1**	**2**	**0**	**20**	**1**	**0**	**11**

Appendix VI

Appendix V1
Avon Park Air Force Base
Florida, Highlands Co.
Test Tube Pitfall Traps
27-May-3-June-1997

	Blank	Aphaenogaster texana	Cardiocondyla nuda	Conomyrma bureni	Smithistruma dietrichi	Formica archboldi	Hypoponera punctatissima	Hypoponera opaciceps	Forelus pruinosus	Monomorius floricola	Odontomachus brunneus	Neivamyrmex opacithorax	Pheidole carrolli	Pheidole dentata	Pheidole floridana	Pheidole morrisi	Pheidole moerens	Stumigenys louisanae	Trichoscapa membranifera	Paratrechina arenivaga	Paratrechina concinna	Prenolepis imparis	Paratrechina longicornis	Paratrechina phantasma	Paratrechina parvula	Paratrechina faisonenesis	Cyphomyrmex rimosus	**Solenopsis invicta**	Solenopsis globularia littoralis	Tetramorium caldarium	Tetramorium caespitum	Camponotus floridanus	Camponotus tortuganus	Cyphomyrmex rimosus	Trachymyrmex septentrionalis
O.Q. Range, AP-1																																		
circle 1, #1			2								4					12																		
#2											3					11																		
circle 2, #3											2	6				7								5										
#4											5					1							1											
circle 3, #5						2			6		7	1				4							2											
#6									1		2	2											1	1					1					
circle 4, #7						1			1		4					8																		
#8			1								2					1												**4**						
circle 5, #9									1		3												7	1										
#10									1		2												8	2										
circle 6, #11				2		1			2		4					2							4	3										
#12				7		1					2			11																				
circle 7, #13														4									3						5					
#14																						2												
circle 8, #15											3																	7	1		3			
#16						1											15																	
TOTALS	0	0	3	9	0	6	0	0	12	0	43	9	0	15	0	46	15	0	0	0	0	0	2	26	12	0	0	**11**	6	1	0	3	0	0	0

Delta Trail, AP-2	circle 57, #113	#114	circle 58, #115	#116	circle 59, #117	#118	circle 60, #119	#120	circle 61, #121	#122	circle 62, #123	#124	circle 63, #125	#126	circle 64, #127	#128	TOTALS
Blank													1				1
Aphaenogaster texana																	0
Cardiocondyla nuda																1	1
Conomyrma bureni									2	13	1	13			2		31
Smithistruma dietrichi																	0
Formica archboldi																	0
Hypoponera punctatissima																	0
Hypoponera opaciceps	1	2															3
Forelus pruinosus																	0
Monomorius floricola																	0
Odontomachus brunneus			1	9	4	4	7	2	1		1						29
Neivamyrmex opacithorax																	0
Pheidole carrolli																	0
Pheidole dentata				4						1		2					7
Pheidole floridana					8												8
Pheidole morrisi																	0
Pheidole moerens				2										13			15
Stumigenys louisanae																	0
Trichoscapa membranifera																	0
Paratrechina arenivaga																	0
Paratrechina concinna																	0
Prenolepis imparis																	0
Paratrechina longicornis																	0
Paratrechina phantasma																	0
Paratrechina parvula																	0
Paratrechina faisonenesis																	0
Cyphomyrmex rimosus																	0
Solenopsis invicta	**16**	**11**	**11**												**40**	**69**	**147**
Solenopsis globularia littoralis								1		1	2	4		1			9
Tetramorium caldarium																	0
Tetramorium caespitum																	0
Camponotus floridanus					1					2						2	5
Camponotus tortuganus												1					1
Cyphomyrmex rimosus															1	1	2
Trachymyrmex septentrionalis																	0

Delta Trail, AP-3	circle 65, #129	#130	circle 66, #131	#132	circle 67, #133	#134	circle 68, #135	#136	circle 69, #137	#138	circle 70, #139	#140	circle 71, #141	#142	circle 72, #143	#144	TOTALS
Blank																	0
Aphaenogaster texana																	0
Cardiocondyla nuda																	0
Conomyrma bureni																	0
Smithistruma dietrichi																	0
Formica archboldi																	0
Hypoponera punctatissima																	0
Hypoponera opaciceps	1	1	1					3					3				9
Forelus pruinosus																	0
Monomorius floricola																	0
Odontomachus brunneus																	0
Neivamyrmex opacithorax																	0
Pheidole carrolli																	0
Pheidole dentata																	0
Pheidole floridana																	0
Pheidole morrisi																	0
Pheidole moerens																	0
Stumigenys louisanae																	0
Trichoscapa membranifera																	0
Paratrechina arenivaga																	0
Paratrechina concinna																	0
Prenolepis imparis																	0
Paratrechina longicornis																	0
Paratrechina phantasma																	0
Paratrechina parvula																	0
Paratrechina faisonenesis																	0
Cyphomyrmex rimosus																	0
Solenopsis invicta	**26**	**14**	**16**	**17**	**3**	**74**	**38**	**18**	**8**	**18**	**99**	**25**	**50**	**36**	**18**	**30**	**490**
Solenopsis globularia littoralis																	0
Tetramorium caldarium																	0
Tetramorium caespitum																	0
Camponotus floridanus																	0
Camponotus tortuganus																	0
Cyphomyrmex rimosus						1				1					2	2	6
Trachymyrmex septentrionalis																	0

O.Q. Range, AP-4	circle 25, #49	#50	circle 26, #51	#52	circle 27, #53	#54	circle 28, #55	#56	circle 29, #57	#58	circle 30, #59	#60	circle 31, #61	#62	circle 32, #63	#64	TOTALS
Blank																	0
Aphaenogaster texana																	0
Cardiocondyla nuda																	0
Conomyrma bureni																	0
Smithistruma dietrichi																	0
Formica archboldi			1				1										2
Hypoponera punctatissima																	0
Hypoponera opaciceps																	0
Forelus pruinosus																	0
Monomorius floricola																	0
Odontomachus brunneus	8	6		1	10	9	6	8		1	1	6				1	57
Neivamyrmex opacithorax																	0
Pheidole carrolli																	0
Pheidole dentata			8	11	2	1		5			1						28
Pheidole floridana	2	4						2			5						13
Pheidole morrisi																	0
Pheidole moerens																	0
Stumigenys louisanae																	0
Trichoscapa membranifera													1				1
Paratrechina arenivaga																	0
Paratrechina concinna																	0
Prenolepis imparis																	0
Paratrechina longicornis																	0
Paratrechina phantasma						1		1									2
Paratrechina parvula																	0
Paratrechina faisonenesis																	0
Cyphomyrmex rimosus													4				4
Solenopsis invicta			**1**						**27**	**3**		**1**	**41**	**26**	**22**	**45**	**166**
Solenopsis globularia littoralis		3							1			1					5
Tetramorium caldarium																	0
Tetramorium caespitum																	0
Camponotus floridanus						1											1
Camponotus tortuganus																	0
Cyphomyrmex rimosus																	0
Trachymyrmex septentrionalis																	0

Delta Trail, AP-5	circle 33, #65	#66	circle 34, #67	#68	circle 35, #69	#70	circle 36, #71	#72	circle 37, #73	#74	circle 38, #75	#76	circle 39, #77	#78	circle 40, #79	#80	TOTALS
Blank											1	1					2
Aphaenogaster texana																	0
Cardiocondyla nuda																	0
Conomyrma bureni														3			3
Smithistruma dietrichi																	0
Formica archboldi	3																3
Hypoponera punctatissima																	0
Hypoponera opaciceps																	0
Forelus pruinosus																	0
Monomorius floricola																	0
Odontomachus brunneus	6	5	6	5	2	2		3	37	16			10	1	11	6	110
Neivamyrmex opacithorax																	0
Pheidole carrolli																	0
Pheidole dentata				5			6	2	1						1	4	19
Pheidole floridana						5											5
Pheidole morrisi																	0
Pheidole moerens																	0
Stumigenys louisanae																	0
Trichoscapa membranifera																	0
Paratrechina arenivaga																1	1
Paratrechina concinna																	0
Prenolepis imparis																	0
Paratrechina longicornis																	0
Paratrechina phantasma																	0
Paratrechina parvula																	0
Paratrechina faisonenesis																	0
Cyphomyrmex rimosus																	0
Solenopsis invicta					**17**	**9**	**1**	**1**									**28**
Solenopsis globularia littoralis														1	1	2	4
Tetramorium caldarium																	0
Tetramorium caespitum																	0
Camponotus floridanus																	0
Camponotus tortuganus																	0
Cyphomyrmex rimosus																	0
Trachymyrmex septentrionalis																	0

Delta Trail, AP-6	circle 73, #145	#146	circle 74, #147	#148	circle 75, #149	#150	circle 76, #151	#152	circle 77, #153	#154	circle 78, #155	#156	circle 79, #157	#158	circle 80, #159	#160	TOTALS
Blank																	0
Aphaenogaster texana																	0
Cardiocondyla nuda															1		1
Conomyrma bureni		2															2
Smithistruma dietrichi																	0
Formica archboldi																	0
Hypoponera punctatissima																	0
Hypoponera opaciceps																	0
Forelus pruinosus																	0
Monomorius floricola																	0
Odontomachus brunneus																	0
Neivamyrmex opacithorax																	0
Pheidole carrolli																	0
Pheidole dentata																	0
Pheidole floridana														3			3
Pheidole morrisi																	0
Pheidole moerens																	0
Stumigenys louisanae											1						1
Trichoscapa membranifera																	0
Paratrechina arenivaga																	0
Paratrechina concinna																	0
Prenolepis imparis																	0
Paratrechina longicornis																	0
Paratrechina phantasma																	0
Paratrechina parvula																	0
Paratrechina faisonenesis																	0
Cyphomyrmex rimosus																	0
Solenopsis invicta	**45**	**19**	**17**	**40**	**24**	**21**	**103**	**88**	**176**	**11**	**42**	**13**	**16**	**37**	**28**	**71**	**751**
Solenopsis globularia littoralis																	0
Tetramorium caldarium																	0
Tetramorium caespitum																	0
Camponotus floridanus							5	2					2	8			17
Camponotus tortuganus																	0
Cyphomyrmex rimosus								2			1		2	4	3	2	14
Trachymyrmex septentrionalis																	0

Delta Trail, AP-7	circle 81, #161	#162	circle 82, #163	#164	circle 83, #165	#166	circle 84, #167	#168	circle 85, #169	#170	circle 86, #171	#172	circle 87, #173	#174	circle 88, #175	#176	TOTALS
Blank																	0
Aphaenogaster texana																	0
Cardiocondyla nuda																	0
Conomyrma bureni																	0
Smithistruma dietrichi																	0
Formica archboldi																	0
Hypoponera punctatissima																	0
Hypoponera opaciceps																	0
Forelus pruinosus																	0
Monomorius floricola																	0
Odontomachus brunneus	8	17	12	17	8	8	12	11	5	8	17	24	39	81	18	34	319
Neivamyrmex opacithorax																	0
Pheidole carrolli																	0
Pheidole dentata	4	1	3	6								4	2	12	3	8	43
Pheidole floridana																	0
Pheidole morrisi								1									1
Pheidole moerens		6										12	2	1	2	1	24
Stumigenys louisanae																	0
Trichoscapa membranifera																	0
Paratrechina arenivaga																	0
Paratrechina concinna						3				5							8
Prenolepis imparis			2	2	1				3	2	5	8	2	5	2	2	#
Paratrechina longicornis																	0
Paratrechina phantasma																	0
Paratrechina parvula				2													2
Paratrechina faisonenesis																	0
Cyphomyrmex rimosus																	0
Solenopsis invicta																	**0**
Solenopsis globularia littoralis							2		2								4
Tetramorium caldarium																	0
Tetramorium caespitum							2		7	11							20
Camponotus floridanus									7	6							13
Camponotus tortuganus																	0
Cyphomyrmex rimosus																	0
Trachymyrmex septentrionalis																	0

Delta Trail, AP-8

Species	circle 49, #97	#98	circle 50, #99	#100	circle 51, #101	#102	circle 52, #103	#104	circle 53, #105	#106	circle 54, #107	#108	circle 55, #109	#110	circle 56, #111	#112	TOTALS
Blank																	0
Aphaenogaster texana																	0
Cardiocondyla nuda																	0
Conomyrma bureni			598	1													599
Smithistruma dietrichi																	0
Formica archboldi																	0
Hypoponera punctatissima																	0
Hypoponera opaciceps						1			1								2
Forelus pruinosus																	0
Monomorius floricola																	0
Odontomachus brunneus																	0
Neivamyrmex opacithorax																	0
Pheidole carrolli																	0
Pheidole dentata																	0
Pheidole floridana																	0
Pheidole morrisi													10				10
Pheidole moerens				2													2
Stumigenys louisanae											10						10
Trichoscapa membranifera																	0
Paratrechina arenivaga														4			4
Paratrechina concinna																	0
Prenolepis imparis																	0
Paratrechina longicornis																	0
Paratrechina phantasma										2			1				3
Paratrechina parvula																	0
Paratrechina faisonenesis		3															3
Cyphomyrmex rimosus																	0
Solenopsis invicta	**35**	**17**		**53**	**107**	**48**	**46**	**32**	**12**	**14**	**12**	**33**	**2**	**25**	**22**	**42**	**500**
Solenopsis globularia littoralis													1		1		2
Tetramorium caldarium																	0
Tetramorium caespitum																	0
Camponotus floridanus	1																1
Camponotus tortuganus					1	1				1				1			4
Cyphomyrmex rimosus	7	1	1		6	2	1										18
Trachymyrmex septentrionalis																	0

O.Q. Range, AP-9	circle 41, #81	#82	circle 42, #83	#84	circle 43, #85	#86	circle 44, #87	#88	circle 45, #89	#90	circle 46, #91	#92	circle 47, #93	#94	circle 48, #95	#96	TOTALS
Blank																	0
Aphaenogaster texana																1	1
Cardiocondyla nuda																	0
Conomyrma bureni																	0
Smithistruma dietrichi																1	1
Formica archboldi																	0
Hypoponera punctatissima																	0
Hypoponera opaciceps	5	1	1			2											9
Forelus pruinosus																	0
Monomorius floricola																	0
Odontomachus brunneus					1			3	4	3							11
Neivamyrmex opacithorax																	0
Pheidole carrolli																	0
Pheidole dentata																	0
Pheidole floridana																	0
Pheidole morrisi																	0
Pheidole moerens																	0
Stumigenys louisanae																	0
Trichoscapa membranifera														2		2	4
Paratrechina arenivaga																	0
Paratrechina concinna																	0
Prenolepis imparis																	0
Paratrechina longicornis																	0
Paratrechina phantasma																	0
Paratrechina parvula																	0
Paratrechina faisonenesis																	0
Cyphomyrmex rimosus	4	1															5
Solenopsis invicta	**5**	**27**	**26**	**45**	**5**	**12**	**4**	**27**		**19**	**13**	**25**	**20**	**16**	**44**	**88**	**376**
Solenopsis globularia littoralis							1										1
Tetramorium caldarium																	0
Tetramorium caespitum																	0
Camponotus floridanus			1														1
Camponotus tortuganus																	0
Cyphomyrmex rimosus				12							1	1			1	3	18
Trachymyrmex septentrionalis																	0

O.Q. Range, AP-10	circle 9, #17	#18	circle 10, #19	#20	circle 11, #21	#22	circle 12, #23	#24	circle 13, #25	#26	circle 14, #27	#28	circle 15, #29	#30	circle 16, #31	#32	TOTALS
Blank																	0
Aphaenogaster texana																	0
Cardiocondyla nuda																	0
Conomyrma bureni	9	3	8	6	21	1	7	7	2	2							66
Smithistruma dietrichi																	0
Formica archboldi							1	2							1		4
Hypoponera punctatissima																	0
Hypoponera opaciceps																	0
Forelus pruinosus							2			1	1		8	4			16
Monomorius floricola			1														1
Odontomachus brunneus	3	1	8	1	6	1		1	1	4	6	1	2	4	3	5	47
Neivamyrmex opacithorax																	0
Pheidole carrolli																	0
Pheidole dentata											4		1			1	6
Pheidole floridana																	0
Pheidole morrisi	10	9								38							57
Pheidole moerens			2			7		1	1		1	5	3		11	5	36
Stumigenys louisanae																	0
Trichoscapa membranifera																	0
Paratrechina arenivaga																	0
Paratrechina concinna																	0
Prenolepis imparis																	0
Paratrechina longicornis				3			3										6
Paratrechina phantasma			1				5										6
Paratrechina parvula																	0
Paratrechina faisonenesis																	0
Cyphomyrmex rimosus																	0
Solenopsis invicta													**1**				**1**
Solenopsis globularia littoralis														2	2		4
Tetramorium caldarium																	0
Tetramorium caespitum																	0
Camponotus floridanus							1										1
Camponotus tortuganus																	0
Cyphomyrmex rimosus																	0
Trachymyrmex septentrionalis																	0

Delta Trail, AP-11	circle 89, #177	#178	circle 90, #179	#180	circle 91, #181	#182	circle 92, #183	#184	circle 93, #185	#186	circle 94, #187	#188	circle 95, #189	#190	circle 96, #191	#192	TOTALS
Blank																	0
Aphaenogaster texana																	0
Cardiocondyla nuda																	0
Conomyrma bureni																	0
Smithistruma dietrichi																	0
Formica archboldi																	0
Hypoponera punctatissima										1		1			2	2	6
Hypoponera opaciceps																	0
Forelus pruinosus																	0
Monomorius floricola																	0
Odontomachus brunneus													2				2
Neivamyrmex opacithorax																	0
Pheidole carrolli														2			2
Pheidole dentata	1																1
Pheidole floridana																	0
Pheidole morrisi																	0
Pheidole moerens																	0
Stumigenys louisanae											1						1
Trichoscapa membranifera																	0
Paratrechina arenivaga																	0
Paratrechina concinna		1															1
Prenolepis imparis													1	3			4
Paratrechina longicornis																	0
Paratrechina phantasma	1																1
Paratrechina parvula																	0
Paratrechina faisonenesis																	0
Cyphomyrmex rimosus																	0
Solenopsis invicta	**27**	**44**	**11**	**14**	**6**	**8**	**39**	**86**	**31**	**9**	**32**	**43**	**2**	**6**	**32**	**53**	**443**
Solenopsis globularia littoralis																	0
Tetramorium caldarium																	0
Tetramorium caespitum																	0
Camponotus floridanus					1								2				3
Camponotus tortuganus																	0
Cyphomyrmex rimosus																	0
Trachymyrmex septentrionalis																	0

Delta Trail, AP-12

	circle 17, #33	#34	circle 18, #35	#36	circle 19, #37	#38	circle 20, #39	#40	circle 21, #41	#42	circle 22, #43	#44	circle 23, #45	#46	circle 24, #47	#48	TOTALS
Blank																	0
Aphaenogaster texana																	0
Cardiocondyla nuda																	0
Conomyrma bureni											1	1			1	10	13
Smithistruma dietrichi																	0
Formica archboldi					1			1									2
Hypoponera punctatissima																	0
Hypoponera opaciceps																	0
Forelus pruinosus																	0
Monomorius floricola																	0
Odontomachus brunneus			3	8		7	3	8	2	3	3		3	6	8		54
Neivamyrmex opacithorax																	0
Pheidole carrolli																	0
Pheidole dentata			1	2			7		3	3	3	3		10			32
Pheidole floridana										7							7
Pheidole morrisi																	0
Pheidole moerens																	0
Stumigenys louisanae																	0
Trichoscapa membranifera																	0
Paratrechina arenivaga																	0
Paratrechina concinna																	0
Prenolepis imparis																	0
Paratrechina longicornis																	0
Paratrechina phantasma																	0
Paratrechina parvula																	0
Paratrechina faisonenesis																	0
Cyphomyrmex rimosus																	0
Solenopsis invicta	**55**	**28**															**83**
Solenopsis globularia littoralis						3				2	1	1					7
Tetramorium caldarium																	0
Tetramorium caespitum																	0
Camponotus floridanus						1											1
Camponotus tortuganus																	0
Cyphomyrmex rimosus	1	3															4
Trachymyrmex septentrionalis							1										1

Appendix VII
Avon Park Air Force Base
Fl; Highlands Co.
Pitfall Traps
13-14-Oct-1997

13-14-Oct-1997	Blank	Aphaenogaster lamellidens	Brachymyrmex obscurior	Cardiocondyla nuda minutior	Conomyrma bureni	Hypoponera opaciceps	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole morrisi	Pheidole dentigula	Smithistruma crolinensis	Paratrechina arenivaga	Paratrechina concinna	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis tennessensis	Solenopsis invicta	Solenopsis globularia littoralis	Solenopsis nickersoni	Camponotus floridanus	Cyphomyrmex rimosus
AP-1																							
circle 1, #1								16	2														
#2								9							1		1						
circle 2, #3								13	1														
#4								3	1				2										
circle 3, #5								18	10		5						1						
#6								24			4		1		1		1						
circle 4, #7								4															
#8									3						1		3						
circle 5, #9								19								9	2						
#10								18							3		2						
circle 6, #11								5					6										
#12								6	2							1							
circle 7, #13								2					2										
#14								3			1						1						
circle 8, #15								1			4											1	
#16								2												2			
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**143**	**19**	**0**	**14**	**0**	**11**	**0**	**6**	**10**	**11**	**0**	**0**	**2**	**0**	**1**	**0**

Appendix VII

13-14-Oct-1997	Blank	Aphaenogaster lamellidens	Brachymyrmex obscurior	Cardiocondyla nuda minutior	Conomyrma bureni	Hypoponera opaciceps	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole morrisi	Pheidole dentigula	Smithistruma crolinensis	Paratrechina arenivaga	Paratrechina concinna	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis tennessensis	Solenopsis invicta	Solenopsis globularia littoralis	Solenopsis nickersoni	Camponotus floridanus	Cyphomyrmex rimosus
AP-2																							
circle 57, #113														1					4				
#114																			9				
circle 58, #115								1												1			
#116								4															
circle 59, #117					2			3			1		1									1	
#118								5					3		1					1			
circle 60, #119								8							1								
#120							1	15		1										1			
circle 61, #121					3			2					6										
#122					1			2	1				3					1		1		1	
circle 62, #123					4			1					8				1						
#124					5			3	10				2										1
circle 63, #125								3	1		2			2									
#126							1		1					1									
circle 64, #127																			3			2	
#128																			11				
TOTAL	**0**	**0**	**0**	**0**	**15**	**0**	**2**	**47**	**13**	**1**	**3**	**0**	**23**	**4**	**2**	**0**	**1**	**1**	**27**	**4**	**0**	**4**	**1**

13-14-Oct-1997	Blank	Aphaenogaster lamellidens	Brachymyrmex obscurior	Cardiocondyla nuda minutior	Conomyrma bureni	Hypoponera opaciceps	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole morrisi	Pheidole dentigula	Smithistruma crolinensis	Paratrechina arenivaga	Paratrechina concinna	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis tennessensis	Solenopsis invicta	Solenopsis globularia littoralis	Solenopsis nickersoni	Camponotus floridanus	Cyphomyrmex rimosus
AP-3																							
circle 65, #129																			19				
#130																			7				
circle 66, #131																			6				
#132																			2				
circle 67, #133																			31				
#134																			61				
circle 68, #135																			6				
#136																			8				
circle 69, #137																			5				
#138																			16				
circle 70, #139																			49				
#140																			19				
circle 71, #141																			25				
#142																			4				
circle 72, #143																			12				
#144																			9				
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**279**	**0**	**0**	**0**	**0**

13-14-Oct-1997	Blank	Aphaenogaster lamellidens	Brachymyrmex obscurior	Cardiocondyla nuda minutior	Conomyrma bureni	Hypoponera opaciceps	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole morrisi	Pheidole dentigula	Smithistruma crolinensis	Paratrechina arenivaga	Paratrechina concinna	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis tennessensis	Solenopsis invicta	Solenopsis globularia littoralis	Solenopsis nickersoni	Camponotus floridanus	Cyphomyrmex rimosus
AP-4																							
circle 25, #49								20			1				1								
#50								13			3			1	2								
circle 26, #51	1																						
#52																			9				
circle 27, #53								17					19										
#54								22	1				12										
circle 28, #55								28			1		7		1								
#56								21			3		8										
circle 29, #57								4			3												
#58								6						1									
circle 30, #59								6			1			1									
#60								13												1			
circle 31, #61																			24				
#62																			12				1
circle 32, #63																			6				
#64																			6				
TOTAL	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**150**	**1**	**0**	**12**	**0**	**46**	**3**	**4**	**0**	**0**	**0**	**57**	**1**	**0**	**0**	**1**

13-14-Oct-1997	Blank	Aphaenogaster lamellidens	Brachymyrmex obscurior	Cardiocondyla nuda minutior	Conomyrma bureni	Hypoponera opaciceps	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole morrisi	Pheidole dentigula	Smithistruma crolinensis	Paratrechina arenivaga	Paratrechina concinna	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis tennessensis	Solenopsis invicta	Solenopsis globularia littoralis	Solenopsis nickersoni	Camponotus floridanus	Cyphomyrmex rimosus
AP-5																							
circle 33, #65								34						1						1			
#66								49							1								
circle 34, #67								4						1						3			
#68								8						1	1					1			
circle 35, #69								2											22				
#70								1											5	1			
circle 36, #71								4															
#72								8						1									
circle 37, #73								2					2		1								
#74								15					9		1								
circle 38, #75								12							1								
#76								7	1								3						
circle 39, #77								15															
#78					1			22												1		1	
circle 40, #79								25							2								
#80								27							2								
TOTAL	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**235**	**1**	**0**	**0**	**0**	**11**	**4**	**9**	**0**	**3**	**0**	**27**	**7**	**0**	**1**	**0**

13-14-Oct-1997	Blank	Aphaenogaster lamellidens	Brachymyrmex obscurior	Cardiocondyla nuda minutior	Conomyrma bureni	Hypoponera opaciceps	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole morrisi	Pheidole dentigula	Smithistruma crolinensis	Paratrechina arenivaga	Paratrechina concinna	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis tennessensis	Solenopsis invicta	Solenopsis globularia littoralis	Solenopsis nickersoni	Camponotus floridanus	Cyphomyrmex rimosus
AP-6																							
circle 73, #145																			4				
#146																			71				
circle 74, #147																			2				
#148	1																						
circle 75, #149																			3				
#150																			7				
circle 76, #151	1																						
#152	1																						
circle 77, #153																			32				
#154																			62				
circle 78, #155																			45				
#156																			9				
circle 79, #157																			4				
#158																			4				1
circle 80, #159																			11				1
#160																			19				1
TOTAL	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**273**	**0**	**0**	**0**	**3**

13-14-Oct-1997	Blank	Aphaenogaster lamellidens	Brachymyrmex obscurior	Cardiocondyla nuda minutior	Conomyrma bureni	Hypoponera opaciceps	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole morrisi	Pheidole dentigula	Smithistruma crolinensis	Paratrechina arenivaga	Paratrechina concinna	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis tennessensis	Solenopsis invicta	Solenopsis globularia littoralis	Solenopsis nickersoni	Camponotus floridanus	Cyphomyrmex rimosus
AP-7																							
circle 81, #161								11			1			1	3					1			
#162								6			7				2			1					
circle 82, #163								8						1					1				
#164				1				12	2					2	2								
circle 83, #165								6	1					1	2					2			
#166								3	1					1	2					1			
circle 84, #167								12						2	3								
#168								3			3			2						1			
circle 85, #169									1		3			2	1							1	
#170								1	12						5							1	
circle 86, #171								4			4				1								
#172								15												1			
circle 87, #173								12							1			1					
#174								28			5												
circle 88, #175								10						2				1					
#176								14	3						2					1			
TOTAL	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**145**	**20**	**0**	**23**	**0**	**0**	**14**	**24**	**0**	**0**	**3**	**1**	**7**	**0**	**2**	**0**

13-14-Oct-1997	Blank	Aphaenogaster lamellidens	Brachymyrmex obscurior	Cardiocondyla nuda minutior	Conomyrma bureni	Hypoponera opaciceps	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole morrisi	Pheidole dentigula	Smithistruma crolinensis	Paratrechina arenivaga	Paratrechina concinna	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis tennessensis	Solenopsis invicta	Solenopsis globularia littoralis	Solenopsis nickersoni	Camponotus floridanus	Cyphomyrmex rimosus
AP-8																							
circle 49, #97																			5				
#98																			12				1
circle 50, #99																			14				
#100																			33				
circle 51, #101																			23			1	
#102																			25				1
circle 52, #103																			6				
#104																			14				
circle 53, #105		1																	5				
#106																			1				
circle 54, #107														1					4				
#108							1							1					9	1			
circle 55, #109													11									1	
#110		1																	13				
circle 56, #111																			4				
#112		1			1		1			1									8				
TOTAL	**0**	**3**	**0**	**0**	**1**	**0**	**2**	**0**	**0**	**1**	**0**	**0**	**11**	**2**	**0**	**0**	**0**	**0**	**176**	**1**	**0**	**2**	**2**

13-14-Oct-1997	Blank	Aphaenogaster lamellidens	Brachymyrmex obscurior	Cardiocondyla nuda minutior	Conomyrma bureni	Hypoponera opaciceps	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole morrisi	Pheidole dentigula	Smithistruma crolinensis	Paratrechina arenivaga	Paratrechina concinna	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis tennessensis	Solenopsis invicta	Solenopsis globularia littoralis	Solenopsis nickersoni	Camponotus floridanus	Cyphomyrmex rimosus
AP-9																							
circle 41, #81												1							5				
#82																			2				
circle 42, #83												1							33				1
#84														2					17				2
circle 43, #85																			48			1	2
#86								1						3						2		2	
circle 44, #87								2														1	
#88								2												2		1	
circle 45, #89								1											15	1			
#90								3															
circle 46, #91																			9				
#92																			9				
circle 47, #93																			7				1
#94																			10				
circle 48, #95																			13				
#96																			20				
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9**	**0**	**0**	**0**	**2**	**0**	**5**	**0**	**0**	**0**	**0**	**188**	**5**	**0**	**5**	**6**

13-14-Oct-1997	Blank	Aphaenogaster lamellidens	Brachymyrmex obscurior	Cardiocondyla nuda minutior	Conomyrma bureni	Hypoponera opaciceps	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole morrisi	Pheidole dentigula	Smithistruma crolinensis	Paratrechina arenivaga	Paratrechina concinna	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis tennessensis	Solenopsis invicta	Solenopsis globularia littoralis	Solenopsis nickersoni	Camponotus floridanus	Cyphomyrmex rimosus
AP-10																							
circle 9, #17								20	1														
#18					1			11	5														
circle 10, #19					1						1					1				1			
#20					3			8									1						
circle 11, #21					2		1	8			12						1				2		
#22					6			4															
circle 12, #23								40								6							
#24								53								1							
circle 13, #25					3		1	17	5						1						1		
#26								11									1			1			
circle 14, #27								10	1		3										2	1	
#28								5	1														
circle 15, #29								11															
#30								3			7				1				2				
circle 16, #31								6			2			1									
#32								9			7										1		
TOTAL	**0**	**0**	**0**	**0**	**16**	**0**	**2**	**216**	**13**	**0**	**32**	**0**	**0**	**1**	**2**	**8**	**3**	**0**	**2**	**2**	**6**	**1**	**0**

13-14-Oct-1997	Blank	Aphaenogaster lamellidens	Brachymyrmex obscurior	Cardiocondyla nuda minutior	Conomyrma bureni	Hypoponera opaciceps	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole morrisi	Pheidole dentigula	Smithistruma crolinensis	Paratrechina arenivaga	Paratrechina concinna	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis tennessensis	Solenopsis invicta	Solenopsis globularia littoralis	Solenopsis nickersoni	Camponotus floridanus	Cyphomyrmex rimosus
AP-11																							
circle 89, #177																			262				1
#178														1					3				
circle 90, #179																			1				
#180																			2				
circle 91, #181			1																7				
#182						1													5				
circle 92, #183																			74				
#184																			33				
circle 93, #185																			9				
#186																			1				
circle 94, #187																			6				
#188																			6				
circle 95, #189								1											3			1	
#190														1					3				
circle 96, #191																			16				
#192																			32				
TOTAL	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**463**	**0**	**0**	**1**	**1**

13-14-Oct-1997	Blank	Aphaenogaster lamellidens	Brachymyrmex obscurior	Cardiocondyla nuda minutior	Conomyrma bureni	Hypoponera opaciceps	Forelius pruinosus	Odontomachus brunneus	Pheidole dentata	Pheidole morrisi	Pheidole dentigula	Smithistruma crolinensis	Paratrechina arenivaga	Paratrechina concinna	Prenolepis imparis	Paratrechina phantasma	Paratrechina parvula	Solenopsis tennessensis	Solenopsis invicta	Solenopsis globularia littoralis	Solenopsis nickersoni	Camponotus floridanus	Cyphomyrmex rimosus
AP-12																							
circle 17, #33																			2				1
#34																			13				
circle 18, #35								4						3									
#36								8	1		1		4	1						2			
circle 19, #37													6			1	1						
#38								6		1			13		1					2			
circle 20, #39								9	1														
#40								6						2	2		1						
circle 21, #41								2	1					2					1	1			
#42								9			1			2								1	
circle 22, #43							1		2														
#44							1	2	1					1						2			
circle 23, #45								18	4														
#46								2	1								1						
circle 24, #47								3					2				2						
#48								5									5						
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**74**	**11**	**1**	**2**	**0**	**25**	**11**	**3**	**1**	**10**	**0**	**16**	**7**	**0**	**1**	**1**

Appendix VIII
Avon Park Air Force Range
Light trap samples
3-4-June-1997

SITE	ACANALONIIDAE	ACRIDIDAE	Melanoplus sp.	ALYDIDAE	ASCALAPHIDAE	ASILIDAE	BELOSTOMATIDAE	Lethocerus sp.	CARABIDAE	Agonum sp.	Anisodactylus sp.	Brachinus sp.	Calleida decora	Clivina sp.	Galerita bicolor	Lebia sp.	Lebia viridis	Lebia viridipennis	Loxandrus sp.	Pangaeus sp.	Pangaeus fasciatus	Stenocrepis sp.
AP-1			1		1							1	1					1				
AP-2						3													3			2
AP-3	2			1	3					1								1	1			
AP-4					2			8			1						2		9			
AP-5			3		3			1				1							4			
AP-6								1						2				2		1		
AP-7					1			4						2								
AP-8								2											1			
AP-9								1				1				1					1	
AP-10			2					1				1			1		1					
AP-11			1	1	1			4						1				2				
AP-12								1				1							2			

Appendix VIII
Avon Park Air Force Range
Light trap samples
3-4-June-1997

SITE	CERAMBYCIDAE	Prionus sp.	CERCOPIDAE	Prosopia bicincta	CICADELLIDAE	Oncometopia sp.	CICINDELIDAE	Cicindela sp.	Cicindela hirtilabrus	COENAGRIONIDAE	DERMAPTERA	DICTYOPTERA	Parcoblatta sp.	DYSTICIDAE	Dysticus sp.	ELATERIDAE	Epicauta sp.	FLATIDAE	GRYLLIDAE	Gryllus sp.	Gryllotalpa sp.	Nemobius sp.	Oecanthus sp.
AP-1					7	1			1	1						63				1		5	
AP-2				6	1				3				1			2						2	
AP-3				30	14						1		2			4						6	
AP-4		1		113	10						1				36	13				2	1	7	
AP-5				391	76					1			2		25	24						8	
AP-6				16	5								2		3							4	
AP-7				79	22					2			2		14	14						7	
AP-8				33	12			1								1	1					3	
AP-9				98	2								2		56	3				1		2	
AP-10				269	27					1			2		9	12				1		6	
AP-11				39	9													1				2	1
AP-12		1		117					1						6	48						6	

Appendix VIII
Avon Park Air Force Range
Light trap samples
3-4-June-1997

SITE	GYRINIDAE	ICHNEUMONIDAE	LAMPYRIDAE	MANTIDAE	Oligonicella scudderi	MANTISPIDAE	MIRIDAE	MYRMELEONTIDAE	PENTATOMIDAE	Euschistus sp.	Nezara viridula	Oebalus pugnax	Podisus sp.	Proxys punctulatus	Thyanta sp.	PYRRHOCORIDAE	Dysdercus suturellus	REDUVIIDAE	Rhiniginia sp.	Sinea sp.	SARCOPHAGIDAE
AP-1	4				1			2		1	1			1	5				1		
AP-2																					
AP-3	5	1													1			1	1		
AP-4	4				8			5					1	2	1			1			
AP-5	2							8					1		6						
AP-6	2					1	1	1							1				1	1	
AP-7			3				1								7		1				
AP-8								4					1		1			2			4
AP-9					11							1	2		6			4			
AP-10	6		2					17						4	5				1		
AP-11	2		1		1								1		2			1			
AP-12	2	2	2		1			5						1							

Appendix VIII
Avon Park Air Force Range
Light trap samples
3-4-June-1997

SITE	SCARABEIDAE	Anomala marginata	Cyclocephala puberula	Diplotaxis bidentata	Dyscinetus morator	Hybosorus illigerus	Ochodaeus icontalis	Oncophagus depressus	Oncophagus gazella	Phyllophaga latifrons	Phyllophaga prunuculina	SILPHIDAE	SPHINGIDAE	TABANIDAE	TETTIGONIIDAE	Conocephalus sp.	Conocephalus fasciatus	Orchelium sp.
AP-1			2		20	4				12				3				
AP-2	1		1	1	1	3	1											
AP-3			1		17	1				67				3				
AP-4					165	9		2	1	29								1
AP-5		1			217	5			1	114		1					2	6
AP-6					10					100				2				1
AP-7			1		25	1				28						2		
AP-8			1		16					48								1
AP-9			1		144	4				27			1	2				
AP-10					40	9				41	1						1	
AP-11					7					47				2				
AP-12			1		92	2		2		45	1			1				

Florida: Highlands Co.
Avon Park Air Force Range
Light trap samples
13-14-Oct.-1997

SITE	CARABIDAE	Agonum sp.	CERCOPIDAE	Prosopia bicincta	CICINDELIDAE	Cicindela sp.	COENAGRIONIDAE	DERMAPTERA	GRYLLIDAE	Gryllus sp.	Nemobius sp.	Oecanthus sp.	MANTIDAE	Oligonicella scudderi	MYRMELEONTIDAE	REDUVIIDAE	Zelus sp.	SCARABAEIDAE	Diplotaxis bidentata	Dyscinetus morator	Trox sp.	TETTIGONIIDAE	Orchelium sp.
AP-1				14																			
AP-2				35			1							1					1		1		1
AP-3				26		1	2				1						1						
AP-4																							
AP-5		1		4		1						1											
AP-6																							
AP-7				5				1			1												1
AP-8				1						2	2												
AP-9				1		1														1			1
AP-10																							
AP-11				12				1		1	2			2	1								
AP-12				5											2								2