# Long-term monitoring and experimental manipulation of a Chihuahuan Desert ant community near Portal, Arizona (1977 – 2009).

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INTRODUCTION

The long-term data for the ant community at the long-term site near Portal, AZ has been used to address a variety of questions examining competition with rodents, impacts on plants, and responses of ants to climate.

Two different types of data on the ant community are collected: bait data and colony data. Collection of bait data started in 1988 and consists of the number of workers of each species observed at baits. Colony data consists of the total number of individual colonies and the number of colony openings for all diurnal species of ants and one nocturnal species, *Myrmecocystus mexicanus*, whose colonies are identified by their stone entrances. Stake-level colony data was provided starting in 1988 in the previous data publication (Ernest et al 2009). Since then, colony data for 1977 – 1986 have been found and are made available in this update (the 1987 plot totals are still included in this table). Additionally, all data has been updated to a format more useful in a relational database. No data is available for any data type from 1995-1997 because changes in methodology resulted in severe data quality issues. Data collection ended in 2009, due to lack of funding. Further details on the ant community and data collection are detailed in this file.

# METADATA CLASS I. DATA SET DESCRIPTORS

A. Data set identity:

Title: Long-term monitoring and manipulation of an ant community in the Chihuahuan Desert near Portal, AZ(1977 – 2009).

B. Data set identification codes: Portal\_ant\_colony\_19772009.csv

Portal\_ant\_bait\_19882009.csv

C. Data set description

Principal Investigators:

Thomas J. Valone, Department of Biology, Saint Louis University, Saint Louis MO 63103.

**Abstract:** The data set covers a 33 year period (1977-2009) of detailed ant sampling of an arid ecosystem in near Portal, Arizona. Each year, ant colonies were counted within 49 circular 2-m radius quadrats on each of 24 experimental plots. In addition, a yearly bait census was conducted using 25 regularly spaced 10 cm diameter crushed bait piles on each plot. The data set should prove useful for studies of population dynamics and species interactions. Sampling was terminated in 2009.

**D.** Key words: ants, bait census, climate, colony counts, competition, granivory, LTREB data

# CLASS II. RESEARCH ORIGIN DESCRIPTORS

A. Overall project description

**Identity:** Bait and colony based data for the 24 experimental plots at the 20 ha study site in the Chihuahuan Desert near Portal, AZ.

**Originators:** Drs. James H. Brown, Diane W Davidson, James Reichman

**Period of Study:** 1977-2009

**Objectives:** To monitor a) the community- and population-level dynamics of desert ants and b) the effects of granivore manipulation on this community.

**Source(s) of funding:** SeePortal\_overview\_metadata.html

B. Specific subproject description

(This description is identical to Ernest et al 2009 because there are no differences in protocols. New information is highlighted in italics)

**1. Site description:** Within the 20 ha study area there are 24 experimental plots. Each plot has an area of 0.25 ha and is fenced to regulate rodent access to the plot. Rodent treatments include controls, kangaroo rat removal, and rodent removal. The ant community, which is also predominately granivorous, is also manipulated. Ant treatments include controls and ant removals. After 1980, poisoning was conducted with AMDRO [American Cyanamide Company] (Davidson et al 1985).

On each plot there are 49 permanent stations marked by rebar stakes forming a 7x7 grid. Rows are numbered 1-7 going from the most northern row to the most southern. Columns are numbered 1-7 going from the most western column to the most eastern. Every stake on a plot has a unique identifying number denoting the coordinate of that stake on that plot. For example, stake 13 is the third stake on the first row (see *Portal\_overview\_metadata.html*, Fig 1). *Starting in 2005, stakes 15 – 17 and 27 were no longer censused in plot 24. Changes to plot shape resulted in all or part of the circular quadrats being outside the plot*.

**Treatments:** See *Portal\_overview\_metadata.html*, Table 1, for details on treatment assignments for each plot. See the previous data publication (Ernest et al 2009) for a history of ant treatments and methods.

**Data Collection Period, Frequency:** Census of the ant community occurred every year over a two week period during July after the summer monsoons have begun. *Data collection ended in 2009.*

**3. Research Methods**

**Field:** *Bait census:* On each plot on one morning in July, we set 25 bait piles on each plot. Bait piles consist of crushed millet placed on the ground in a 10 cm diameter circle. Bait piles are placed at the base of the permanent rebar stakes. In rows 1, 3, 5, and 7 we place bait at all odd column stakes (e.g. stake 11, 13, 15, 17). In rows 2, 4 and 6, we place bait piles at even numbered column stakes (e.g., stake 22, 24, 26). This creates a checkerboard layout of bait piles across the entire plot. Baits are established at dawn and ants are allowed to recruit to bait piles for 1.5 hours. After 1.5 hours, all bait piles are censused recording all individuals of all species within the 10 cm diameter bait circle.

*Colony census:*  We record the number of colonies and the number of colony entrances for all diurnal species within a 2 m radius circle that is centered 2 m north of each of the 49 permanent stakes. For each colony entrance, we record the species identity and determine whether any additional entrances exist within 0.5 m. If so we define that as one colony with multiple entrances.

Exceptions to this methodology:

For all years: For *Solenopsis*, we simply recorded the presence (1) of any colony entrance within the 2 m radius circle.

1977-1983: According to Davidson et al (1985), number of colony entrances within the entire 0.25 ha plot were records for the following species: *Novomessor, Pheidole desertorum, Pheidole militicida, Pogonomyrmex barbatus, Pogonomyrmex maricopa, Pogonomyrmex rugosus*. Nearest census stake was recorded for these species.

1988-2009: For *Novomessor* and *Pogonomyrmex rugosus*, we counted the number of all colony entrances within the entire 0.25 ha plot. Records in the database for these speciesare the number of colony entrances closest to each stake.

1984-1987: It is currently unclear whether the data from 1984-1987 follows the 1977-1983 protocol for full plot surveys or the 1988-2009 protocol. Given documentation found referring to the ant census during this time, we suspect protocols were in-line with 1988-2009, but cannot say with certainty.

**Taxonomy and systematics:** Bolton, B. 1995. A new general catalogue of the ants of the world. Harvard University Press.

**4. Project personnel:**  Our estimate of the number of people who have assisted with the ant census is currently over 75. Many of these people assisted on a volunteer basis and this work would not have been possible without their help.

# CLASS III. DATA SET STATUS AND ACCESSIBILITY

A. Status

Latest Update: July 2009

Latest Archive date: July 2009

**Metadata status**: The metadata are complete and up to date.

**Data verification:** Species have been sent to Dr. Michael Kaspari for independent verification. In the field, all identifications are double checked by Valone if there are any questions.

B. Accessibility

**Storage location and medium:** (Ecological Society of America data archives [Ecological Archives], URL published in each issue of its journals). Original data files reside with Thomas J. Valone on two separate machines. Original datasheets also reside with Thomas J. Valone.

**Contact person:** Thomas J. Valone, Department of Biology, Saint Louis University, Saint Louis MO 63103. email:valone@slu.edu

**Copyright restrictions**: None.

**Proprietary restrictions:** None. However, we do request that authors of publications using the ant database notify Thomas J. Valone (contact information above) of publication of their study. This helps us by allowing us to make accurate reports to the National Science Foundation and document that the scientific community finds the data from this study to be useful.

**Costs:** None.

# CLASS IV. DATA STRUCTURAL DESCRIPTORS

### ANT COLONY CENSUS

A. Data Set File:

**Identity:** Portal\_ ant\_colony\_19772009.csv

**Size:** 34932 rows (including header), 1088 kilobytes.

**Format and storage mode:** ASCII text, comma delimited. No compression scheme used.

**Header information:** The first row of the file contains the variable names below.

Alphanumeric attributes: Mixed.

B. Variable information

**Table 1**. Column information for Portal\_ant\_colony\_19772009.csv

Each row contains information on the number of colonies and colony openings counted separately for each species on a plot (the exception to this is for *Solenopsis* species, for which only the presence of a colony was recorded (as a 1), not the number of colonies or openings). If two openings for a species were < 0.5 m apart they were considered to belong to the same colony. For *Novomessor*, we sample the entire 0.25 ha plot for colonies and record colony location to the nearest quadrat (stake).

|  |  |  |  |
| --- | --- | --- | --- |
| *Variable name* | *Variable definition* | *Storage type* | *Variable codes, definitions, and notes* |
| Day | Day data collected | Integer | 1-31 |
| Month | Month data collected | Character | July |
| Year | Year data collected | Integer | 1977-2009 |
| Plot | Plot number where data collected | Integer | 1-24 |
| Stake | Stake number where data collected | Integer | -99 = missing stake number |
| Species | Species code | Integer | See Table 3 for species codes |
| Colonies | Colonies located in the census area | Integer |  |
| Openings | Total colony openings located in the census area | Integer | -99 = when only presence was recorded (*Solenopsis*) |
| Flag | Data flagged for quality issues | Integer | 1 – 11, see Table 4 for key to flagged data |

### ANT BAIT CENSUS

A. Data Set File:

**Identity:** Portal\_ant\_bait\_19882009.csv

**Size:** 12413 rows (including header), 350 kilobytes.

**Format and storage mode:** ASCII text, comma delimited. No compression scheme used.

**Header information:** The first row of the file contains the variable names below.

Alphanumeric attributes: Mixed.

B. Variable information

Table 2. Column information for Portal\_ant\_bait\_19882009.csv

Each row contains information on the number of individuals of each species censused on a particular quadrat during a particular year.

|  |  |  |  |
| --- | --- | --- | --- |
| *Variable name* | *Variable definition* | *Storage type* | *Variable codes, definitions, and notes* |
| Month | Month data collected | Character | July |
| Year | Year data collected | Integer | 1988 – 2009 |
| Plot | Plot number where data collected | Integer | 1-24 |
| Stake | Stake number where data collected | Integer |  |
| Species | Species code | Character | See Table 4 for species codes and scientific names. |
| Abundance | Number of individuals | Integer |  |

Table 3. Ant Species codes and scientific names

|  |  |  |
| --- | --- | --- |
| **Species Code** | **Scientific Name** | **ID Issues** |
| camp fest | *Camponotus festinatus* | Unclear if in other years this was simply labeled camp sp, or if camp sp is a different species |
| camp sp | *Camponotus sp.* |  |
| cono bico | *Conomyrma bicolor* |  |
| cono insa | *Conomyrma insana* |  |
| crem sp | *Crematogastor sp.* |  |
| irid prui | *Forelius pruinosus (Iridomyrma pruinosum)* | Prior to 1987, simply labeled Dolichoderinae, may include more than this species |
| myrm depi | *Myrmecocystus depilis* |  |
| myrm mexi | *Myrmecocystus mexicanus* |  |
| myrm mimi | *Myrmecocystus mimicus* | Prior to 1982, counts included all myrm mimi and myrm depi |
| myrm nava | *Myrmecocystus navajo* |  |
| novo cock | *Novomessor cockerelli* |  |
| novo sp | *Novomessor spp.* |  |
| phei dese | *Pheidole desertorum* |  |
| phei mili | *Pheidole militicida* |  |
| phei sp | *Pheidole sp* |  |
| phei sita | *Pheidole sitarches* |  |
| phei xero | *Pheidole xerophila* |  |
| phei yell | *Pheidole sp* “yellow” | No further description |
| pogo barb | *Pogonomyrmex barbatus* |  |
| pogo dese | *Pogonomyrmex desertorum* |  |
| pogo imbe | *Pogonomyrmex imbebiculus* |  |
| pogo mari | *Pogonomyrmex maricopa* |  |
| pogo pima | *Pogonomyrmex pima* |  |
| pogo rugo | *Pogonomyrmex rugosus* |  |
| sole sp | *Solenopsis sp.* |  |
| sole xylo | *Solenopsis xyloni* |  |
| unkn | Unknown species | Possibly contains several species within one year and plot |

Table 4: Notes for problem data

|  |  |
| --- | --- |
| **Flag** | **Meaning** |
| 1 | missing stake data |
| 2 | suspect data, count missing assumed to be 1 |
| 3 | no stake recorded, nearest stake recorded in notes, used for stake value |
| 4 | colony near or on edge of census boundary, distance recorded in notes |
| 5 | sole xylo not counted in this census (1978, 1979) |
| 6 | rare species not counted in this census (1981) |
| 7 | only presence (=1) recorded, not abundance |
| 8 | rocky, washed out, or disturbed substrate |
| 9 | no stake level data, only plot totals recorded |
| 10 | plot redone at end of census, this is duplicate data, possible data issues on earlier date |
| 11 | openings number suspect |

# CLASS V. SUPPLEMENTAL DESCRIPTORS

A. Publications using the data set: See *Portal\_overview\_metadata.html*

# LITERATURE CITED

Davidson, D.W., D.A. Samson, and R.S. Inouye. 1985. Granivory in the Chihuahuan Desert: Interactions within and between trophic levels. Ecology 66: 486-502.

Ernest, S. K. Morgan, Thomas J. Valone, and James H. Brown. 2009. Long-term monitoring and experimental manipulation of a Chihuahuan Desert ecosystem near Portal, Arizona, USA. Ecology 90:1708.