README

----- GENERAL INFORMATION -----

DATA TITLE: FFAR Prairie Strips Honey Bees

PROJECT TITLE: Impact of prairie strips on honey bee health

DATA ABSTRACT: This data set includes results from a comparison of honey bee health, population growth and productivity for apiaries kept at farms with prairie strips and farms without prairie strips. This includes data collected over three years and multiple farms within each year. A set of seven separate data files is obtained for this research. Seven corresponding codebooks are included to define and describe the variables, abbreviations, units, and additional information for those data files.

AUTHORS:

Author: Ge Zhang

Institution: Department of Entomology, Iowa State University (formerly)

Department of Entomology, Washington State University (currently)

Address: Food Science and Human Nutrition Building, Room 106, 1945 Ferdinand's Ln Pullman, WA 99164-6376

Email: gezhang@iastate.edu; ge.zhang1@wsu.edu

Author: Matthew O'Neal

Institution: Department of Entomology, Iowa State University

Address: 2003 ATRB, Ames, IA 50011-3140

Email: oneal@iastate.edu

Corresponding author: Matthew O'Neal

ASSOCIATED PUBLICATIONS:

Zhang, G. (2020). Honey bee nutritional health in agricultural landscapes: Relationships to pollen and habitat diversity (Doctoral dissertation, Iowa State University). https://doi.org/10.31274/etd-20200902-176

COLLECTION INFORMATION:

Time period(s): 2017-2020

Location(s): Apiary locations are located across Iowa. Location information (both county and coordinates) can be found in spreadsheet file named "2017_2019_site_coordinates_landscape_composition_FFAR".

----- FILE DIRECTORY -----

This data set has seven separate data files that are listed below.

----- FILE LIST-----

a. 2017_2019_hive_inspection_ffar: this file includes mass of colonies (three year data from 2017 to 2019), area of capped brood (two year data in 2018 and 2019), Varroa mite infestation data

(two year data in 2018 and 2019), and queen sign (queen bee itself, eggs or larvae within three day old; two year data in 2018 and 2019).

b. 2017_2019_pollen_abundance_FFAR - this file includes mass of pollen collected from each colony across season of 2017-2019.

c. c. 2017_2019_pollen_diversity_FFAR - this file provides information about number of flower taxa (richness) found in pollen samples, name of those flower taxa, and percentage of each floral taxon by weight in pollen samples.

d. d. [file name: 2018_2020_overwinter_survival_FFAR - this file includes the data of mortality of honey bee colonies during winters (November to April of second year) of 2018-2019 and 2019-2020

e. 2018_2020_post-winter_population_FFAR - this file includes the data of adult bee population of survival colonies in early springs of 2019 and 2020.

f. 2018_2019_nursebee_lipid_FFAR - this file includes data of lipid content (%) in nurse bees collected from colonies in 2019 and 2020.

g. 2017_2019_landscape_composition_FFAR - file includes data of landscape compositions of each apiary locations/sites within one mile/1.6 km radius and coordinates of apiary locations.

----- CODEBOOK -----

There are seven codebooks that match the seven data files (a to g) and a codebook (g) that contains information on the site codes used throughout. Codebook names are listed as follows.

a. 2017_2019_hive_inspection_FFAR_code_book
b. 2017_2019_pollen_abundance_FFAR_code_book
c. 2017_2019_pollen_diversity_FFAR_code_book
d. 2018_2020_overwinter_survival_FFAR_code_book
e. 2018_2020_post-winter_population_FFAR_code_book
f. 2018_2019_nursebee_lipid_FFAR_code_book
g. 2017_2019_site_coordinates_landscape_composition_FFAR_code_book

----- METHODS AND MATERIALS -----

----- DATA COLLECTION METHODS -----

Methods and materials is described according to the order of data files mentioned above.

a. 2017_2019_hive_inspection_ffar

During hive inspection in field in 2017-2019, colony mass and brood area was measured by digital scale and gridded plexiglass plate; while bees and queen status were visually estimated. Samples of 300 honey bees were also collected during hive inspection and washed with 70% ethanol in a plastic cup. Number of Varroa mite was counted in bottom of plastic cup and recorded as Varroa number per 100 bees. Queen signs were measured by observing queen bee itself, eggs laid by queen bee or young larvae (the subsequent stage of egg).

b. 2017_2019_pollen_abundance_FFA

Pollen samples were collected with entrance pollen traps during 24 period across the growing

seasons of 2017-2019. After pollen collected from apiaries in 2017-2019, it was stored in -20 °C in Dr. O'Neal lab for pollen diversity assessment. In the same time, pollen mass was measured with digital scale in lab.

c. 2017_2019_pollen_diversity_FFAR
    After pollen mass was weighed in 2017-2019, two gram pollen was extracted from pooled pollen sample from two colonies collected on a site on a date. This two gram pollen subsample was sorted into pollen pellets of different colors. The pellets of each color was weighted and dissolved in Caberla's solution and mounted to glass slide. Plant taxonomic source of pollen was identified under compound microscope (Olympus BX40 Binocular Microscope) with x 200 magnification by comparing reference pollen images. Pollen diversity was estimated by number of flower taxa (i.e., taxon richness) found in pollen samples. Percentage of each pollen type was calculated by dividing mass of pollen pellets of the same color by two gram pollen subsample.

d. 2018_2020_overwinter_survival_FFAR
    During winters of 2018-2019 and 2019-2020, honey bee hives were opened or checked with stethoscope twice a month to observe mortality of bee colonies.

e. 2018_2020_post-winter_population_FFAR
    In early springs (the end of March) of 2019 and 2020, adult bee population of survival colonies were visually estimated by inspectors.

f. 2018_2019_nursebee_lipid_FFAR
    Nurse bees were collected from open brood (larvae) of each colony during hive inspection across season during 2018-2019. For lab assay, five bees from each nurse bee sample were crushed with liquid nitrogen. Lipids of nurse bees were extracted with 5ml 2:1 chloroform:methanol in glass vials for 24 h and residual bee tissue was filtered out by glass wool. The liquid lipid extract was adjusted to 6 ml by adding additional 2:1 chloroform:methanol. A volume of 0.1 ml lipid extract was reacted with 0.2 ml sulfuric in glass tubes in boiling water for 10 min, and then with 2 ml sulfo-phospho-vanillin reagent in a dark laboratory location (lab bench drawer), at room temperature for 10 minutes. The absorbance of 0.2 ml reaction products was measured at 525 nm with a Synergy HT spectrophotometer (BioTek, Winooski, USA). A standard curve of a series of lipid solution with known concentration was generated and lipid content was calculated based on it.

g. 2017_2019_site_coordinates_landscape_composition_FFAR
    During 2017-2019, original coordinates of apiaries (same to the research sites) were read from google map in field and transformed to hide the real locations. A 6-letter code for name of each site instead of full name was used for privacy protection. The locations (original coordinates) or full names of the sites used in the STRIPS project are not publicly available. If more information about the locations is needed, please contact prairiestrips@iastate.edu. Landscape

compositions (i.e., the percentage of each land use) within one mile (1.6 km) radius of each apiary were generated from software of ArcMap 10.5.1.

----- DATA PROCESSING METHODS -----

Data files (a, b, d, e) were originally recorded on paper data sheets and then entered in spreadsheets (excel, xlsx format) without further process. Paper data sheets were stored in Dr. Matthew O'Neal lab. The entered data were inspected for accuracy after entry.

For data file "c. 2017_2019_pollen_diversity_FFAR", each floral taxon found in pollen were recorded on paper data sheets and entered in spreadsheets. Mass of each sorted pollen was also recorded on paper data sheets. Percentage of each floral taxon was calculated by dividing mass of pollen pellets of the same color by two-gram pollen subsample. Percentage of each floral taxon was entered into excel spreadsheets.

For data file "f. 2018_2019_nursebee_lipid_FFAR", lipid content was generated by spectrophotometer and saved as excel spreadsheets.

For data file "g. 2017_2019_landscape_composition_FFAR", area of each land use/compositions were generated from ArcMap 10.5.1. Percentage of each land use was a result dividing area of each land use by the research area (1.6 km radius with apiary as the centroid). Coordinates were read from google map and recorded in spreadsheets without further process.

------- SOFTWARE -------

Landscape composition data were generated from software ArcMap 10.5.1.
Name: ArcMap
Version: 10.5.1.
System Requirements: information was cited from ArcGIS website.
https://desktop.arcgis.com/en/system-requirements/10.5/arcgis-desktop-system-requirements.htm

Supported operating systems	Latest update or service pack tested
Windows 10 Home, Pro and Enterprise (64 bit [EM64T])	Creators Update
Windows 8.1 Basic, Pro, and Enterprise (32 bit and 64 bit [EM64T])	Update: April 2017
Windows 7 Ultimate, Professional, and Enterprise (32 bit and 64 bit [EM64T])	SP1

Supported operating systems	Latest update or service pack tested
Windows Server 2016 Standard and Datacenter (64 bit [EM64T])	
Windows Server 2012 R2 Standard and Datacenter (64 bit [EM64T])	Update: April 2017
Windows Server 2012 Standard and Datacenter (64 bit [EM64T])	Update: April 2017
Windows Server 2008 R2 Standard, Enterprise, and Datacenter (64 bit [EM64T])	SP1
Windows Server 2008 Standard, Enterprise, and Datacenter (32 bit and 64 bit [EM64T])	SP2

URL: https://www.arcgis.com/index.html
Developer: Esri
Additional Notes: N/A

------- EQUIPMENT -------

Lipid content data is generated from spectrophotometer.
Manufacturer: Biotech
Model: Synergy HT
Embedded Software/Firmware Name: Gen5
Embedded Software/Firmware Version: 2.09
Additional Notes: the equipment is located at 251 Bessey Hall, 2200 Osborn Dr. Ames, IA 50011

------- SHARING / ACCESS -------

Data license, CC-BY (Creative Commons Attribution), is applied to the data.