

Lab 9

Stat 426

Spring 2021

Instructions

Complete all questions. To prepare for the randomly collected lab, follow the instructions on the class website to prepare the work for submission. These submission rules will apply to all labs throughout the semester.

Graphs

- (1) Listed below are 8 years of data collected by the U.S. Bureau of Land Management on the proghorn (*Antilocapra americana*) population in the Thunder Basin National Grassland in Wyoming. The variables are fawn count y , proghorn population size u , annual precipitation v , and winter severity index w . Create a scatterplot matrix of the variables.

y	u	v	w
290	920	13.2	2
240	870	11.5	3
200	720	10.8	4
230	850	12.3	2
320	960	12.6	3
190	680	10.6	5
340	970	14.1	1
210	790	11.2	3

- (2) To decrease the use of insecticides in agriculture, predator insects are often released to combat insect pests. Coccinellids (lady beetles) in particular have a voracious appetite for aphids. In a 2005 study (Pervez and Omkar 2005), entomologists looked at the suitability of using lady beetles to control a particular aphid, *Myzus persicae* (common name is “green peach aphid”), a serious pest of many fruit and vegetable crops. In the study, the entomologists experimentally ascertained aphid kill rates for three different species of lady beetles. Provided below is the data for the beetles (feeding rates (# eaten 24 hr)) and aphids (#/jar).
- (a) For each type of lady beetle, create a scatterplot (with points) of the feeding rate of the beetle versus aphid density
- (b) Add a kill rate (see module 1) curve to each of the beetle/aphid graphs; use the following constants in the kill rate equation:
- (i) *C.sexmaculata*: $a = 234.5, b = 261.9$
 - (ii) *C.transversalis*: $a = 178.9, b = 194.9$
 - (iii) *P.dissecta*: $a = 100.4, b = 139.8$
- (c) Plot all three species of lady beetles on *one* graph

- (i) Use different symbols for each species of beetles
- (ii) Add the fitted kill rate curves for each species of beetles
- (iii) Create a legend

APHID DENSITY (#/jar)	Cheilomenes sexmaculata	Coccinella transversalis	Propylea dissecta
25	21	21	15
50	37	37	26
100	65	60	42
200	102	90	59
300	125	109	69
400	141	120	74
500	154	129	79
600	164	136	82
700	170	140	83
800	177	143	85