

Biostatistics (BIOL0031132104) - Assignment #1

(released on Sept. 26th, due on Oct 7th)

1. In a study of diet preferences in leafcutter ants, a researcher presented 20 randomly chosen ant colonies with leaves from the two most common tree species in the surrounding forest. The leaves were placed in piles of 100, one pile for each tree species, close to colony entrances. Leaves were cut so that each was small enough to be carried by a single ant. After 24 hours, the researcher returned and counted the number of leaves remaining of the original 100 of each species. Some of the results are shown in the following table. Using these results, the researcher estimated the proportion of *Spondius mombin* leaves taken as 0.65 and concluded that the ants have a preference for leaves of this species. [40 marks]

在一项关于食叶蚁饮食偏好的研究中，研究人员向 20 个随机选择的蚁群提供了周围森林中两种最常见树种的树叶。树叶以 100 片为一堆，每种树叶一堆，堆放在蚁群入口附近。树叶被裁剪得足够小，以便一只蚂蚁搬运。24 小时后，研究人员返回计算每个树种 100 片树叶中剩余的数量。部分结果见下表。根据这些结果，研究人员估算出 *Spondius mombin* 的叶片比例为 0.65，并得出结论：蚂蚁偏爱这种叶片。

Tree species	Number of leaves removed
<i>Spondius mombin</i> (黄槟榔青)	1561
<i>Sapium thelocarpum</i> (乌柏属的某种)	851
Total	2412

- a. Identify the two variables whose association is displayed in the table. Which is the explanatory variable and which is the response variable? Are they numeric or categorical? 找出表格中显示其关联的两个变量。哪个是解释变量，哪个是响应变量？它们是数字变量还是分类变量？ [20 marks]
- b. Why do the 2412 leaves used in the calculation of the proportion not represent a random sample? 为什么计算比例时使用的 2412 片树叶不代表随机样本？ [10 marks]
- c. Would treating the 2412 leaves as a random sample most likely affect the accuracy of the estimate of diet preference or the precision of the estimate? 将 2412 片树叶作为随机样本最有可能影响饮食偏好估计值的准确性或估计值的精确性吗？ [10 marks]

2. The following data are measurements of body mass, in grams, of finches captured in mist nets during a survey of various habitats in Kenya, East Africa (Schluter 1988). Read the data file and make calculations and a figure in R. [60 marks]

以下数据是在东非肯尼亚调查各种栖息地时用雾网捕获的雀类的体重测量值（单位：克）。数据文件请见‘chap03q04KenyaFinches.csv’，请在 R 中完成计算和绘图。

Bird species	Body mass
Crimson-rumped waxbill (赤腰梅花雀)	8, 8, 8, 8, 8, 8, 8, 6, 7, 7, 7, 8, 8, 8, 7, 7, 7
Cutthroat finch (环喉雀)	16, 16, 16, 12, 16, 15, 15, 17, 15, 16, 15, 16
White-browed sparrow weaver (白眉织雀)	40, 43, 37, 38, 43, 33, 35, 37, 36, 42, 36, 36, 39, 37, 34, 41

- a. Calculate the mean body mass of each of these three finch species. Which species is largest, and which is smallest? 计算这三种雀类的平均体重。哪种最大，哪种最小？[10 marks]
- b. Which species has the greatest standard deviation in body mass? Which has the least? 哪个物种的体重标准偏差最大？哪个最小？[10 marks]
- c. Calculate the coefficient of variation (CV) in mass for each finch species. How different are the coefficients between the species? Compare the differences in CVs with the differences in standard deviation calculated in part (b). 计算每个雀类的体重变异系数（CV）。各物种之间的系数有多大差异？将 CV 的差异与 (b) 部分计算的标准偏差的差异进行比较。[20 marks]
- d. Choose one graph type to plot the data in the table to show the relationship between bird species and body mass. 选择一种图的类型绘制表格中的数据，以表示雀类与体重之间的关系。[20 marks]