HW2

Mushroom dataset

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目錄

一、變數定義

表 1: 主要分類變數

變數	類型	定義	註記
family	character	蘑菇所屬的科	
name	character	蘑菇的名稱	
class	nominal	蘑菇是否可食	poisonous=p, edibile=e

表 2: 蘑菇型態變數

變數	類型	定義	註記
cap-diameter	numerical	蘑菇帽子的直徑(公分)	兩個值表示最小值與最大值 一個值表示平均值
cap-shape	nominal	蘑菇帽子的形狀	bell=b, conical=c, convex=x, flat=f, sunken=s, spherical=p, others=o
cap-surface	nominal	帽子的表面特徵	fibrous=i, grooves=g, scaly=y, smooth=s, shiny=h, leathery=l, silky=k, sticky=t, wrinkled=w, fleshy=e
cap-color	nominal	帽子的顏色	brown=n, buff=b, gray=g, green=r, pink=p, purple=u,red=e, white=w, yellow=y, blue=l, orange=o, black=k
does-bruise-bleed	nominal	是否會瘀傷或出汁	bruises-or-bleeding=t, no=f

變數	類型	定義	註記
gill-attachment	nominal	蕈褶如何附著在菌柄上	adnate=a, adnexed=x, decurrent=d, free=e, sinuate=s, pores=p, none=f, unknown=?
gill-spacing	ordinal	蕈褶間距	close=c, distant=d, none=f
gill-color	nominal	蕈褶顏色	see cap-color + none=f

表 3: 菌柄變數

變數	類型	定義	註記
stem-height	numerical	菌柄高度 (公分)	兩個值表示最小值與最大值 一個值表示平均值
stem-width	numerical	菌柄直徑 (毫米)	兩個值表示最小值與最大值 一個值表示平均值
stem-root	nominal	菌柄的基部形狀	bulbous=b, swollen=s, club=c, cup=u, equal=e, rhizomorphs=z, rooted=r
stem-surface	nominal	菌柄表面特徵	see cap-surface + none=f
stem-color	nominal	菌柄顏色	see cap-color + none=f

表 4: 其他變數

變數	類型	定義	註記
veil-type	nominal	菌幕類型	partial=p, universal=u
veil-color	nominal	菌幕顏色	see cap-color + none=f
has-ring	nominal	是否有菌環	ring=t, none=f
ring-type	nominal	菌環類型	cobwebby=c, evanescent=e, flaring=r, grooved=g, large=l, pendant=p, sheathing=s, zone=z, scaly=y, movable=m, none=f, unknown=?
spore-print-color	nominal	孢子印顏色	see cap color
habitat	nominal	生長環境	grasses=g, leaves=l, meadows=m, paths=p, heaths=h, urban=u, waste=w, woods=d
season	ordinal	生長季節	spring=s, summer=u, autumn=a, winter=w

這份資料集一般來說所感興趣的反應變數是class蘑菇是否可食，並且解釋變數共有20個，其中17個為類別變數，3個為數值變數。

這3個數值變數在資料中有兩種紀錄方式

- 兩個值：最小值與最大值
- 一個值：平均值

並且兩個值是中括號包起來以逗點隔開，以上情況導致分析上困難，也無法看到變數的敘述性統計量，因此這三個變數皆做了以下處理：

- 各自都拆成兩個變數，表示原變數的最小值以及最大值
- 如果資料原本是只有紀錄一個平均值，則兩個變數最小與最大都是以平均值表示

二、資料敘述

```
library(reticulate)
library(Hmisc)
library(readr)
library(dplyr)
library(tidyr)

rm(list = ls())
data <- read_delim("primary_data.csv",
                           delim = ";", escape_double = FALSE, trim_ws = TRUE)

colnames(data) <- gsub("-", "_", colnames(data))

data <- data %>%
  mutate(across(!c(family, name, cap_diameter, stem_height, stem_width), as.factor))

data <- data %>%
  mutate(cap_diameter = as.character(cap_diameter)) %>%
  separate(
    cap_diameter,
    into = c("cap_diameter_min", "cap_diameter_max"),
    sep = ",",
    fill = "right",
    convert = TRUE
  ) %>%
  mutate(cap_diameter_max = ifelse(is.na(cap_diameter_max), cap_diameter_min, cap_diameter_max)) %>%
  mutate(stem_height = as.character(stem_height)) %>%
  separate(
    stem_height,
    into = c("stem_height_min", "stem_height_max"),
    sep = ",",
    fill = "right",
    convert = TRUE
  ) %>%
  mutate(stem_height_max = ifelse(is.na(stem_height_max), stem_height_min, stem_height_max)) %>%
  mutate(stem_width = as.character(stem_width)) %>%
  separate(
    stem_width,
    into = c("stem_width_min", "stem_width_max"),
    sep = ",",
    fill = "right",
    convert = TRUE
  ) %>%
  mutate(stem_width_max = ifelse(is.na(stem_width_max), stem_width_min, stem_width_max)) %>%
  mutate(across(
    c(
      cap_diameter_min,
      cap_diameter_max,
      stem_height_min,
      stem_height_max,
      stem_width_min,
      stem_width_max
```

```
    ),
    ~ gsub("\\[|\\]", "", .)
  )) %>%
  mutate(across(
    c(
      cap_diameter_min,
      cap_diameter_max,
      stem_height_min,
      stem_height_max,
      stem_width_min,
      stem_width_max
    ),
    as.numeric
  ))


latex(describe(data), descript = "Descriptive Statistics",
      file="", caption.placement = "top")
```

data

26 Variables 173 Observations

---

family

n	missing	distinct
173	0	23

```
lowest : Amanita Family     Bolbitius Family   Bolete Family      Bracket Fungi      Chanterelle Family
highest: Russula Family     Saddle-Cup Family  Stropharia Family  Tricholoma Family  Wax Gill Family
```

---

name

n	missing	distinct
173	0	173

```
lowest : Amethyst Deceiver        Aniseed Funnel Cap       Apricot Fungus           Bare-toothed Russula     Bay Bolete
highest: Yellow-gilled Russula    Yellow-staining Mushroom Yellow-stemmed Bell Cap  Yellow Swamp Russula     Yellow Wax cap
```

---

class

n	missing	distinct
173	0	2

```
Value          e     p
Frequency     77    96
Proportion 0.445 0.555
```

---

cap_diameter_min

n	missing	distinct	Info	Mean	pMedian	Gmd	.05	.10	.25	.50	.75	.90	.95
173	0	14	0.976	4.043	3.5	3.038	1	1	2	3	5	7	8

```
Value       0.4   0.5   0.7   1.0   2.0   3.0   4.0   5.0   6.0   7.0   8.0  10.0  12.0  50.0
Frequency     2     4     1    17    39    24    26    29    11     4     9     4     2     1
Proportion 0.012 0.023 0.006 0.098 0.225 0.139 0.150 0.168 0.064 0.023 0.052 0.023 0.012 0.006

For the frequency table, variable is rounded to the nearest 0
```

---

cap_diameter_max

n	missing	distinct	Info	Mean	pMedian	Gmd	.05	.10	.25	.50	.75	.90	.95
173	0	20	0.991	9.435	8.5	6.548	2	3	5	8	12	15	20

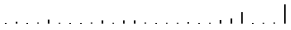
Value	1.0	1.3	1.5	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	12.0	14.0
Frequency	3	1	4	7	6	12	18	16	7	16	3	28	18	3
Proportion	0.017	0.006	0.023	0.040	0.035	0.069	0.104	0.092	0.040	0.092	0.017	0.162	0.104	0.017

Value	15.0	18.0	20.0	25.0	30.0	50.0
Frequency	15	3	5	5	2	1
Proportion	0.087	0.017	0.029	0.029	0.012	0.006

For the frequency table, variable is rounded to the nearest 0

---

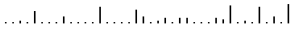
cap_shape



n	missing	distinct
173	0	27

lowest : [b, f, s] [b, f] [b, x, f] [b, x] [b]
highest: [x, f] [x, o] [x, p] [x, s] [x]

Cap_surface

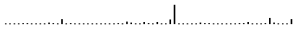


n	missing	distinct
133	40	40

lowest : [d, e, y, i] [d, k, s] [d, k] [d, s] [d]
highest: [t] [w, t] [w] [y, s] [y]

---

cap_color



n	missing	distinct
173	0	67

lowest : [b, p, e, y] [b, u] [b] [e, n, p, w] [e, n, y]
highest: [y, n] [y, o, g, n, r] [y, o, r, n] [y, o] [y]

---

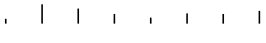
does_bruise_or_bleed

n	missing	distinct
173	0	2

Value	[f]	[t]
Frequency	143	30
Proportion	0.827	0.173

---

gill_attachment

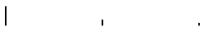


n	missing	distinct
145	28	8

Value	[a, d]	[a]	[d]	[e]	[f]	[p]	[s]	[x]
Frequency	8	32	25	16	10	17	16	21
Proportion	0.055	0.221	0.172	0.110	0.069	0.117	0.110	0.145

---

gill_spacing

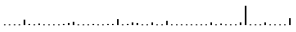


n	missing	distinct
102	71	3

Value	[c]	[d]	[f]
Frequency	70	22	10
Proportion	0.686	0.216	0.098

---

gill_color

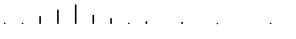


n	missing	distinct
173	0	59

```
lowest : [b, p, w] [b, u]    [b]       [e]       [f]
highest: [y, o, e] [y, r, k] [y, r]    [y, w]    [y]
```

---

stem_height_min



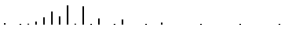
n	missing	distinct	Info	Mean	pMedian	Gmd	.05	.10	.25	.50	.75	.90	.95
173	0	12	0.957	4.306	4	2.233	2.0	2.0	3.0	4.0	5.0	6.8	8.0

Value	0	1	2	3	4	5	6	7	8	10	12	15
Frequency	3	2	21	38	52	24	15	3	7	5	1	2
Proportion	0.017	0.012	0.121	0.220	0.301	0.139	0.087	0.017	0.040	0.029	0.006	0.012

For the frequency table, variable is rounded to the nearest 0

---

stem_height_max



n	missing	distinct	Info	Mean	pMedian	Gmd	.05	.10	.25	.50	.75	.90	.95
173	0	19	0.977	8.873	8	4.37	4.0	5.0	6.0	8.0	10.0	14.8	15.0

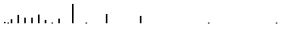
Value	0	2	3	4	5	6	7	8	9	10	11	12	14	15
Frequency	3	1	2	6	14	25	16	37	2	35	1	12	1	10
Proportion	0.017	0.006	0.012	0.035	0.081	0.145	0.092	0.214	0.012	0.202	0.006	0.069	0.006	0.058

Value	18	20	25	30	35
Frequency	1	4	1	1	1
Proportion	0.006	0.023	0.006	0.006	0.006

For the frequency table, variable is rounded to the nearest 0

---

stem_width_min



n	missing	distinct	Info	Mean	pMedian	Gmd	.05	.10	.25	.50	.75	.90	.95
173	0	16	0.98	8.529	8	6.804	1	2	4	8	10	19	20

Value	0.0	0.5	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	10.0	12.0	15.0	20.0
Frequency	3	1	9	18	12	12	19	7	1	10	42	1	20	16
Proportion	0.017	0.006	0.052	0.104	0.069	0.069	0.110	0.040	0.006	0.058	0.243	0.006	0.116	0.092

Value	30.0	40.0
Frequency	1	1
Proportion	0.006	0.006

For the frequency table, variable is rounded to the nearest 0

---

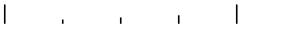
stem_width_max

n	missing	distinct	Info	Mean	pMedian	Gmd	.05	.10	.25	.50	.75	.90	.95
173	0	21	0.992	15.79	14	13.49	2	3	8	12	20	30	40

```
lowest :   0   1   2   3   4, highest:  40  50  60  80 100
```

---

stem_root

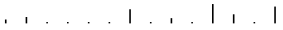


n	missing	distinct
27	146	5

Value	[b]	[c]	[f]	[r]	[s]
Frequency	9	2	3	4	9
Proportion	0.333	0.074	0.111	0.148	0.333

---

stem_surface

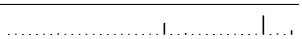


n	missing	distinct
65	108	14

Value	[f]	[g]	[h]	[i, s]	[i, t]	[i, y]	[i]	[k, s]	[k]	[s, h]	[s]	[t]
Frequency	3	5	1	1	1	1	11	1	4	1	15	7
Proportion	0.046	0.077	0.015	0.015	0.015	0.015	0.169	0.015	0.062	0.015	0.231	0.108

Value	[y, s]	[y]
Frequency	1	13
Proportion	0.015	0.200

stem_color



n	missing	distinct
173	0	41

lowest :	[b, u]	[e, n]	[e, u, y]	[e, y]	[e]
highest:	[w]	[y, e, n]	[y, n]	[y, o, k]	[y]

veil_type

n	missing	distinct	value
9	164	1	[u]

Value	[u]
Frequency	9
Proportion	1

veil_color

n	missing	distinct
21	152	7

Value	[e, n]	[k]	[n]	[u]	[w]	[y, w]	[y]
Frequency	1	1	1	1	15	1	1
Proportion	0.048	0.048	0.048	0.048	0.714	0.048	0.048

has_ring

n	missing	distinct
173	0	2

Value	[f]	[t]
Frequency	130	43
Proportion	0.751	0.249

ring_type

n	missing	distinct
166	7	13

Value	[e, g]	[e]	[f]	[g, p]	[g]	[l, e]	[l, p]	[l, r]	[l]	[m]	[p]	[r]
Frequency	1	6	137	2	2	1	1	2	2	1	2	3
Proportion	0.006	0.036	0.825	0.012	0.012	0.006	0.006	0.012	0.012	0.006	0.012	0.018

Value	[z]
Frequency	6
Proportion	0.036

Spore_print_color

n	missing	distinct
18	155	8

Value	[g]	[k, r]	[k, u]	[k]	[n]	[p, w]	[p]	[w]
Frequency	1	1	1	5	3	1	3	3
Proportion	0.056	0.056	0.056	0.278	0.167	0.056	0.167	0.167

habitat

```
   n    missing    distinct
 173          0          21

lowest : [d, h]    [d]       [g, d, h] [g, d]    [g, h, d]
highest: [m, d]    [m, h]    [m]       [p, d]    [w]
```

season

```
   n    missing    distinct
 173          0          10

Value            [a, w]          [a]    [s, a, w] [s, u, a, w]    [s, u, a]       [s, u]
Frequency            15           16            1           13            5            3
Proportion        0.087        0.092        0.006        0.075        0.029        0.017

Value              [s]    [u, a, w]       [u, a]          [u]
Frequency            1           12          106            1
Proportion       0.006        0.069        0.613        0.006
```

三、Table one

```
library(table1)

table1(~.-family-name |class, data = data)
```

	e	p	Overall
	(N=77)	(N=96)	(N=173)
cap_diameter_min			
Mean (SD)	4.75 (5.74)	3.47 (2.27)	4.04 (4.22)
Median [Min, Max]	4.00 [0.500, 50.0]	3.00 [0.400, 10.0]	3.00 [0.400, 50.0]
cap_diameter_max			
Mean (SD)	10.9 (7.29)	8.29 (5.58)	9.44 (6.50)
Median [Min, Max]	10.0 [1.50, 50.0]	7.00 [1.00, 30.0]	8.00 [1.00, 50.0]
cap_shape			
[b, f, s]	0 (0%)	1 (1.0%)	1 (0.6%)
[b, f]	2 (2.6%)	3 (3.1%)	5 (2.9%)
[b, x, f]	0 (0%)	1 (1.0%)	1 (0.6%)
[b, x]	0 (0%)	3 (3.1%)	3 (1.7%)
[b]	2 (2.6%)	8 (8.3%)	10 (5.8%)
[c, f]	0 (0%)	2 (2.1%)	2 (1.2%)
[c, x, f]	1 (1.3%)	0 (0%)	1 (0.6%)
[c, x]	1 (1.3%)	0 (0%)	1 (0.6%)
[c]	1 (1.3%)	2 (2.1%)	3 (1.7%)
[f, s]	3 (3.9%)	5 (5.2%)	8 (4.6%)
[f, x]	1 (1.3%)	1 (1.0%)	2 (1.2%)
[f]	4 (5.2%)	4 (4.2%)	8 (4.6%)
[o]	1 (1.3%)	7 (7.3%)	8 (4.6%)
[p, b]	1 (1.3%)	2 (2.1%)	3 (1.7%)
[p, c, o]	1 (1.3%)	0 (0%)	1 (0.6%)
[p, f]	2 (2.6%)	0 (0%)	2 (1.2%)
[p, x, f]	2 (2.6%)	0 (0%)	2 (1.2%)
[p, x]	3 (3.9%)	1 (1.0%)	4 (2.3%)

	e	p	Overall
[p]	0 (0%)	1 (1.0%)	1 (0.6%)
[s, o]	2 (2.6%)	0 (0%)	2 (1.2%)
[s]	4 (5.2%)	5 (5.2%)	9 (5.2%)
[x, f, s]	7 (9.1%)	6 (6.3%)	13 (7.5%)
[x, f]	14 (18.2%)	15 (15.6%)	29 (16.8%)
[x, o]	0 (0%)	1 (1.0%)	1 (0.6%)
[x, p]	1 (1.3%)	1 (1.0%)	2 (1.2%)
[x, s]	1 (1.3%)	2 (2.1%)	3 (1.7%)
[x]	23 (29.9%)	25 (26.0%)	48 (27.7%)
Cap_surface			
[d, e, y, i]	0 (0%)	1 (1.0%)	1 (0.6%)
[d, k, s]	0 (0%)	1 (1.0%)	1 (0.6%)
[d, k]	1 (1.3%)	1 (1.0%)	2 (1.2%)
[d, s]	1 (1.3%)	0 (0%)	1 (0.6%)
[d]	4 (5.2%)	5 (5.2%)	9 (5.2%)
[e, k, s, h]	0 (0%)	1 (1.0%)	1 (0.6%)
[e, t, k]	0 (0%)	1 (1.0%)	1 (0.6%)
[e, y]	1 (1.3%)	0 (0%)	1 (0.6%)
[e]	3 (3.9%)	2 (2.1%)	5 (2.9%)
[g, h]	0 (0%)	1 (1.0%)	1 (0.6%)
[g, s, d]	0 (0%)	1 (1.0%)	1 (0.6%)
[g, s, h, t]	1 (1.3%)	0 (0%)	1 (0.6%)
[g, s, t]	1 (1.3%)	0 (0%)	1 (0.6%)
[g]	5 (6.5%)	7 (7.3%)	12 (6.9%)
[h, s, d]	1 (1.3%)	0 (0%)	1 (0.6%)
[h, s, t]	0 (0%)	1 (1.0%)	1 (0.6%)
[h, t, w]	0 (0%)	1 (1.0%)	1 (0.6%)
[h, t, y]	0 (0%)	1 (1.0%)	1 (0.6%)
[h, t]	6 (7.8%)	4 (4.2%)	10 (5.8%)
[h]	3 (3.9%)	2 (2.1%)	5 (2.9%)
[i, e]	0 (0%)	1 (1.0%)	1 (0.6%)
[i, y]	2 (2.6%)	0 (0%)	2 (1.2%)
[i]	0 (0%)	4 (4.2%)	4 (2.3%)
[k, e]	0 (0%)	1 (1.0%)	1 (0.6%)
[k]	0 (0%)	4 (4.2%)	4 (2.3%)
[l]	2 (2.6%)	2 (2.1%)	4 (2.3%)
[s, d]	1 (1.3%)	0 (0%)	1 (0.6%)
[s, h]	0 (0%)	1 (1.0%)	1 (0.6%)
[s, i]	0 (0%)	1 (1.0%)	1 (0.6%)
[s, t]	2 (2.6%)	2 (2.1%)	4 (2.3%)
[s, y]	1 (1.3%)	2 (2.1%)	3 (1.7%)
[s]	8 (10.4%)	5 (5.2%)	13 (7.5%)
[t, h, s]	1 (1.3%)	0 (0%)	1 (0.6%)
[t, h]	1 (1.3%)	1 (1.0%)	2 (1.2%)
[t, w, d]	0 (0%)	1 (1.0%)	1 (0.6%)
[t]	2 (2.6%)	10 (10.4%)	12 (6.9%)
[w, t]	1 (1.3%)	0 (0%)	1 (0.6%)
[w]	2 (2.6%)	3 (3.1%)	5 (2.9%)
[y, s]	1 (1.3%)	0 (0%)	1 (0.6%)
[y]	7 (9.1%)	7 (7.3%)	14 (8.1%)
Missing	19 (24.7%)	21 (21.9%)	40 (23.1%)
cap_color			

	e	p	Overall
[b, p, e, y]	0 (0%)	1 (1.0%)	1 (0.6%)
[b, u]	1 (1.3%)	0 (0%)	1 (0.6%)
[b]	1 (1.3%)	0 (0%)	1 (0.6%)
[e, n, p, w]	0 (0%)	1 (1.0%)	1 (0.6%)
[e, n, y]	2 (2.6%)	0 (0%)	2 (1.2%)
[e, n]	0 (0%)	2 (2.1%)	2 (1.2%)
[e, o, k]	0 (0%)	1 (1.0%)	1 (0.6%)
[e, o]	0 (0%)	1 (1.0%)	1 (0.6%)
[e, p, w]	0 (0%)	1 (1.0%)	1 (0.6%)
[e, u, y]	0 (0%)	1 (1.0%)	1 (0.6%)
[e]	0 (0%)	3 (3.1%)	3 (1.7%)
[g, k]	1 (1.3%)	1 (1.0%)	2 (1.2%)
[g, n, k]	0 (0%)	1 (1.0%)	1 (0.6%)
[g, n]	6 (7.8%)	4 (4.2%)	10 (5.8%)
[g, r, k, n]	0 (0%)	1 (1.0%)	1 (0.6%)
[g, r, n]	0 (0%)	2 (2.1%)	2 (1.2%)
[g, u, n, p]	1 (1.3%)	0 (0%)	1 (0.6%)
[g, u, n]	0 (0%)	1 (1.0%)	1 (0.6%)
[g]	0 (0%)	1 (1.0%)	1 (0.6%)
[k, n, w]	1 (1.3%)	0 (0%)	1 (0.6%)
[l, g, b, w]	1 (1.3%)	0 (0%)	1 (0.6%)
[l, k]	0 (0%)	1 (1.0%)	1 (0.6%)
[l, r, w]	1 (1.3%)	0 (0%)	1 (0.6%)
[l, u, g, n]	1 (1.3%)	0 (0%)	1 (0.6%)
[l, y]	1 (1.3%)	0 (0%)	1 (0.6%)
[n ,w]	1 (1.3%)	0 (0%)	1 (0.6%)
[n, b]	1 (1.3%)	1 (1.0%)	2 (1.2%)
[n, e, y]	0 (0%)	1 (1.0%)	1 (0.6%)
[n, e]	1 (1.3%)	4 (4.2%)	5 (2.9%)
[n, g]	3 (3.9%)	0 (0%)	3 (1.7%)
[n, o, e]	1 (1.3%)	0 (0%)	1 (0.6%)
[n, o, y, w]	0 (0%)	1 (1.0%)	1 (0.6%)
[n, o]	2 (2.6%)	2 (2.1%)	4 (2.3%)
[n, p, e]	1 (1.3%)	1 (1.0%)	2 (1.2%)
[n, r, u, y]	1 (1.3%)	0 (0%)	1 (0.6%)
[n, w]	1 (1.3%)	3 (3.1%)	4 (2.3%)
[n, y, e]	1 (1.3%)	0 (0%)	1 (0.6%)
[n, y, w]	1 (1.3%)	0 (0%)	1 (0.6%)
[n, y]	3 (3.9%)	6 (6.3%)	9 (5.2%)
[n]	22 (28.6%)	16 (16.7%)	38 (22.0%)
[o, b]	1 (1.3%)	0 (0%)	1 (0.6%)
[o, e, n, k]	0 (0%)	1 (1.0%)	1 (0.6%)
[o, n]	1 (1.3%)	0 (0%)	1 (0.6%)
[o, p, e]	1 (1.3%)	0 (0%)	1 (0.6%)
[o, y, r]	0 (0%)	1 (1.0%)	1 (0.6%)
[o, y]	0 (0%)	3 (3.1%)	3 (1.7%)
[o]	0 (0%)	2 (2.1%)	2 (1.2%)
[p]	0 (0%)	2 (2.1%)	2 (1.2%)
[r, l]	0 (0%)	1 (1.0%)	1 (0.6%)
[r, n]	0 (0%)	1 (1.0%)	1 (0.6%)
[r, p, y]	0 (0%)	1 (1.0%)	1 (0.6%)
[r, y]	0 (0%)	1 (1.0%)	1 (0.6%)

	e	p	Overall
[r]	0 (0%)	1 (1.0%)	1 (0.6%)
[u, k]	1 (1.3%)	0 (0%)	1 (0.6%)
[u]	0 (0%)	2 (2.1%)	2 (1.2%)
[w, g]	1 (1.3%)	1 (1.0%)	2 (1.2%)
[w, n]	2 (2.6%)	2 (2.1%)	4 (2.3%)
[w, p, o]	1 (1.3%)	0 (0%)	1 (0.6%)
[w, u]	0 (0%)	1 (1.0%)	1 (0.6%)
[w, y, g, n]	0 (0%)	1 (1.0%)	1 (0.6%)
[w, y]	1 (1.3%)	1 (1.0%)	2 (1.2%)
[w]	6 (7.8%)	6 (6.3%)	12 (6.9%)
[y, n]	0 (0%)	3 (3.1%)	3 (1.7%)
[y, o, g, n, r]	0 (0%)	1 (1.0%)	1 (0.6%)
[y, o, r, n]	0 (0%)	1 (1.0%)	1 (0.6%)
[y, o]	0 (0%)	1 (1.0%)	1 (0.6%)
[y]	6 (7.8%)	4 (4.2%)	10 (5.8%)
does_bruise_or_bleed			
[f]	63 (81.8%)	80 (83.3%)	143 (82.7%)
[t]	14 (18.2%)	16 (16.7%)	30 (17.3%)
gill_attachment			
[a, d]	5 (6.5%)	3 (3.1%)	8 (4.6%)
[a]	11 (14.3%)	21 (21.9%)	32 (18.5%)
[d]	9 (11.7%)	16 (16.7%)	25 (14.5%)
[e]	10 (13.0%)	6 (6.3%)	16 (9.2%)
[f]	4 (5.2%)	6 (6.3%)	10 (5.8%)
[p]	12 (15.6%)	5 (5.2%)	17 (9.8%)
[s]	7 (9.1%)	9 (9.4%)	16 (9.2%)
[x]	9 (11.7%)	12 (12.5%)	21 (12.1%)
Missing	10 (13.0%)	18 (18.8%)	28 (16.2%)
gill_spacing			
[c]	29 (37.7%)	41 (42.7%)	70 (40.5%)
[d]	13 (16.9%)	9 (9.4%)	22 (12.7%)
[f]	4 (5.2%)	6 (6.3%)	10 (5.8%)
Missing	31 (40.3%)	40 (41.7%)	71 (41.0%)
gill_color			
[b, p, w]	0 (0%)	1 (1.0%)	1 (0.6%)
[b, u]	1 (1.3%)	0 (0%)	1 (0.6%)
[b]	1 (1.3%)	0 (0%)	1 (0.6%)
[e]	0 (0%)	1 (1.0%)	1 (0.6%)
[f]	4 (5.2%)	6 (6.3%)	10 (5.8%)
[g, k]	1 (1.3%)	1 (1.0%)	2 (1.2%)
[g, n, u]	0 (0%)	1 (1.0%)	1 (0.6%)
[g, n]	1 (1.3%)	2 (2.1%)	3 (1.7%)
[g, p]	1 (1.3%)	0 (0%)	1 (0.6%)
[g, r, w]	0 (0%)	1 (1.0%)	1 (0.6%)
[g, u]	0 (0%)	1 (1.0%)	1 (0.6%)
[g, w, y]	1 (1.3%)	0 (0%)	1 (0.6%)
[g, w]	2 (2.6%)	0 (0%)	2 (1.2%)
[g]	3 (3.9%)	1 (1.0%)	4 (2.3%)
[k, n]	2 (2.6%)	4 (4.2%)	6 (3.5%)
[k, p, w]	1 (1.3%)	0 (0%)	1 (0.6%)
[k, p]	0 (0%)	1 (1.0%)	1 (0.6%)
[n, e, y]	0 (0%)	1 (1.0%)	1 (0.6%)

	e	p	Overall
[n, p]	0 (0%)	2 (2.1%)	2 (1.2%)
[n, r]	0 (0%)	1 (1.0%)	1 (0.6%)
[n, u]	0 (0%)	1 (1.0%)	1 (0.6%)
[n, w]	0 (0%)	2 (2.1%)	2 (1.2%)
[n, y]	1 (1.3%)	1 (1.0%)	2 (1.2%)
[n]	3 (3.9%)	8 (8.3%)	11 (6.4%)
[o, b]	1 (1.3%)	0 (0%)	1 (0.6%)
[o, e]	1 (1.3%)	1 (1.0%)	2 (1.2%)
[o, y]	1 (1.3%)	4 (4.2%)	5 (2.9%)
[o]	2 (2.6%)	2 (2.1%)	4 (2.3%)
[p, n, k]	1 (1.3%)	0 (0%)	1 (0.6%)
[p, n]	1 (1.3%)	0 (0%)	1 (0.6%)
[p, w]	3 (3.9%)	2 (2.1%)	5 (2.9%)
[p, y, r]	0 (0%)	1 (1.0%)	1 (0.6%)
[p, y]	0 (0%)	1 (1.0%)	1 (0.6%)
[p]	3 (3.9%)	5 (5.2%)	8 (4.6%)
[r, y]	0 (0%)	1 (1.0%)	1 (0.6%)
[r]	1 (1.3%)	0 (0%)	1 (0.6%)
[u, w]	1 (1.3%)	0 (0%)	1 (0.6%)
[w, b, n]	0 (0%)	1 (1.0%)	1 (0.6%)
[w, g, k]	0 (0%)	1 (1.0%)	1 (0.6%)
[w, g, p, n]	0 (0%)	1 (1.0%)	1 (0.6%)
[w, g, u]	0 (0%)	1 (1.0%)	1 (0.6%)
[w, g]	0 (0%)	1 (1.0%)	1 (0.6%)
[w, n]	3 (3.9%)	2 (2.1%)	5 (2.9%)
[w, p, y]	1 (1.3%)	0 (0%)	1 (0.6%)
[w, p]	1 (1.3%)	2 (2.1%)	3 (1.7%)
[w, r]	0 (0%)	1 (1.0%)	1 (0.6%)
[w, u, g, n]	1 (1.3%)	0 (0%)	1 (0.6%)
[w, y, g, n]	0 (0%)	1 (1.0%)	1 (0.6%)
[w, y]	3 (3.9%)	2 (2.1%)	5 (2.9%)
[w]	21 (27.3%)	15 (15.6%)	36 (20.8%)
[y, e, n]	1 (1.3%)	0 (0%)	1 (0.6%)
[y, g, k]	0 (0%)	1 (1.0%)	1 (0.6%)
[y, k]	1 (1.3%)	0 (0%)	1 (0.6%)
[y, n]	1 (1.3%)	4 (4.2%)	5 (2.9%)
[y, o, e]	0 (0%)	1 (1.0%)	1 (0.6%)
[y, r, k]	0 (0%)	1 (1.0%)	1 (0.6%)
[y, r]	1 (1.3%)	0 (0%)	1 (0.6%)
[y, w]	0 (0%)	1 (1.0%)	1 (0.6%)
[y]	6 (7.8%)	7 (7.3%)	13 (7.5%)
stem_height_min			
Mean (SD)	4.52 (2.20)	4.14 (2.31)	4.31 (2.26)
Median [Min, Max]	4.00 [2.00, 15.0]	4.00 [0, 15.0]	4.00 [0, 15.0]
stem_height_max			
Mean (SD)	9.58 (5.03)	8.30 (4.03)	8.87 (4.53)
Median [Min, Max]	8.00 [3.00, 35.0]	8.00 [0, 20.0]	8.00 [0, 35.0]
stem_width_min			
Mean (SD)	10.1 (6.80)	7.26 (5.71)	8.53 (6.36)
Median [Min, Max]	10.0 [1.00, 40.0]	5.00 [0, 20.0]	8.00 [0, 40.0]
stem_width_max			
Mean (SD)	18.6 (15.7)	13.5 (11.8)	15.8 (13.9)

	e	p	Overall
Median [Min, Max]	15.0 [1.00, 100]	10.0 [0, 60.0]	12.0 [0, 100]
stem_root			
[b]	6 (7.8%)	3 (3.1%)	9 (5.2%)
[c]	0 (0%)	2 (2.1%)	2 (1.2%)
[f]	0 (0%)	3 (3.1%)	3 (1.7%)
[r]	0 (0%)	4 (4.2%)	4 (2.3%)
[s]	4 (5.2%)	5 (5.2%)	9 (5.2%)
Missing	67 (87.0%)	79 (82.3%)	146 (84.4%)
stem_surface			
[f]	0 (0%)	3 (3.1%)	3 (1.7%)
[g]	0 (0%)	5 (5.2%)	5 (2.9%)
[h]	0 (0%)	1 (1.0%)	1 (0.6%)
[i, s]	0 (0%)	1 (1.0%)	1 (0.6%)
[i, t]	1 (1.3%)	0 (0%)	1 (0.6%)
[i, y]	0 (0%)	1 (1.0%)	1 (0.6%)
[i]	4 (5.2%)	7 (7.3%)	11 (6.4%)
[k, s]	1 (1.3%)	0 (0%)	1 (0.6%)
[k]	1 (1.3%)	3 (3.1%)	4 (2.3%)
[s, h]	0 (0%)	1 (1.0%)	1 (0.6%)
[s]	9 (11.7%)	6 (6.3%)	15 (8.7%)
[t]	3 (3.9%)	4 (4.2%)	7 (4.0%)
[y, s]	1 (1.3%)	0 (0%)	1 (0.6%)
[y]	4 (5.2%)	9 (9.4%)	13 (7.5%)
Missing	53 (68.8%)	55 (57.3%)	108 (62.4%)
stem_color			
[b, u]	1 (1.3%)	0 (0%)	1 (0.6%)
[e, n]	1 (1.3%)	2 (2.1%)	3 (1.7%)
[e, u, y]	0 (0%)	1 (1.0%)	1 (0.6%)
[e, y]	1 (1.3%)	0 (0%)	1 (0.6%)
[e]	0 (0%)	1 (1.0%)	1 (0.6%)
[f]	0 (0%)	3 (3.1%)	3 (1.7%)
[g, w]	1 (1.3%)	0 (0%)	1 (0.6%)
[g, n]	1 (1.3%)	3 (3.1%)	4 (2.3%)
[g, r, n]	0 (0%)	2 (2.1%)	2 (1.2%)
[g, u, n]	0 (0%)	1 (1.0%)	1 (0.6%)
[g, w]	2 (2.6%)	0 (0%)	2 (1.2%)
[g]	2 (2.6%)	0 (0%)	2 (1.2%)
[k, n]	1 (1.3%)	1 (1.0%)	2 (1.2%)
[k]	0 (0%)	1 (1.0%)	1 (0.6%)
[l, r, w]	1 (1.3%)	0 (0%)	1 (0.6%)
[n, e]	0 (0%)	2 (2.1%)	2 (1.2%)
[n, g]	1 (1.3%)	1 (1.0%)	2 (1.2%)
[n, o]	1 (1.3%)	1 (1.0%)	2 (1.2%)
[n, p, w]	1 (1.3%)	0 (0%)	1 (0.6%)
[n, p]	0 (0%)	1 (1.0%)	1 (0.6%)
[n, w]	2 (2.6%)	1 (1.0%)	3 (1.7%)
[n, y]	1 (1.3%)	1 (1.0%)	2 (1.2%)
[n]	15 (19.5%)	20 (20.8%)	35 (20.2%)
[o, e]	1 (1.3%)	0 (0%)	1 (0.6%)
[o, n]	1 (1.3%)	0 (0%)	1 (0.6%)
[o, y]	1 (1.3%)	4 (4.2%)	5 (2.9%)
[o]	0 (0%)	1 (1.0%)	1 (0.6%)

	e	p	Overall
[p]	0 (0%)	2 (2.1%)	2 (1.2%)
[r, y]	0 (0%)	1 (1.0%)	1 (0.6%)
[u, e]	0 (0%)	1 (1.0%)	1 (0.6%)
[u]	1 (1.3%)	1 (1.0%)	2 (1.2%)
[w, l, n]	0 (0%)	1 (1.0%)	1 (0.6%)
[w, n]	2 (2.6%)	1 (1.0%)	3 (1.7%)
[w, o]	1 (1.3%)	0 (0%)	1 (0.6%)
[w, u]	0 (0%)	1 (1.0%)	1 (0.6%)
[w, y]	1 (1.3%)	2 (2.1%)	3 (1.7%)
[w]	32 (41.6%)	25 (26.0%)	57 (32.9%)
[y, e, n]	0 (0%)	1 (1.0%)	1 (0.6%)
[y, n]	0 (0%)	4 (4.2%)	4 (2.3%)
[y, o, k]	0 (0%)	1 (1.0%)	1 (0.6%)
[y]	5 (6.5%)	8 (8.3%)	13 (7.5%)
veil_type			
[u]	3 (3.9%)	6 (6.3%)	9 (5.2%)
Missing	74 (96.1%)	90 (93.8%)	164 (94.8%)
veil_color			
[e, n]	0 (0%)	1 (1.0%)	1 (0.6%)
[k]	0 (0%)	1 (1.0%)	1 (0.6%)
[n]	0 (0%)	1 (1.0%)	1 (0.6%)
[u]	0 (0%)	1 (1.0%)	1 (0.6%)
[w]	7 (9.1%)	8 (8.3%)	15 (8.7%)
[y, w]	1 (1.3%)	0 (0%)	1 (0.6%)
[y]	1 (1.3%)	0 (0%)	1 (0.6%)
Missing	68 (88.3%)	84 (87.5%)	152 (87.9%)
has_ring			
[f]	60 (77.9%)	70 (72.9%)	130 (75.1%)
[t]	17 (22.1%)	26 (27.1%)	43 (24.9%)
ring_type			
[e, g]	0 (0%)	1 (1.0%)	1 (0.6%)
[e]	3 (3.9%)	3 (3.1%)	6 (3.5%)
[f]	61 (79.2%)	76 (79.2%)	137 (79.2%)
[g, p]	0 (0%)	2 (2.1%)	2 (1.2%)
[g]	2 (2.6%)	0 (0%)	2 (1.2%)
[l, e]	0 (0%)	1 (1.0%)	1 (0.6%)
[l, p]	1 (1.3%)	0 (0%)	1 (0.6%)
[l, r]	2 (2.6%)	0 (0%)	2 (1.2%)
[l]	1 (1.3%)	1 (1.0%)	2 (1.2%)
[m]	1 (1.3%)	0 (0%)	1 (0.6%)
[p]	1 (1.3%)	1 (1.0%)	2 (1.2%)
[r]	1 (1.3%)	2 (2.1%)	3 (1.7%)
[z]	0 (0%)	6 (6.3%)	6 (3.5%)
Missing	4 (5.2%)	3 (3.1%)	7 (4.0%)
Spore_print_color			
[g]	1 (1.3%)	0 (0%)	1 (0.6%)
[k, r]	0 (0%)	1 (1.0%)	1 (0.6%)
[k, u]	0 (0%)	1 (1.0%)	1 (0.6%)
[k]	1 (1.3%)	4 (4.2%)	5 (2.9%)
[n]	0 (0%)	3 (3.1%)	3 (1.7%)
[p, w]	0 (0%)	1 (1.0%)	1 (0.6%)
[p]	1 (1.3%)	2 (2.1%)	3 (1.7%)

	e	p	Overall
[w]	2 (2.6%)	1 (1.0%)	3 (1.7%)
Missing	72 (93.5%)	83 (86.5%)	155 (89.6%)
habitat			
[d, h]	1 (1.3%)	3 (3.1%)	4 (2.3%)
[d]	47 (61.0%)	57 (59.4%)	104 (60.1%)
[g, d, h]	1 (1.3%)	0 (0%)	1 (0.6%)
[g, d]	6 (7.8%)	4 (4.2%)	10 (5.8%)
[g, h, d]	1 (1.3%)	2 (2.1%)	3 (1.7%)
[g, l, d]	0 (0%)	1 (1.0%)	1 (0.6%)
[g, l, m, d]	1 (1.3%)	0 (0%)	1 (0.6%)
[g, m, d]	1 (1.3%)	4 (4.2%)	5 (2.9%)
[g, m]	3 (3.9%)	2 (2.1%)	5 (2.9%)
[g, u, d]	1 (1.3%)	0 (0%)	1 (0.6%)
[g]	1 (1.3%)	10 (10.4%)	11 (6.4%)
[h, d]	0 (0%)	2 (2.1%)	2 (1.2%)
[l, d, h]	1 (1.3%)	0 (0%)	1 (0.6%)
[l, d]	7 (9.1%)	6 (6.3%)	13 (7.5%)
[l, h]	1 (1.3%)	0 (0%)	1 (0.6%)
[l]	1 (1.3%)	0 (0%)	1 (0.6%)
[m, d]	2 (2.6%)	1 (1.0%)	3 (1.7%)
[m, h]	0 (0%)	1 (1.0%)	1 (0.6%)
[m]	1 (1.3%)	1 (1.0%)	2 (1.2%)
[p, d]	0 (0%)	2 (2.1%)	2 (1.2%)
[w]	1 (1.3%)	0 (0%)	1 (0.6%)
season			
[a, w]	9 (11.7%)	6 (6.3%)	15 (8.7%)
[a]	5 (6.5%)	11 (11.5%)	16 (9.2%)
[s, a, w]	1 (1.3%)	0 (0%)	1 (0.6%)
[s, u, a, w]	7 (9.1%)	6 (6.3%)	13 (7.5%)
[s, u, a]	1 (1.3%)	4 (4.2%)	5 (2.9%)
[s, u]	2 (2.6%)	1 (1.0%)	3 (1.7%)
[s]	1 (1.3%)	0 (0%)	1 (0.6%)
[u, a, w]	8 (10.4%)	4 (4.2%)	12 (6.9%)
[u, a]	43 (55.8%)	63 (65.6%)	106 (61.3%)
[u]	0 (0%)	1 (1.0%)	1 (0.6%)