

Department of Statistics

COURSE STATS 330

Assignment 4, 2004

Instructions: Hand in your completed assignment to the Student Resource Centre by 4pm on Thursday 7th October.

Female horseshoe crabs share a nest with a male partner. In some cases, additional males, called satellites, reside nearby. A biologist is interested in what attributes of the female are associated with the presence of satellites.

Some data on female crabs have been collected and are in an Excel spreadsheet **crab.csv** in comma-delimited form. This may be downloaded from the course web page. The data are also reproduced overleaf.

The variables in the data set are

colour: colour of the crab (1=light medium, 2=medium, 3=dark medium, 4=dark),
spine: Spine condition (1=both good, 2=one broken, 3-both broken),
width: Width of the carapace (shell) in cm,
weight: weight of the crab (grams),
satellite: presence of satellite crabs (0=absent, 1=present).

1. Read in the data and check for errors.
2. Divide the data up into 10 groups according to the weight of the crabs. Draw a suitable plot that illustrates the relationship between the weight of the crab and the probability the crab will have a satellite. Repeat for the widths. What do you conclude? Do the same for the colours and spines. Summarize the relationships between the response and the explanatory variables.
3. Fit a logistic regression model to these data. Subject your model to the usual diagnostic checks.
4. What variables are associated with the presence of satellites?
5. Produce a method for predicting whether a crab will have satellites or not.

Data for Assignment 4

crab	colour	spine	width	weight	satelite	crab	colour	spine	width	weight	satelite
1	2	3	28.3	3050	1	88	4	1	25.5	2750	0
2	3	3	22.5	1550	0	89	4	3	23.5	1900	0
3	1	1	26.0	2300	1	90	2	2	24.0	1700	0
4	3	3	24.8	2100	0	91	2	1	29.7	3850	1
5	3	3	26.0	2600	1	92	2	1	26.8	2550	0
6	2	3	23.8	2100	0	93	4	3	26.7	2450	0
7	1	1	26.5	2350	0	94	2	1	28.7	3200	0
8	3	2	24.7	1900	0	95	3	3	23.1	1550	0
9	2	1	23.7	1950	0	96	2	1	29.0	2800	1
10	3	3	25.6	2150	0	97	3	3	25.5	2250	0
11	3	3	24.3	2150	0	98	3	3	26.5	1967	1
12	2	3	25.8	2650	0	99	3	3	24.5	2200	1
13	2	3	28.2	3050	1	100	3	3	28.5	3000	1
14	4	2	21.0	1850	0	101	2	3	28.2	2867	1
15	2	1	26.0	2300	1	102	2	3	24.5	1600	1
16	1	1	27.1	2950	1	103	2	3	27.5	2550	1
17	2	3	25.2	2000	1	104	2	2	24.7	2550	1
18	2	3	29.0	3000	1	105	2	1	25.2	2000	1
19	4	3	24.7	2200	0	106	3	3	27.3	2900	1
20	2	3	27.4	2700	1	107	2	3	26.3	2400	1
21	2	2	23.2	1950	1	108	2	3	29.0	3100	1
22	1	2	25.0	2300	1	109	2	3	25.3	1900	1
23	2	1	22.5	1600	1	110	2	3	26.5	2300	1
24	3	3	26.7	2600	1	111	2	3	27.8	3250	1
25	4	3	25.8	2000	1	112	2	3	27.0	2500	1
26	4	3	26.2	1300	0	113	3	3	25.7	2100	0
27	2	3	28.7	3150	1	114	2	3	25.0	2100	1
28	2	1	26.8	2700	1	115	2	3	31.9	3325	1
29	4	3	27.5	2600	0	116	4	3	23.7	1800	0
30	2	3	24.9	2100	0	117	4	3	29.3	3225	1
31	1	1	29.3	3200	1	118	3	3	22.0	1400	0
32	1	3	25.8	2600	0	119	2	3	25.0	2400	1
33	2	2	25.7	2000	0	120	3	3	27.0	2500	1
34	2	1	25.7	2000	1	121	3	3	23.8	1800	1
35	2	1	26.7	2700	1	122	1	1	30.2	3275	1
36	4	3	23.7	1850	0	123	3	3	26.2	2225	0
37	2	3	26.8	2650	0	124	2	3	24.2	1650	1
38	2	3	27.5	3150	1	125	2	3	27.4	2900	1
39	4	3	23.4	1900	0	126	2	2	25.4	2300	0
40	2	3	27.9	2800	1	127	3	3	28.4	3200	1
41	3	3	27.5	3100	1	128	4	3	22.5	1475	1
42	1	1	26.1	2800	1	129	2	3	26.2	2025	1
43	1	1	27.7	2500	1	130	2	1	24.9	2300	1
44	2	1	30.0	3300	1	131	1	2	24.5	1950	1
45	3	1	28.5	3250	1	132	2	3	25.1	1800	0
46	3	3	28.9	2800	1	133	2	1	28.0	2900	1
47	2	3	28.2	2600	1	134	4	3	25.8	2250	1

48	2	3	25.0	2100	1	135	2	3	27.9	3050	1
49	2	3	28.5	3000	1	136	2	3	24.9	2200	0
50	2	1	30.3	3600	1	137	2	1	28.4	3100	1
51	4	3	24.7	2100	1	138	3	3	27.2	2400	1
52	2	3	27.7	2900	1	139	2	2	25.0	2250	1
53	1	1	27.4	2700	1	140	2	3	27.5	2625	1
54	2	3	22.9	1600	1	141	2	1	33.5	5200	1
55	2	1	25.7	2000	1	142	2	3	30.5	3325	1
56	2	3	28.3	3000	1	143	3	3	29.0	2925	1
57	2	3	27.2	2700	1	144	2	1	24.3	2000	0
58	3	3	26.2	2300	1	145	2	3	25.8	2400	0
59	2	1	27.8	2750	0	146	4	3	25.0	2100	1
60	4	3	25.5	2250	0	147	2	1	31.7	3725	1
61	3	3	27.1	2550	0	148	2	3	29.5	3025	1
62	3	3	24.5	2050	1	149	3	3	24.0	1900	1
63	3	1	27.0	2450	1	150	2	3	30.0	3000	1
64	2	3	26.0	2150	1	151	2	3	27.6	2850	1
65	2	3	28.0	2800	1	152	2	3	26.2	2300	0
66	2	3	30.0	3050	1	153	2	1	23.1	2000	0
67	2	3	29.0	3200	1	154	2	1	22.9	1600	0
68	2	3	26.2	2400	0	155	4	3	24.5	1900	0
69	2	1	26.5	1300	0	156	2	3	24.7	1950	1
70	2	3	26.2	2400	1	157	2	3	28.3	3200	0
71	3	3	25.6	2800	1	158	2	3	23.9	1850	1
72	3	3	23.0	1650	1	159	3	3	23.8	1800	0
73	3	3	23.0	1800	0	160	3	2	29.8	3500	1
74	2	3	25.4	2250	1	161	2	3	26.5	2350	1
75	3	3	24.2	1900	0	162	2	3	26.0	2275	1
76	2	2	22.9	1600	0	163	2	3	28.2	3050	1
77	3	2	26.0	2200	1	164	4	3	25.7	2150	0
78	2	3	25.4	2250	1	165	2	3	26.5	2750	1
79	3	3	25.7	1200	0	166	2	3	25.8	2200	0
80	2	3	25.1	2100	1	167	3	3	24.1	1800	0
81	3	2	24.5	2250	0	168	3	3	26.2	2175	1
82	4	3	27.5	2900	0	169	3	3	26.1	2750	1
83	3	3	23.1	1650	0	170	3	3	29.0	3275	1
84	3	1	25.9	2550	1	171	1	1	28.0	2625	0
85	2	3	25.8	2300	0	172	4	3	27.0	2625	0
86	4	3	27.0	2250	1	173	2	2	24.5	2000	0
87	2	3	28.5	3050	0						