

Effects of Three Factors on the Growth of Shrimp

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1 * Scientists want to know how water temperature, salinity, and density of shrimp
2 populations influence the growth rate of shrimp and whether the factors acted
3 independently on the shrimp populations. A factorial experiment was used with 3
4 factors:
5 temperature -- 25 deg, 35 deg. C
6 salinity -- 10%, 25%, 40%
7 density -- 80 shrimp/40 liters, 160 shrimp/40 liters.
8 Three aquaria were assigned to each treatment combination for a completely
9 randomized design. The 36 aquaria were stocked with shrimp at the beginning of
10 the test and the weight of the shrimp after 4 weeks was recorded.;
11
12 option ls=120 ps=35 nocenter nodate;
13 title 'Shrimp Cultures-3 Factor Exp';
14
15 data shrimp;
16 array Y Y1-Y3; INPUT T D S Y1-Y3; do over Y;
17 X=Y;
18 output; end;
19     drop Y1-Y3;
20     label T = 'TEMPERATURE' D = 'DENSITY' S = 'SALINITY'
21           X = 'WEIGHT GAIN';
22 cards;
23 25 80 10 86 52 73
24 25 80 25 544 371 482
25 25 80 40 390 290 397
26 25 160 10 53 73 86
27 25 160 25 393 398 208
28 25 160 40 249 265 243
29 35 80 10 439 436 349
30 35 80 25 249 245 330
31 35 80 40 247 277 205
32 35 160 10 324 305 364
33 35 160 25 352 267 316
34 35 160 40 188 223 281
35 proc print; var t d s x;
36 proc glm;
37 class T D S;
38 model X = T|D|S/SS3;
39 means T D T*D S S*T S*D S*T*D;
40 output out=ASSUMP r=RESID p=MEANS;
41 PROC SORT;BY T;
42 PROC PLOT; BY T;PLOT MEANS*D=S; PLOT MEANS*S=D;
43
44
45
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Shrimp Cultures-3 Factor Exp

OBS	T	D	S	X
1	25	80	10	86
2	25	80	10	52
3	25	80	10	73
4	25	80	25	544
5	25	80	25	371
6	25	80	25	482
7	25	80	40	390
8	25	80	40	290
9	25	80	40	397
10	25	160	10	53
11	25	160	10	73
12	25	160	10	86
13	25	160	25	393
14	25	160	25	398
15	25	160	25	208
16	25	160	40	249
17	25	160	40	265
18	25	160	40	243
19	35	80	10	439
20	35	80	10	436
21	35	80	10	349
22	35	80	25	249
23	35	80	25	245
24	35	80	25	330
25	35	80	40	247
26	35	80	40	277
27	35	80	40	205
28	35	160	10	324
29	35	160	10	305
30	35	160	10	364
31	35	160	25	352
32	35	160	25	267
33	35	160	25	316
34	35	160	40	188
35	35	160	40	223
36	35	160	40	281

Shrimp Cultures-3 Factor Exp

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General Linear Models Procedure
Class Level Information

Class	Levels	Values
T	2	25 35
D	2	80 160
S	3	10 25 40

Number of observations in data set = 36

Shrimp Cultures-3 Factor Exp

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General Linear Models Procedure

Dependent Variable: X WEIGHT GAIN

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	11	467636.33333333	42512.39393939	14.64	0.0001
Error	24	69690.66666667	2903.77777778		
Corrected Total	35	537327.00000000			

R-Square	C.V.	Root MSE	X Mean
0.870301	19.30270	53.88671244	279.16666667

Source	DF	Type III SS	Mean Square	F Value	Pr > F
T	1	15376.00000000	15376.00000000	5.30	0.0304
D	1	21218.77777778	21218.77777778	7.31	0.0124
T*D	1	8711.11111111	8711.11111111	3.00	0.0961
S	2	96762.50000000	48381.25000000	16.66	0.0001
T*S	2	300855.16666667	150427.58333333	51.80	0.0001
D*S	2	674.38888889	337.19444444	0.12	0.8909
T*D*S	2	24038.38888889	12019.19444444	4.14	0.0285

Shrimp Cultures-3 Factor Exp

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General Linear Models Procedure

Level of T	N	Mean	SD
25	18	258.500000	160.011856
35	18	299.833333	71.408724

Level of D	N	Mean	SD
80	18	303.444444	139.964795
160	18	254.888889	103.774580

Level of T	Level of D	N	Mean	SD
25	80	9	298.333333	185.106051
25	160	9	218.666667	128.739077
35	80	9	308.555556	85.475305
35	160	9	291.111111	57.953525

Level of S	N	Mean	SD
10	12	220.000000	161.041497
25	12	346.250000	99.692368
40	12	271.250000	64.640439

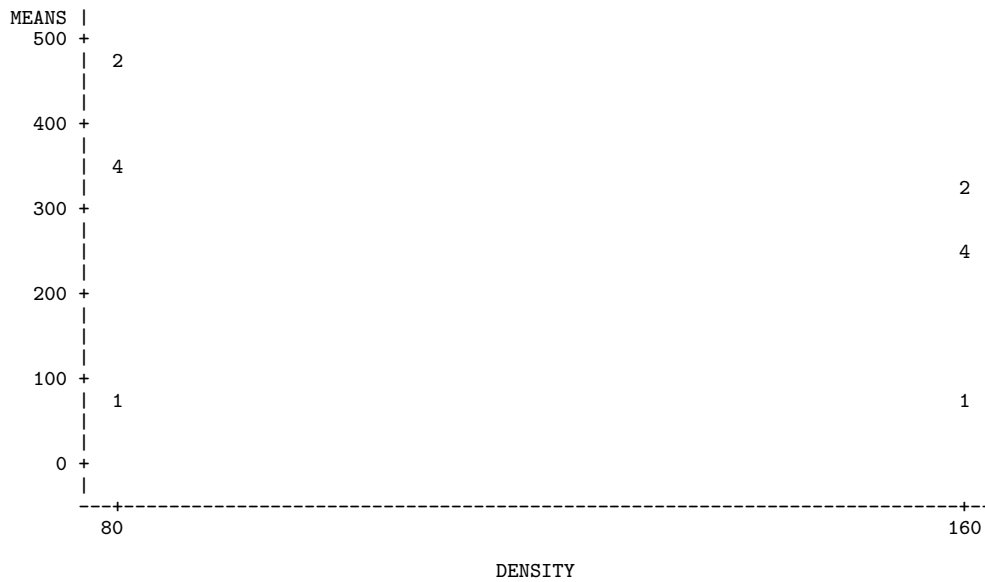
Level of T	Level of S	N	Mean	SD
25	10	6	70.500000	15.109600
25	25	6	399.333333	114.206246
25	40	6	305.666667	69.987618
35	10	6	369.500000	56.450864
35	25	6	293.166667	45.375838
35	40	6	236.833333	38.096807

Level of D	Level of S	N	Mean	SD
80	10	6	239.166667	188.065326
80	25	6	370.166667	122.218520
80	40	6	301.000000	77.415761
160	10	6	200.833333	144.240655
160	25	6	322.333333	74.529636
160	40	6	241.500000	32.788718

Level of T	Level of D	Level of S	N	Mean	SD
25	80	10	3	70.333333	17.156146
25	80	25	3	465.666667	87.648921
25	80	40	3	359.000000	59.858166
25	160	10	3	70.666667	16.623277
25	160	25	3	333.000000	108.282039
25	160	40	3	252.333333	11.372481
35	80	10	3	408.000000	51.117512
35	80	25	3	274.666667	47.961790
35	80	40	3	243.000000	36.166283
35	160	10	3	331.000000	30.116441
35	160	25	3	311.666667	42.665365
35	160	40	3	230.666667	46.971623

TEMPERATURE=25

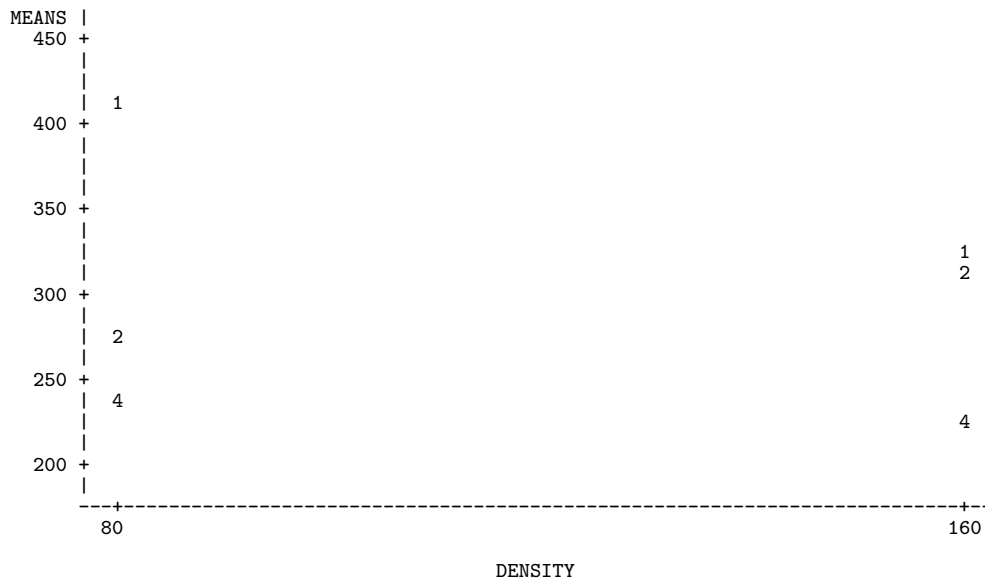
Plot of MEANS*D. Symbol is value of S.



NOTE: 12 obs hidden.

TEMPERATURE=35

Plot of MEANS*D. Symbol is value of S.

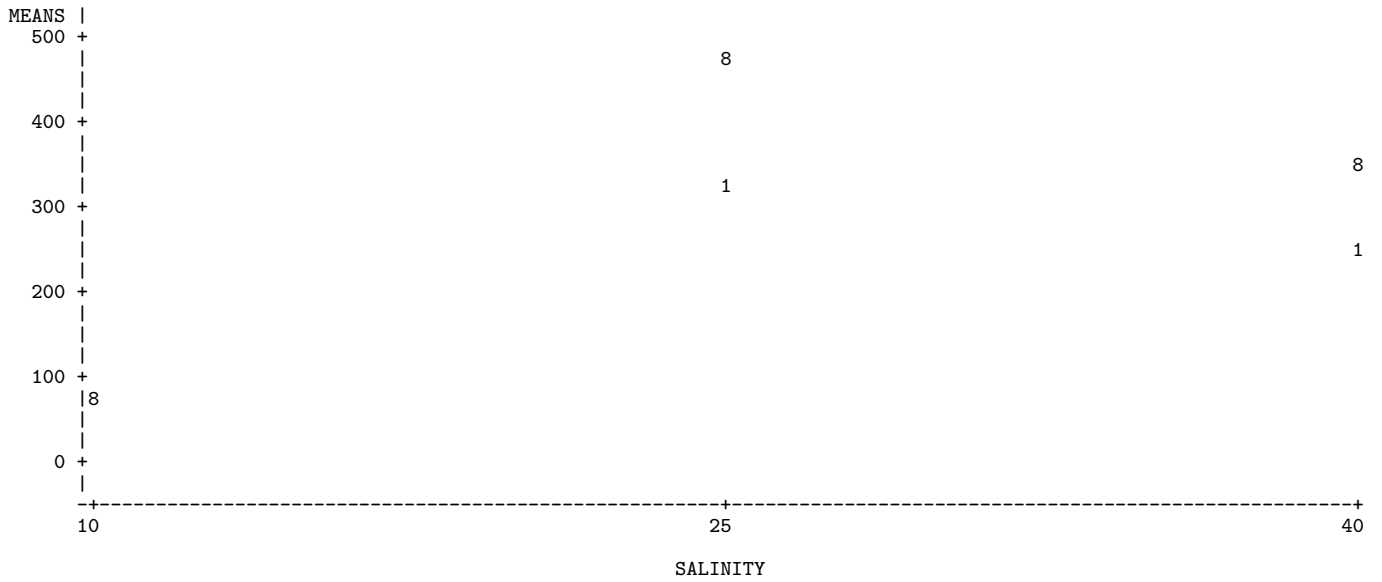


NOTE: 12 obs hidden.

Shrimp Cultures-3 Factor Exp

TEMPERATURE=25

Plot of MEANS*S. Symbol is value of D.

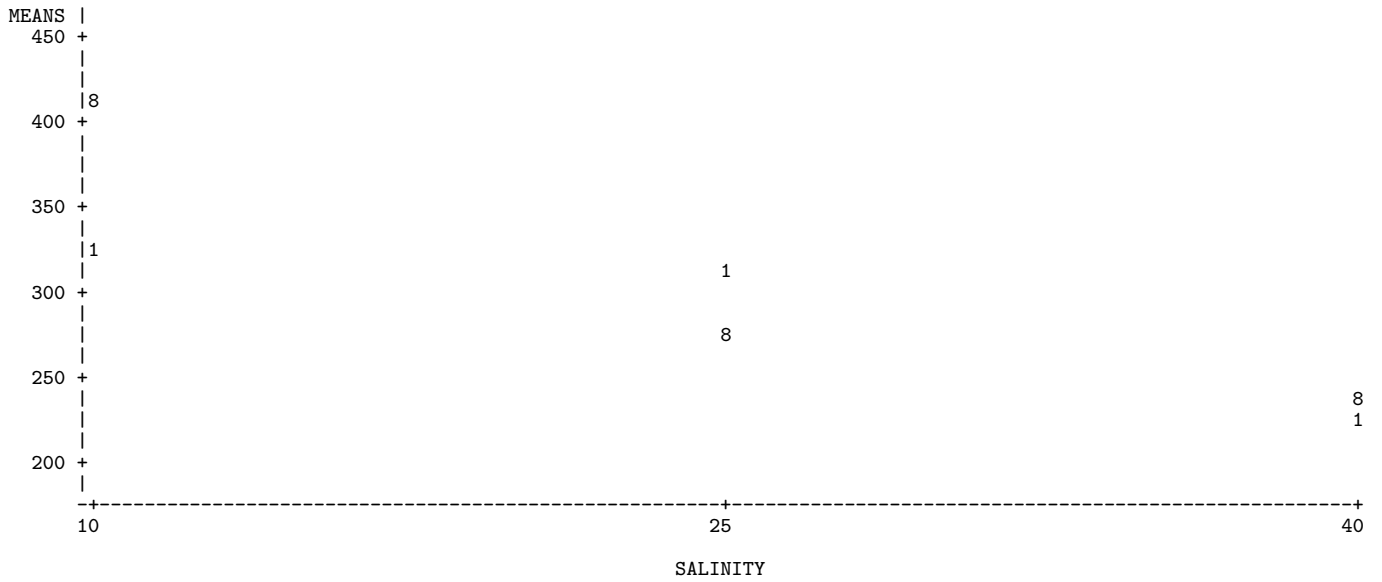


NOTE: 13 obs hidden.

Shrimp Cultures-3 Factor Exp

TEMPERATURE=35

Plot of MEANS*S. Symbol is value of D.



NOTE: 12 obs hidden.