

Factors related to being successful in fishing

Aim:

- This project will analyse the comparison of means between different variables; an estimation of differences in performance parameters will be calculated.
- This analysis will result in a comparison of catch value between the skippers and the correlation of the difference in categorical factors.

Background:

There is a vast difference between each fishing expedition; the quantity and quality of catches will determine whether a trip is successful. Therefore, this report would like to explore what factors are related to a successful fishing venture. This report primarily based on data on the amount of fish caught by each of the 151 fishing boats working in Tasmania. For each boat, the amount of fish caught was recorded. Moreover, the total time spent on trips and the total price paid for catches was measured, along with four other factors (experienced, age of the boat, equipment and search).

Findings:

1. The mean value paid for catches of experienced skippers was \$10,800 - \$20,800 higher than the mean value paid for catches of inexperienced skippers (Table 1).
2. The mean time on spent trips for skippers with adequate search equipment was 39.2 hours - 50.9 hours more than the mean time spent on trips for skippers with sophisticated search equipment (Table 2).
3. The mean time on spent trips for inexperienced skippers with average general equipment was 19.8 hours - 45.7 hours more than the mean time on spent trips for inexperienced skippers with above-average general equipment (Table 3).
4. The mean time spent on trips for experienced skippers with average general equipment was 11.3 hours – 32.5 hours more than the mean time on spent trips for experienced skippers with above-average general equipment (Table 4).
5. The possibility of getting high catch value for experienced skippers was 52% - 71% and the possibility of getting high catch value for inexperienced skippers was 5% - 26% (Table 5) (Table 6).
6. Boats that have adequate search equipment usually have average general equipment, whereas boats that have sophisticated search equipment have above average general equipment (Table 7).

Statistical methods and results

Variables

Measuring how much fish caught within one trip, is sorted as a new variable catch value. "high" represent catch is above the median and "low" represent catch below the median.

Computational methods:

Microsoft Excel 2016 was used for the statistical calculation of this report.

The 'Pivot table' tool produced the table for calculating the count of a boat with different combinations for categorical variables.

Degree of freedom:

1. For the test of association: (number of rows – 1) * (number of columns).
2. For the goodness of fit: depends on the no data points and several statistics needed to obtain the expected result.

The t-test table is made by 't-Test: Two-Sample Assuming Unequal Variances' option in data analysis.

$$standard\ error = \frac{stand\ deviation}{\sqrt{(size\ of\ sample)}}$$

Confidence Interval = point estimate \pm (confidence multiplier * standard error)

$$Chi\ square = \sum (observed - expected)^2 \div expected$$

$$p\text{-value} = 1 - CHISQ.DIST(chi\text{-squared statistic}, 1, 1)$$

Results

Table 1. Two-tailed t-test assuming unequal variances for value versus the experience of skippers

	Experienced skippers	Inexperienced skippers
Mean in value [\$1000]	70.7	54.9
Variance	238.9	178.2
Observations	105	46
degree of freedom = 99		
t-statistic = 6.37		
P (T ≤ t) two-tailed < 0.001		
The point estimate of difference = 15.8		
Standard error = 2.5		
Approximate 95% CI: (10.8, 20.8)		

There is strong evidence ($p < 0.001$) to reject the null hypothesis that there is no difference in the mean value of catch between experience and inexperienced skippers. The mean value paid for catches of 105 experienced skippers was \$70,700 and the mean value paid for catches of 46 inexperienced skippers was \$54,900.

Table 2. Two-tailed t-test assuming unequal variances for time versus search equipment.

	Skippers with adequate search equipment	Skippers with sophisticated search equipment
Mean-time [in an hour]	131.1	86
Variance	370.9	264.6
Observations	69	82
degree of freedom = 134		
t-statistic = 15.37		
P (T ≤ t) two-tailed < 0.001		
The point estimate of difference = 45.1		
Standard error = 2.9		
Approximate 95% CI: (39.2, 50.9)		

There is strong evidence ($p < 0.001$) to reject the null hypothesis that there is no difference in the mean time on spent trips between skippers with adequate and sophisticated search equipment. The mean time on spent trips of 69 skippers with adequate search equipment was 131.1 hours and the mean time on spent trips of 82 skippers with sophisticated search equipment was 86 hours.

Table 3: Two-tailed t-test assuming unequal variances for time versus inexperienced skippers with general equipment

	<i>Inexperienced skippers with average general equipment</i>	<i>Inexperienced skippers with above-average general equipment</i>
Mean time		
[in an hour]	116.4	83.7
Variance	452.1	493.9
Observations	26	20
degree of freedom = 40		
t-statistic = 5.05		
P (T ≤ t) two-tailed < 0.001		
The point estimate of difference = 32.7		
Standard error = 6.5		
Approximate 95% CI: (19.8, 45.7)		

There is strong evidence ($p < 0.001$) to reject the null hypothesis that there is no difference in the mean time on spent trips between inexperienced skippers with average general equipment and inexperienced skippers with above-average general equipment. The mean time on spent trips of 26 inexperienced skippers with average general equipment was 116.4 hours and the mean time on spent trips of 20 inexperienced skippers with above-average general equipment was 83.7 hours.

Table 4: Two-tailed t-test assuming unequal variances for time versus experienced skippers with general equipment

	<i>Experienced skippers with average general equipment</i>	<i>Experienced skippers with above-average general equipment</i>
Mean time		
[in an hour]	119.7	97.8
Variance	792.7	685.7
Observations	52	53
degree of freedom = 102		
t-statistic = 4.13		
P (T ≤ t) two-tailed < 0.001		
The point estimate of difference = 21.9		
Standard error = 5.3		
Approximate 95% CI: (11.3, 32.5)		

There is strong evidence ($p < 0.001$) to reject the null hypothesis that there is no difference in the mean time on spent trips between experienced skippers with average general equipment and experienced skippers with above-average general equipment. The mean time on spent trips of 52 experienced skippers with average general equipment was 119.7 hours and the mean time on spent trips of 53 experienced skippers with above-average general equipment was 97.8 hours.

Table 5: Pivot table of counts for experience and catch value

Count of boat	Experienced		
catch value	no	yes	Grand Total
high	7	65	72
low	39	40	79
Grand Total	46	105	151

Count of the boat with different combinations of experience of skippers and catch value. Experienced skippers are more likely to have high catch value than inexperienced skippers.

Table 6: Proportion of experienced and inexperienced skippers with high catch value trips

	Inexperienced skippers	Experienced skippers
point estimate	0.15	0.62
sample size	46	105
Standard error	0.05	0.05
Approximate 95% CI:	(0.05, 0.26)	(0.52, 0.71)

The interval does not include zero; therefore, it means that there is a statistically significant difference between the probabilities of catching high value for inexperienced versus experienced skippers.

Table 7: Association of search equipment and general equipment

Count of Boat	Search equipment		
General equipment	adequate	sophisticated	Grand Total
above average	19	54	73
average	50	28	78
Grand Total	69	82	151

Expected count of boat	Search equipment		
General equipment	adequate	sophisticated	Grand Total
above average	33.36	39.64	73
average	35.64	42.36	78
Grand Total	69	82	151

chi-squared statistic = 22
degree of freedom = 1
p-value <0.001

There is strong evidence ($p < 0.001$) to reject the null hypothesis that the boat with search equipment and boat with general equipment are independent. The actual amount of boat with adequate search equipment and average general equipment is 50 which is higher than expected amount (35.64), the actual amount of boat with sophisticated search equipment and above-average general equipment is 54 which is higher than expected amount (39.64).