PACIFIC SALMON - PART 1

CASE STUDY NOTES

The goal of this study was to find out more about the effects of the conservation strategy of bycatch. Bycatch is when you capture fish in a net, but then release some back into the water. This is done to protect more vulnerable species of fish or can happen by accident when a fish escapes from a net. For example, fishers may be fishing for sockeye salmon, but they may happen to catch some coho salmon in their nets. They put the coho salmon back in the water, because this is a species that needs protection. Biologists worry that the coho salmon are being injured by the nets, even though they are being returned to the water. They want to find out if the practice of releasing bycatch fish back into the water is harming this vulnerable species.

The biologists captured and tagged fish using a seine net (a gentle type of net). They then divided the fish into two groups - a stressed group, and a not stressed (control) group. The stressed group was put through a gillnet, which caused the fish stress. A gillnet is a type of fishing net that fish get easily tangled in. Many of the stressed fish in this study became injured or tired after going through the gillnet. This simulates what it is like for bycatch fish that are caught and released.

The researchers then released both groups of fish, and tracked their movements using biotelemetry. They placed antennas at various points along the fish migration path to track how far each fish made it. They were curious about how many of the fish would make it to the spawning grounds (where they would reproduce), and how long it would take them to get there.

Each antenna is like a checkpoint. If a fish is detected by an antenna, then we know it made it at least that far. But, if the fish is not detected by the next antenna, then we know that something happened to it along the way.

Today, you will be analyzing the real telemetry data that was gathered from this experiment. You will be calculating the distances travelled for each fish, organizing the data and then drawing conclusions from the results.

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TABLE 1: DISTANCE TRAVELLED BY PACIFIC

The table below is known as a raw data table. This means that the data has been collected, but it hasn't been organized in any meaningful way. On the next page, you will be organizing the data into a relative frequency table. This will allow us to start seeing patterns in the data. On the following pages, you will create graphs which will help show the data in a more visual way.

STRESSED FISH

FISH ID	LAST LOCATION DETECTED	TIME (DAYS)	DISTANCE (KM)
1	MISSION	7	40
3	VEDDER	6	75
5	VEDDER	8	75
7	VEDDER	10	75
9	TAMIHI	14	95
11	VEDDER	5	75
13	LOWER HATCHERY	15	110
15	CONFLUENCE	5	60
17	CONFLUENCE	5	60
19	VEDDER	10	75
21	MISSION	2	40
23	TAMIHI	8	95
25	MISSION	1	40
27	VEDDER	19	75
29	LOWER HATCHERY	31	110

NOT STRESSED FISH

FISH ID	LAST LOCATION DETECTED	TIME (DAYS)	DISTANCE (KM)
2	TAMIHI	12	95
4	TAMIHI	8	95
6	LOWER HATCHERY	35	110
8	LOWER HATCHERY	13	110
10	LOWER HATCHERY	25	110
12	TAMIHI	7	95
14	VEDDER	3	75
16	LOWER HATCHERY	26	110
18	TAMIHI	8	95
20	LOWER HATCHERY	17	110
22	TAMIHI	9	95
24	TAMIHI	29	95
26	TAMIHI	26	95
28	TAMIHI	7	95
30	TAMIHI	14	95

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CREATING RELATIVE FREQUENCY TABLES

A relative frequency table is a specific type of table, used to organize data. The table shows how often each event occurred, and then compares that to the total number of events.

In the first column, you create intervals based on your data set. In the second column, you record how many events occurred that fit into that interval. In the third column, you divide the number of events by the total number of events to get the relative frequency, which is written as a decimal.

For example, the relative frequency table to the right shows the data from the following set:

92, 70, 100, 74, 80, 96, 75, 96, 25, 60

SCORE ON MATH TEST	# OF STUDENTS	RELATIVE FREQUENCY
0-25	1	0.1
26-50	0	0
51-75	4	0.4
76-100	5	0.5

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HOW FAR DID THE FISH TRAVEL?

Our data tells us that each fish travelled past the checkpoint, but didn't make it to the next checkpoint. That means we don't know exactly how far each fish travelled. So, we need to represent each distance below as an interval. For example, a fish that last passed the 40 km checkpoint, travelled between 40 km and 59 km, because it never reached the 60 km checkpoint. Complete the tables below based on our data.

STRESSED FISH

DISTANCE (KM)	# OF FISH	RELATIVE FREQUENCY
40 - 59	3	0.2
60 - 74	2	0.13
75 - 94	6	0.4
95 - 109	2	0.13
110+	2	0.13

NOT STRESSED FISH

DISTANCE (KM)	# OF FISH	RELATIVE FREQUENCY
40 - 59	0	0
60 - 74	0	0
75 - 94	1	0.07
95 - 109	9	0.6
110+	5	0.33

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CREATING A CIRCLE GRAPH

- A circle graph displays data using wedges that represent a percentage of a total.
- To create a circle graph, you must first calculate the relative frequency that an event occured. You have already done this on the previous page.
- You will use a protractor to measure the angles needed to draw each wedge. Use the tables below to calculate the angle needed for each wedge. To do this, multiply the relative frequency by 360. (Note: There are 360° in a circle!)

TABLE 3: CALCULATING ANGLES FOR PACIFIC SALMON CIRCLE GRAPH

STRESSED FISH

DISTANCE (KM)	RELATIVE FREQUENCY	ANGLE
40 - 59	0.2	72°
60 - 74	0.13	47°
75 - 94	0.4	144°
95 - 109	0.13	47°
110+	0.13	47°
TOTAL:	0.99	357

NOT STRESSED FISH

DISTANCE (KM)	RELATIVE FREQUENCY	ANGLE
40 - 59	0	0
60 - 74	0	0
75 - 94	0.07	25°
95 - 109	0.6	216°
110+	0.33	119°
TOTAL:	1.0	360°

- Add up the last two columns to find the totals. If you have done your calculations correctly, the relative frequencies should add up to 1.0 and the angles should add up to 360°.
- Note: You can calculate the percentage of fish that travelled each distance by multiplying the relative frequency by 100.
- Ex. 0.2 x 100 = 20%, so 20% of stressed fish travelled between 40-59 km.

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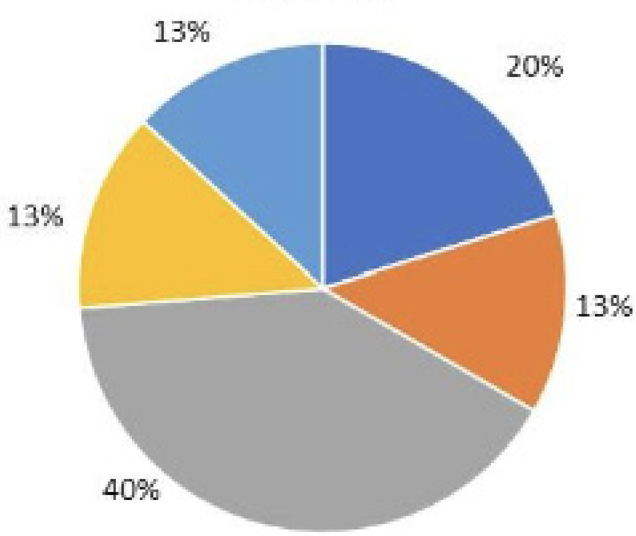
CREATING A CIRCLE GRAPH

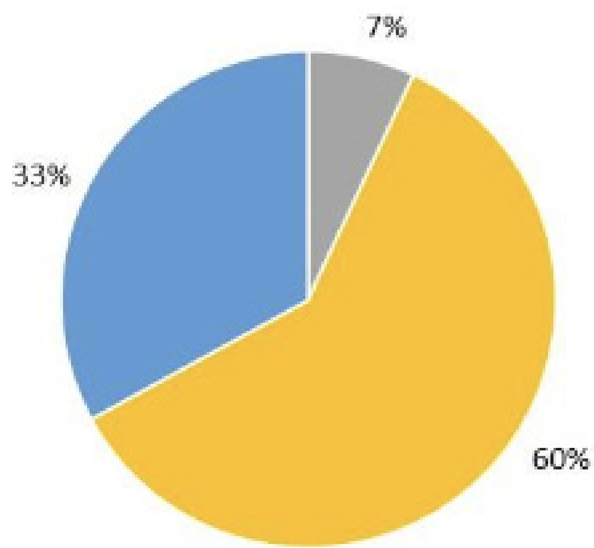
Begin by drawing a straight line from the center of the circle, to the outer edge. (This line is known as the radius.) Then, draw in the wedges using the angles that you calculated on the previous page. Colour in each wedge using a different colour, and then label the wedge using the key. Write the percentage on or beside each wedge.

FIGURE 1: DISTANCE TRAVELLED BY PACIFIC SALMON

STRESSED FISH



NOT STRESSED FISH



- 40 - 59 km
- 60 - 74 km
- 75 - 94 km
- 95 - 109 km
- 110+ km

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DRAWING CONCLUSIONS FROM THE DATA: MEAN, MEDIAN AND MODE

Use scrap paper to calculate the **mean, median** and **mode**, and record them in the table below.

TABLE 4: MEASURES OF CENTRAL TENDENCY FOR PACIFIC SALMON

	MEAN	MEDIAN	MODE
STRESSED FISH	75 KM	75 KM	78.33 KM
NOT STRESSED FISH	95 KM	95 KM	98.67 KM