PACIFIC SALMON FOUNDATION

Eat Or Be Eaten

Students Worksheet

Presented by the Pacific Salmon Foundation

PSF.ca

Eat or Be Eaten: Part 1 Name:_____

VOCABULARY

Photosynthesis: the process of using the sun's energy to convert carbon dioxide and water into carbohydrates and oxygen

Primary producer: an organism that makes organic material from inorganic material. E.g. plants, phytoplankton, some bacteria

Secondary producer: an animal that eats plants (a herbivore) and is food for a predator.

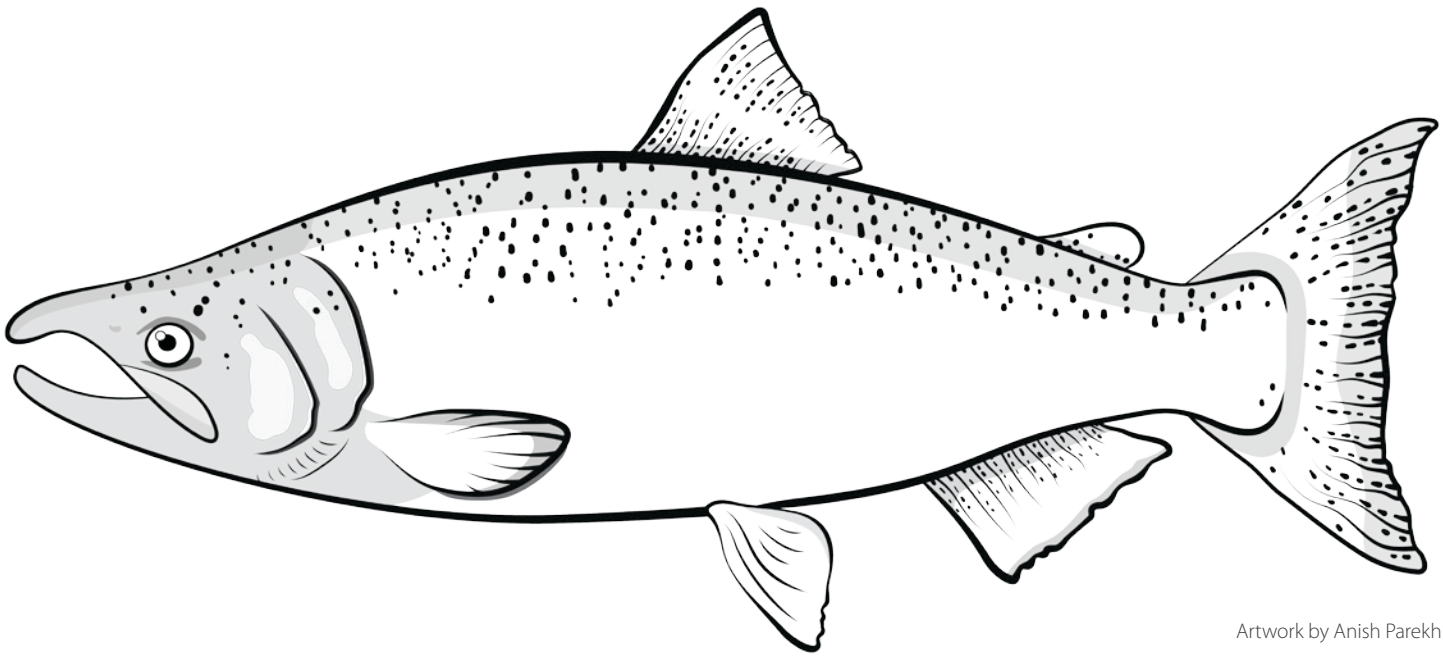
Phytoplankton: microscopic algae that live in water and play a key part as primary producers at the base of the food chain. Derived from Greek words *phyto* (plant) and *planktos* (wanderer or drifter)

Zooplankton: the animal component of the plankton, including small animals and immature stages of larger animals. Derived from Greek words *zoo* (animal) and *planktos* (wanderer of drifter)

Trophic: of or relating to food or nutrition

Trophic level: the hierarchical position an organism occupies in the food chain, comprised of organisms that share the same function

Trophic cascade: indirect effects on other animals when a trophic level in a food chain or food web is reduced or removed



Artwork by Anish Parekh

Cover photos by: top - Eiko Jones, left - Mitch Miller, middle and right - Ryan Miller

Given the importance of salmon to the ecosystems and peoples in the North Pacific, there are many scientists and researchers studying the relationships between salmon and the other animals in the marine food chain to better understand how changes at one level might be affecting salmon health and abundance. If you were a salmon scientist, what questions would you be asking about the food chain?

Come up with 3 research questions, and then for each one, develop a hypothesis or a prediction of what you think the answer is. For example:

> Research question: *How is climate change influencing energy production at the base of the food chain?*
>
> Prediction: *Climate change is causing the timing of the phytoplankton bloom and the peak in zooplankton abundance to change.*

Research question:	Prediction:
Research question:	Prediction:
Research question:	Prediction:

Eat or Be Eaten: Part 2 Name: _____

Scientists have similar research questions to you and go out and collect data to try to answer them. Below are a series of datasets related to salmon and the food chain. Use the data provided to create figures and draw inferences about the potential trophic interactions.

SALMON DIETS:

A diet that's high in essential fatty acids is important for the health and growth of juvenile salmon. The amount of fatty acids can be quite variable between different prey types. Calculate the sum and percent of each prey type at each sampling location. With these values, create a circle chart for each location depicting the salmon's diet composition. Which location has better prey availability and a higher quality diet (refer to the table of total fatty acids per prey group)? What might be the impact of juvenile salmon spending more time feeding in Location 1?

Location	Fish	Prey	Quantity
1	1	Crustaceans	79
		Larval Fish	3
		Gelatinous	4
	2	Crustaceans	23
		Larval Fish	1
		Gelatinous	9
	3	Crustaceans	13
		Larval Fish	0
		Gelatinous	102
	4	Crustaceans	17
		Larval Fish	1
		Gelatinous	64
	5	Crustaceans	10
		Larval Fish	0
		Gelatinous	215

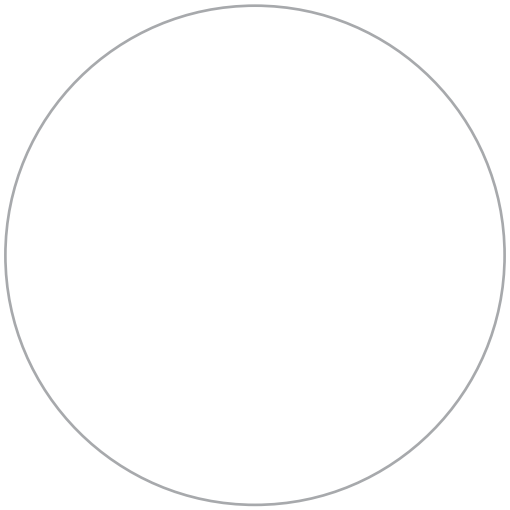
Location	Fish	Prey	Quantity
2	1	Crustaceans	175
		Larval Fish	4
		Gelatinous	0
	2	Crustaceans	61
		Larval Fish	7
		Gelatinous	0
	3	Crustaceans	5
		Larval Fish	10
		Gelatinous	10
	4	Crustaceans	260
		Larval Fish	3
		Gelatinous	0
	5	Crustaceans	121
		Larval Fish	3
		Gelatinous	0

		Sum	Percent
Totals	Crustaceans Larval Fish Gelatinous All		

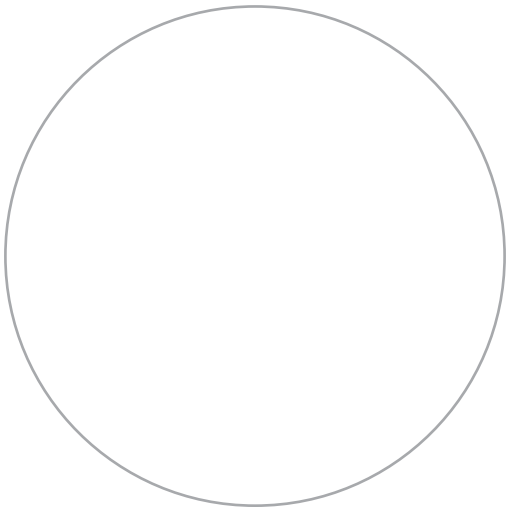
		Sum	Percent
Totals	Crustaceans Larval Fish Gelatinous All		

Prey	Total fatty acids (mg/g)
Crustaceans	16
Larval Fish	13
Gelatinous	0.8

Salmon Diets at Location 1



Salmon Diets at Location 2



FORAGE FISH:

A survey was conducted throughout the Strait of Georgia to measure juvenile salmon growth rates. They also looked at the stomach contents to see if there was a relationship between the abundance of forage fish and salmon growth (measured using hormone levels in blood samples from the salmon). Create a scatter plot with the number of herring in the salmon diets along the x-axis and the salmon growth hormone on the y-axis. Is there a trend?

Fish Sample	# Herring	Salmon Growth Hormone (ng/ml)
1	0	20
2	1	29
3	2	30
4	0	28
5	0	36
6	2	25
7	2	38
8	3	42
9	4	40
10	5	48
11	2	45
12	4	29
13	2	36
14	4	51
15	1	32
16	3	39
17	7	49
18	5	43
19	9	50
20	2	28

MATCH OR MISMATCH:

A survey was conducted in the Strait of Georgia to determine how the number of salmon returns would change when they entered the ocean at different times relative to the availability of their prey. Zooplankton abundance was measured approximately once per week and juvenile salmon were released into the ocean on 3 specific dates (bolded in the table). Using the data below, create a line graph of the zooplankton abundance over time. Then add a secondary axis on the right hand side and overlay bars to represent the salmon return rate. What's the relationship between release timing, prey abundance, and returns?

Date	Zooplankton Abundance (per m^3)	% Salmon Returns
07-Mar	100	
13-Mar	280	
18-Mar	960	
25-Mar	100	
01-Apr	430	
07-Apr	140	
13-Apr	230	
19-Apr	400	
25-Apr	**720**	0.5
01-May	480	
07-May	2080	
13-May	**930**	1.8
19-May	420	
25-May	1270	
31-May	**380**	1.4
06-Jun	360	
12-Jun	600	
18-Jun	220	
24-Jun	200	
30-Jun	110	

MATCH OR MISMATCH FIGURE:

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