

Aquaculture Workshop Outline

Instructor: Dr. Vicki Swan, NS Department of Fisheries and Aquaculture

This workshop provides an introduction to aquaculture and begins with its history and the different types practiced today. You will then look at why aquaculture is one of the fastest growing industries and the different types of farming practices. With a variety of activities, outcomes will be taught that look at ecological, economic and social impacts of aquaculture and how they are managed within the industry.

All of these activities are easily replicable for your class, and require minimal, easy to find, low-cost materials. This is an 80-minute workshop, but can be expanded to a whole module when teaching within the school.

Key Outcomes:

- Develop an understanding of what aquaculture is and how it is practiced regionally and globally
- Construct a representation of an integrated multi-trophic ecosystem to demonstrate understanding of the factors that contribute to effective aquaculture
- Investigate how lifecycles, food-chains and ecosystems are considered in the farming of aquatic species
- Gain insight into how science, farming practices, and economics contribute to an evolving aquaculture industry
- Consider the regional and global ecological, social, and economic issues related to aquaculture and explore what can be done to mitigate these issues
- Understanding eco-systems as a whole, and the utilization of Nature in solving challenges to environmental issues.

Key vocabulary:

Aquaculture, terrestrial agriculture, integrated multi-trophic ecosystems, ocean acidification, salinity, invasive species,



Curriculum Integration Document

Topic	Description of discussion or exploration	questions and probes	resources
<p><i>Intro: What is Aquaculture</i></p> <p><i>Activity 1: Aquaculture in our daily lives</i></p>	<p>What is aquaculture?</p> <p>How is aquaculture similar to terrestrial farming?</p> <p>Where else is aquaculture practiced?</p> <p>What is the history of aquaculture?</p> <p>Using the <i>Aquaculture Intro Activity</i> document, break into groups and present an aspect of aquaculture that affects you, your environment or your community.</p> <p>You can present a play, a PowerPoint, a picture or a unique craft, use your imagination.</p>	<p>What are some of the environmental challenges associated with aquaculture?</p> <p>What technologies have evolved to support this industry?</p> <p>What careers do this type of work?</p>	<p>See <i>Aquaculture Intro Activity</i> document</p>
<p><i>Activity 2: Global Aquaculture</i></p>	<p>Why is aquaculture a booming industry? (fastest growing source of animal protein – less expensive source of protein for much of the world’s population)</p> <p>Refer to the Exercise 1: <i>Global Farmed Meat Production</i>. Calculate the total worldwide farmed meat production, and convert each animal into a percentage of the total (rounded to the nearest whole number).</p>	<p>What factors are driving the need for more effective and expansive aquaculture practices? (running out of terrestrial farming space, feeding a growing world population, greenhouse gases)</p>	<p>See <i>Global Aquaculture Answer Key</i> document</p>



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<p>Activity 3: Global Aquaculture</p>	<p>Refer to Exercise 4: Feed Conversion Ratios Calculate conversion ratios comparing aquaculture to other forms of protein production -calculate the various ‘costs’ of producing a pound of farmed fish vs a pound of farmed meat</p>		<p>See <i>Global Aquaculture Answer Key</i> document</p>
<p>Activity 4: Global Aquaculture</p>	<p>Refer to Exercise 5: Global Food Production Area. Based on the graph and the information from the previous exercises, create an argument supporting an increase in global aquaculture production by the year 2050.</p>	<p>What are the economic, social and environmental benefits of aquaculture over ‘hunting’ style fishing (i.e. only catch the fish we want so less waste, mitigates fuel waste from searching for fish), and over terrestrial farming (integrated ecosystems can be self-cleaning and self-sustaining, fewer pollutants, can farm vertically as well as horizontally so less space requirements, etc)</p>	<p>See <i>Global Aquaculture Answer Key</i> document</p>
<p>Activity 5: Lifecycles and ecosystems</p>	<p>Lifecycle analysis -examine the lifecycle of a species you’ve been given/selected -how does the lifecycle (spawning, gestation, life span) inform the farming practices</p> <p>Carry out the shellfish filtering activity. Fill two aquariums with 5-10 litres of seawater. Add one litre of concentrated algae to each tank and place 40 mussels in one tank. Observe.</p>	<p>How does understanding the biology of species and ecosystems influence aquaculture? (raise healthy species, select for species that taste better or grow faster or that are hardier and more naturally resistant to disease)</p> <p>Biology of filter feeders, volume of water cleansed by a commercial mussel farm, siting</p>	



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		of farms based on food availability.	
<i>Activity 6: Integrated multi-trophic ecosystems</i>	<p>What is Integrated multi-trophic aquaculture?</p> <p>Refer to the <i>Integrated Multitrophic</i> document and break into groups and show a representation of Integrated Multi-trophic Aquaculture using the materials on your table.</p>	<p>How does science help us to develop a better aquaculture industry?</p> <p>What careers do this type of work?</p>	<p>See <i>Integrated Multitrophic</i> document</p> <p>https://medium.com/invironment/an-army-of-ocean-farmers-on-the-frontlines-of-the-blue-green-economic-revolution-d5ae171285a3#.dwtc2c40s</p>
<i>Activity 7: Comparative Culture Methods</i>	Refer to the <i>Comparative culture methods</i> document, and using the Information above break into groups and show a representation Comparative Culture Methods.	How does shellfish culture differ from finfish culture in what you need to supply your farm?	See <i>Comparative culture methods</i> document
<i>Activity 8: Local Opportunity</i>	<p>Refer to <i>Web Mapping Tool Activity sheet</i> document.</p> <p><i>Using the online map, answer the questions relating to the regional aquaculture</i></p>	<p>Where is aquaculture practiced in our region? What types?</p> <p>What is the impact on our regional economy? Where is most of the farmed seafood sold?</p> <p>What careers do this type of work?</p>	See <i>Web Mapping Tool Activity sheet</i> document

Instructor Bio

Dr. Vicki Swan

Dr. Vicki Swan is the Manager of Aquaculture Development with the Nova Scotia Department of Fisheries and Aquaculture. She earned her PhD in Pathology and Microbiology at the Atlantic Veterinary College in PEI. Her research has focused on parasites of aquatic organisms and much of her work has tackled issues impacting the aquaculture industry. Her current role with the Provincial Government, as Manager of Aquaculture Development, draws upon her scientific background and industry knowledge to develop and administer industry focused programs to support research, development, innovation and growth of aquaculture in Nova Scotia

Extension Activities

<i>Topic</i>	Description of discussion or exploration	questions and probes	resources
<i>Food-chains and Ecosystems</i>	Species matching activity: Examine several plant and animal species you've been provided and match them to 'inputs' and 'outputs' (i.e what do they consume from their environment, what do they produce that is helpful to us e.g. mussels, sea grass, scallops, etc).	How do these species contribute to their ecosystems? How do they rely upon their ecosystem?	
<i>Global Aquaculture: Activities 2-4</i>	See worksheet See <i>Global Aquaculture Answer Key</i> document		See <i>Global Aquaculture Answer Key</i> document
<i>Factors relating to aquaculture</i>	Factors for consideration pH, salinity, temperature of water physical factors (flushing with currents, hurricanes in open-systems, other extreme weather events) biological factors (sea lice, invasive species)	What environmental issues relate to these factors? (ocean acidification, fresh water usage, run-off of foul water)	https://medium.com/invironment/an-army-of-ocean-farmers-on-the-frontlines-of-the-blue-green-economic-



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	impact on the sea bottom farm economics		revolution-d5ae171285a3#.dwtc2c40s
<i>Activity 6: Lifecycles and ecosystems</i>	Design a terrarium representing an integrated multi-trophic ecosystem for commercial aquaculture. -using art materials that are available, build an representation of an ecosystem that shows consideration for; inputs and outputs, that integrates plant and animal species, that considers currents and tides) -estimate the required size and yield of your aquaculture farm to support a family (food and income)		