Laaqudax̂: The Northern Fur Seal

GRADES 7–12 PART I: LESSONS 1-3

2018

Artwork by
Thomas Stream

NOAA Fisheries Alaska Fisheries Science Center Alaska Regional Office	Pribilof School District	Thalassa	Central Bering Sea Fishermen's Association	Aleut Community of St. Paul Island Tribal Government	**National Marine Sanctuaries Foundation**

Laaqudaxˆ the Northern Fur Seal for grades 7-12 was developed by NOAA's National Marine Fisheries Service (NMFS)/ Alaska Fisheries Science Center and Thalassa Education, in partnership with the Pribilof School District, the Aleut Community of St. Paul Island – Tribal Government, and the NMFS Alaska Regional Office. The curriculum was developed by Lisa Hiruki-Raring (NMFS), Pam Goddard (Thalassa), Tonia Kushin (St. Paul School) , and Harriet Huber (NMFS). Graphic design and layout was provided by Rebecca White (NMFS).

Pinniped images (Activity 1.6) were used with permission from "Marine Mammals of Alaska" by Kate Wynne. Material in Activities 2.1 and 2.2, adapted from the "Unangam-Based Environmental Education Primer for St. Paul Island, Alaska" (Mierzejek, B., A.D. Lestenkof, and P.A. Zavadil, 2007) are used with permission from the Aleut Community of St. Paul Island – Tribal Government. The map of traditional territories of Alaska Native Cultures (Activity 2.2) is used with permission of the Alaska Native Heritage Center. Readings from "Aleut Images" (Activity 2.4) are used with permission from the State of Alaska, Alaska Pacific University, Alaskool and Dana G. Anderson (Copyright 1980). Curriculum and activities for Aleut Story (Lab 2.4) are used with permission by Marla Williams. The "Create a Rookery" activity was developed with Seattle artist Liz Haven.

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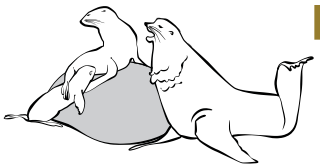
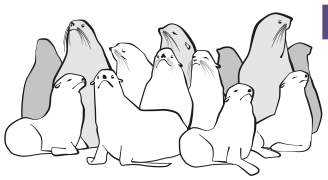
Table of Contents

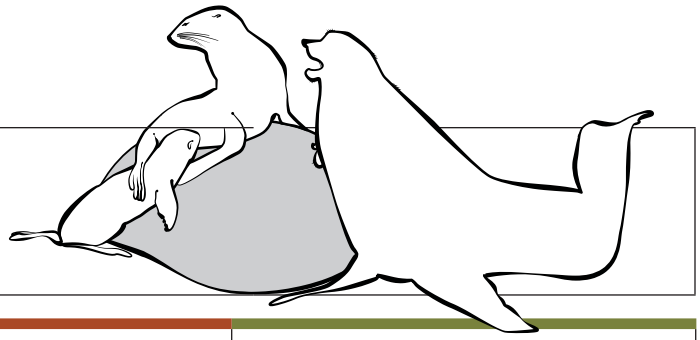




Secondary Curriculum: Grades 7–12

LESSON ONE

What is a fur seal?



Subject Area(s): Life Science	**Grade Levels:** 7-12	Presentation – 10 minutes Labs – variable

Lesson Topics:	Review characteristics of mammals, marine mammals, and pinnipeds.	**Focus Questions**	• What is a mammal? • What is a marine mammal? • What is a pinniped?
Learning Objectives:	Students will: • review the characteristics of mammals, marine mammals, and pinnipeds.	**Key words:**	mammal, pinniped, true seal, eared seal, walrus, phocid, otariid, odobenid, northern fur seal, harbor seal, sea lion, pelage

LABS		STANDARDS		
		Science	Minutes	Grades
Lab 1.1	Review Mammals, Marine Mammals, and Pinnipeds (worksheets)	SC2	30	7-12

Targeted Alaska Grade Level Expectations (GLEs)

Science

Concepts of Life Science

SC2 Students develop an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms.

LESSON TWO

Who Are The Unangan?

Subject Area(s): Life science, history, cultural	**Grade Levels:** 7-12	Presentation – 15 minutes Labs – variable

Lesson Topics:	Geography, Unangam culture and history, Unangan relationship to northern fur seals	**Focus Questions**	• Where are the Aleutian and Pribilof Islands? • Who are the Unangan? • How have historical events affected Unangam history?
Learning Objectives:	Students will: • investigate the geography of the Aleutian and Pribilof Islands • interpret the Unangam culture through film and literature	**Key words:**	Unangan (noun), Unangam (adjective), Aleutian Islands, Pribilof Islands, culture, history, internment

LABS		ALASKA STANDARDS			
		Science	History	Minutes	Grades
Lab 2.1	Where are the Aleutian Islands and the Pribilof Islands? (mapping)	SF1-3	PPE1	50	7–12
Lab 2.2	Who Are the Unangan? (read and discuss)		IGCP2	50	7–12
Lab 2.3	*People of the Seal* (watch and discuss)		ICGP2,9, CC1-4	2x50	7-12
Lab 2.4	*Aleut Story* (watch and discuss)		ICGP2,5,9, CC1-4	3x50	7-12
Lab 2.5	*Aleutian Sparrow, The White Seal, Libby* (read and discuss)		ICGP2,5,9, CC1-4	30-50	7-12

Targeted Alaska Grade Level Expectations (GLEs)

Cultural, Social, Personal Perspectives, and Science

SF1 Students develop an understanding of the interrelationships among individuals, cultures, societies, science, and technology.

SF2 Students develop an understanding that some individuals, cultures, and societies use other beliefs and methods in addition to scientific methods to describe and understand the world.

SF3 Students develop an understanding of the importance of recording and validating cultural knowledge.

American History-People, Places, Environment (PPE)

The student demonstrates an understanding of the interaction between people and their physical environment by:

PPE 1 comparing and contrasting geographic regions of Alaska.

Individual, Citizenship, Governance, Power (ICGP)

The student demonstrates an understanding of the historical rights and responsibilities of Alaskans by:

ICGP 2 using texts/sources to analyze the impacts of the relationships between Alaska Natives and Russians (i.e., Russian Orthodox Church, early fur traders, Russian American Companies, enslavement, and Creoles).

ICGP 5 explaining the impacts of military actions relative to Native communities (e.g., Naval bombardment of Angoon, Aleut internment, military expeditions.)

ICGP 9 exploring the federal government's influence on settlements in Alaska (e.g., Matanuska Colony, Anchorage, Adak, Tok, Hydaburg) by establishment of post offices, military facilities, schools, courts, and railroads.

Continuity and Change (CC)

The student demonstrates an understanding of the chronology of Alaska history by:

CC 1 using texts/sources to recognize and explain the interrelationships among Alaska, national, and international events and developments (e.g., international interest, trade, commerce).

CC 2 describing how policies and practices of non-natives (e.g., missionaries, miners, Alaska Commercial Company merchants) influenced Alaska Natives.

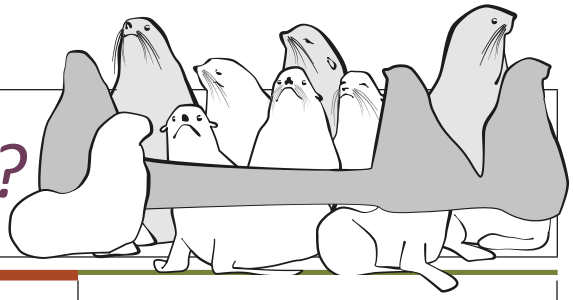
CC 3 describing how the roles and responsibilities in Alaska Native societies have been continuously influenced by changes in technology, economic practices, and social interactions.

CC 4 giving correct and incorrect examples to explain subsistence as a way of life.

Secondary Curriculum: Grades 7–12

LESSON THREE

What is a fur seal rookery?



Subject Area(s): Life science, genetics, reading	**Grade Levels:** 7-12	Presentation – 15 minutes Labs – variable

Lesson Topics:	Fur seal rookery structure, location, and seasonal changes	**Focus Questions**	• What is a fur seal rookery? • What information can scientist gather from a rookery? • How does the structure of the fur seal population change on the rookery?
Learning Objectives:	Students will: • describe the seasonal structure of a fur seal rookery • investigate fecundity • examine genetic relationships • summarize their knowledge with art	**Key words:**	rookery, haulout, fecundity, paternity, maternity, seasonal, age class, genetics

LABS		ALASKA STANDARDS		
		Science	Minutes	Grades
Lab 3.1	What is a Rookery? (review, worksheet, discussion)	SC2	30	7–12
Lab 3.2	Fecundity: The Next Generation (worksheet)	SC2	50	7-12
Lab 3.3	Rookery Timeline (hands-on, spreadsheet)	SC2	50	7–12
Lab 3.4	Paternity and Maternity on the Rookery (worksheet)	SC2	50	7–12
Lab 3.5	Create a Rookery – Rubber Stamp Making (hands-on, art)	SC2	2x50	7-12

Targeted Alaska Grade Level Expectations (GLEs)

Science

Concepts of Life Science

SC2 Students develop an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms.

Math

CC Counting and Cardinality

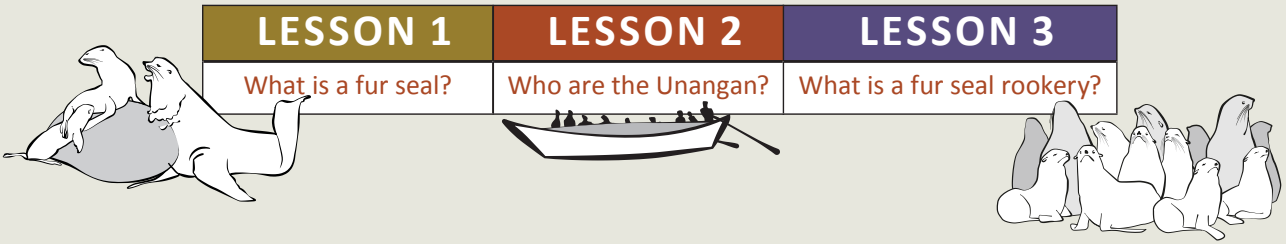
MD Measurement and Data

Introduction

Northern fur seals have played an important economic and biological role in the history of Alaska and the United States that is often overlooked. Historically, Alaska was home to over 90% of the world's population of northern fur seals with the majority found on the Pribilof Islands in the Bering Sea. The Unangan (Aleut people) have inhabited Alaska's Aleutian Islands for thousands of years, and their history is intertwined with that of the commercial fur harvest, as forced labor first for Russians and later for Americans. It is a little-known fact that in the twenty years following the United States' 1867 acquisition of the Alaska territory, revenues to the United States Government from the Pribilof Island fur seal harvest paid off the 7.2 million dollar purchase price.

The term **Aleut** is the Russian word used historically for the people of the Aleutian Islands. Today, people of this region use the words **Unangan** (Eastern dialect) and **Unangas** (Western dialect) to refer to the Aleut people. In this curriculum, we use the term **Unangan** when appropriate.

Part I: Marine Mammal Review



Part II: More In-Depth Biological Information

Part III: Population Estimation, Management, and Policy

LESSON 7	LESSON 8
Populations, Harvest, Management	Marine Mammal Protection Act

Goal

The goal of this integrated curriculum is to increase knowledge of northern fur seals and the Unangan through lessons and activities designed for varying grade levels and teachers with little or no background knowledge. Science, math, language arts, culture, and art have been integrated into lessons that can be adjusted for grades 7-12. Teachers with multi-grade classes have the choice to teach the same material at many levels and provide opportunities for older students to work with younger students, encouraging community teaching. The curriculum is designed as a spiral curriculum, where the same content can be revisited over several grades, each time at a higher level of difficulty and in greater depth.

Parts I, II, and III of this curriculum accomplish the following objectives:

- Review the story of the annual cycle of northern fur seals,
- Review the core concepts in fur seal biology,
- Review the relationship between northern fur seals and Unangam culture,
- Introduce methods behind population estimation,
- Understand the reasons for and consequences of the Marine Mammal Protection Act,
- Develop awareness of the science and research techniques used to study northern fur seals.

CURRICULUM FRAMEWORK

The curriculum is divided into Part I (Lessons 1-3), Part II (Lessons 4-6), and Part III (Lessons 7-8), each with a PowerPoint presentation and accompanying activities for different grade levels. A complementary curriculum is available for grades K-6. The labs are designed to reinforce and expand the lesson themes, and to provide hands-on opportunities for students to investigate and integrate the information they have learned.

Part I Lessons

1 What is a fur seal?

2 Who are the Unangan?

3 What is a fur seal rookery?

Part II Lessons

4 What do fur seals eat?

5 How do fur seals dive?

6 Where do fur seals go in the winter?

Part III Lessons

7 Populations, Harvest, and Management

8 Marine Mammal Protection Act

Lessons 1, 2, and 3 provide the foundation for the curriculum. It is strongly suggested that teachers at least review the information in these lessons before proceeding. Lesson 4-6 can be taught in any order Lessons 7 and 8 are the most advanced. They introduce population dynamics, management techniques, and the Marine Mammal Protection Act. Lessons 7 and 8 can be taught independently of the other lessons but some background information is recommended. Labs are structured to take one class period of 45-55 minutes. Some shorter labs take half a class period (30) minutes.

See Appendix III for a complete curriculum overview and Appendix IV for lesson overviews from Parts II and III.

The curriculum is designed to be flexible enough that teachers can pick and choose the order of lessons and activities within a lesson based on their students' grade level and prior knowledge.

HOW DOES THIS MATERIAL FIT THE ALASKA STATE EDUCATIONAL STANDARDS?

This curriculum has been specifically designed to meet Alaska State Standards for science, math, reading, writing, history, and cultural standards.

WHAT ARE ASSESSMENT METHODS?

Assessment methods vary with each lesson and lab; any of these methods can be given a point value and entered into a grade book. Methods include:

- Pre and Post test
- Visual representations
- Data analysis
- Geographical display (maps)
- Summary of observations using technical writing
- Verbal presentations
- Creative writing
- Visual arts

HOW MUCH TIME DO I NEED?

Each lesson can be completed in 40-60 minutes if at least one lab is selected. Labs range from 10-50 minutes with most being 50 minutes.

CULMINATING PROJECT IDEAS:

Consider choosing a culminating project that summarizes the knowledge gained from the unit, and making it a project that the class works on each week, individually or as a whole. Examples of culminating projects include:

- Teach what you have learned to someone else (family, another class).
- Create a school display.
- Create an all-school mural using the stamps created in Lab 3.4. This is a great opportunity for older students to work with younger students or earn community service hours.
- Write a song, skit or a play about a northern fur seal rookery or migration and act it out for students at your school.
- Make an educational video about something you learned.
- Record an elder telling a story. Ask for permission to share it with your class or school.
- Hold a debate on the Marine Mammal Protection Act.
- Visit the Pribilof Islands for summer camp.
- Write a letter to your Congressional representative.

Northern Fur Seal Curriculum Overview

Lesson	Topic	Components	Grade Level	Time
Labs vary by grade level allowing educators to select age appropriate activities for their class.				
	Curriculum Pre and Post Assessment Part I Pre and Post Assessment		7-12 7-12	15 min 15 min
1	***What is a fur seal?***	PowerPoint Overview (7 slides) Lab 1.1: Review: Mammals, Marine Mammals, and Pinnipeds	 7-12	 30 min
2	***Who are the Unangan?***	PowerPoint Overview (10 slides) Lab 2.1: Where are the Aleutian Islands and the Pribilof Islands? (mapping) Lab 2.2: Who are the Unangan? (read and discuss) Lab 2.3: *People of the Seal* (watch and discuss) Lab 2.4: *Aleut Story* (watch and discuss) Lab 2.5: *Aleutian Sparrow*, *The White Seal*, and *Libby* (read and discuss)	 7-12 7-12 7-12 7-12 7-12	 50 min 50 min 2x50 min 3x50 min 30-50 min
3	***What is a fur seal rookery?***	PowerPoint Overview (13 slides) Lab 3.1: What is a Rookery? (review, worksheet, discussion) Lab 3.2: Fecundity: The Next Generation (worksheet, hands-on) Lab 3.3: Rookery Timeline (hands-on) Lab 3.4: Paternity and Maternity on the Rookery (hands-on) Lab 3.5: Create a Rookery – Rubber Stamp Making (hands on, art)	 7-12 7-12 7-12 9-12 7-12	 50 min 50 min 50 min 50 min 2x50 min

PART-I: PRE/POST-ASSESSMENT

Student Name: _____Date: _____

1. Name four characteristics of a mammal. List up to four mammals.
2. How is a marine mammal different from a mammal? List up to four marine mammals. (Hint: A penguin is not a marine mammal.)
3. What are pinnipeds? Name 3 pinnipeds.
4. Who are the Unangan? Where do they live?
5. What is a rookery? Name two animals that use rookeries.
6. How does the structure of the rookery change throughout the year?
7. Where is Funter Bay and why were the Unangan sent there?

TEACHER KEY PART-I: PRE/POST-ASSESSMENT

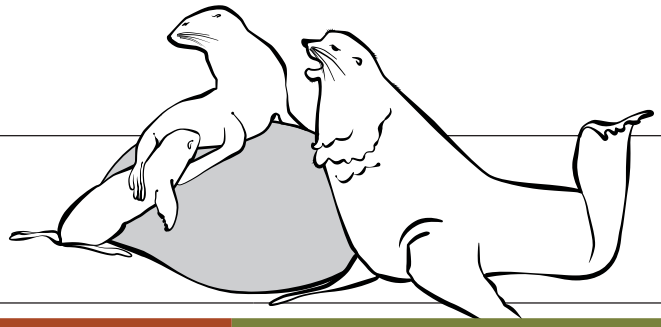
Lab Student Name: _____ Date: _____

Lab	
1	1. Name four characteristics of a mammal. List up to four mammals. hair or fur gives birth to live young mouse, dog, cat, mammary glands/nurses young warm blooded/endothermic human, seal, whale
1	2. How is a marine mammal different from a mammal? List up to four marine mammals. (Hint: A penguin is not a marine mammal.) A marine mammal lives in or depends on the ocean. fur seal, harbor seal, walrus, sea lion, elephant seal, orca, blue whale, humpback whale, manatee... (many more)
1	3. What are pinnipeds? Name 3 pinnipeds. Pinnipeds are semi-aquatic marine mammals; pinnipeds leave the water to rest, molt, and reproduce. Pinniped is Latin for “fin-foot.” Seals, sea lions and walruses are all pinnipeds.
2	4. Who are the Unangan? The Unangan are the people who live in the Aleutian, Pribilof, and Commander Islands.
3	5. Where are northern fur seal rookeries? Name two animals that use rookeries. A rookery is a colony of breeding animals, or a specific area where animals gather each year to mate and raise their young. Answers will vary: e.g., northern fur seal, Steller sea lions, puffins, kittiwakes, and many other birds
3	6. How does the structure of the rookery change throughout the year? A northern fur seal rookery is empty in the winter. In the spring males arrive first and then females. Females have their pups within a few days after arriving at the rookery. Younger non-breeding animals hang out around the edges. Adult males leave the rookery first in mid-summer. Females and pups leave in the fall.
2	7. Where is Funter Bay and why were the Unangan sent there? Funter Bay is in southeast Alaska. The Unangan from the Pribilof Islands and Aleutian Islands were taken away from their homes and made to live at Funter Bay and other villages in southeast Alaska during World War II.

Secondary Curriculum: Grades 7–12

LESSON ONE

What is a fur seal?



Subject Area(s): Life Science	**Grade Levels:** 7-12	Presentation – 10 minutes Labs – variable

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LABS		STANDARDS		
		Science	Minutes	Grades
Lab 1.1	Review Mammals, Marine Mammals, and Pinnipeds (worksheets)	SC2	30	7-12

Targeted Alaska Grade Level Expectations (GLEs)

Science

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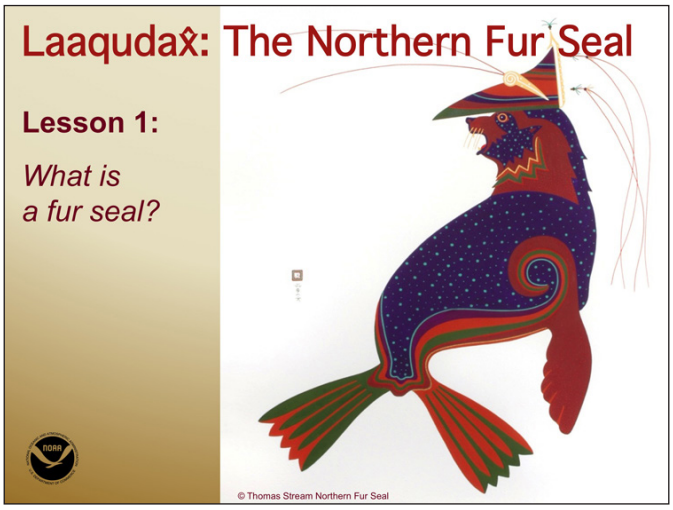


Lesson 1 provides an overview of the characteristics of a mammal, pinniped and northern fur seal.

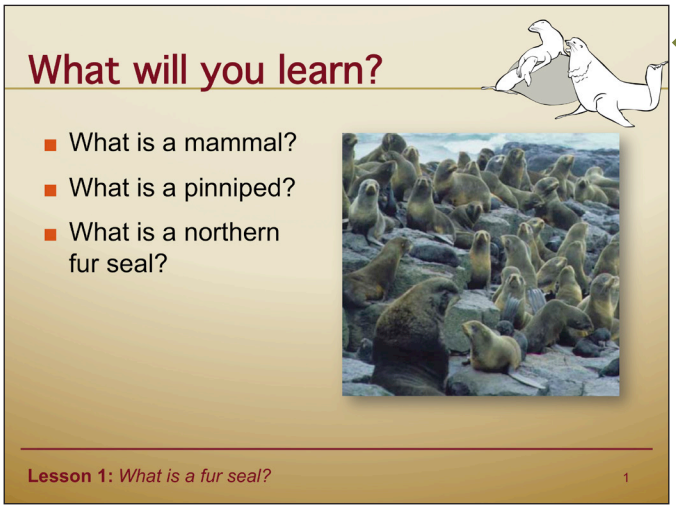
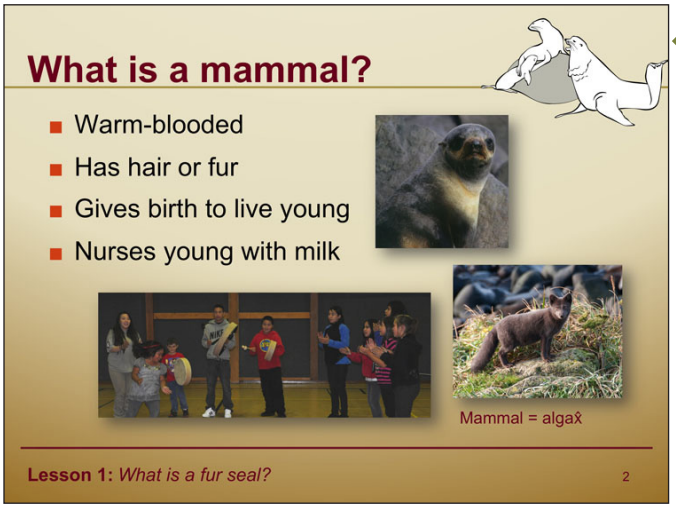


Photo: NOAA/AFSC/MML



These are the characteristics of a mammal.

They are warm-blooded, have hair or fur, and nurse their young with milk.

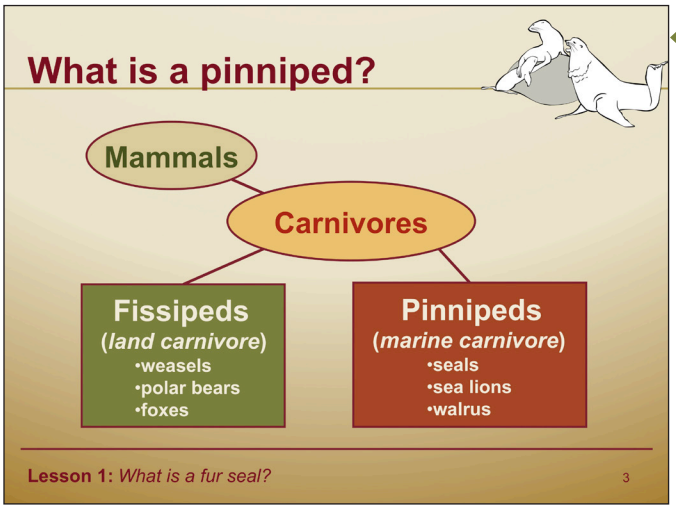
The platypus and echidna (spiny anteater) are the only two mammals that lay eggs.

Marine mammals are mammals that live in marine ecosystems (cetaceans – whales, dolphins, porpoises; pinnipeds – true seals, eared seals, walrus; sirenians – manatees and dugongs; and sea otters). Polar bears and arctic fox are often also counted as marine mammals since they depend largely on the marine environment for their food.

We often get the questions, “Are penguins marine mammals?”

No, penguins are not marine mammals. They are birds that cannot fly but they are not marine mammals.

Photos: fur seal – Rolf Ream, NOAA/AFSC/MML
fox – Pam Goddard, Thalassa
dancing – Lisa Hiruki-Raring, NOAA/AFSC



Within the biological classification of mammals, carnivores are meat-eaters. This group can be broken up into two subgroups, fissipeds (land carnivores) and pinnipeds (marine carnivores).

Fissiped = split foot; Pinniped = fin foot

Fissi = split; Pinni = fin; Ped = foot

Fissipeds or land carnivores include: dogs and related species (e.g. dogs, wolves, coyotes, foxes); raccoons and related species; bears (e.g. polar bears); weasels and related species (e.g. weasels, ferrets, badgers, river otters, sea otters); skunks; cats (e.g. domestic cats, lions, tigers, cougars, lynx); civets and related species; mongooses and related species (e.g. mongoose, meerkat, kusimanse); hyenas and aardwolf

Pinnipeds or marine carnivores include: true seals; fur seals and sea lions (eared seals); walrus

Pinnipeds are divided into three groups: true seals (phocid seals) – these are seals like harbor seals and ringed seals; eared seals (otariid seals) – these are fur seals and sea lions; walrus (odobenid)

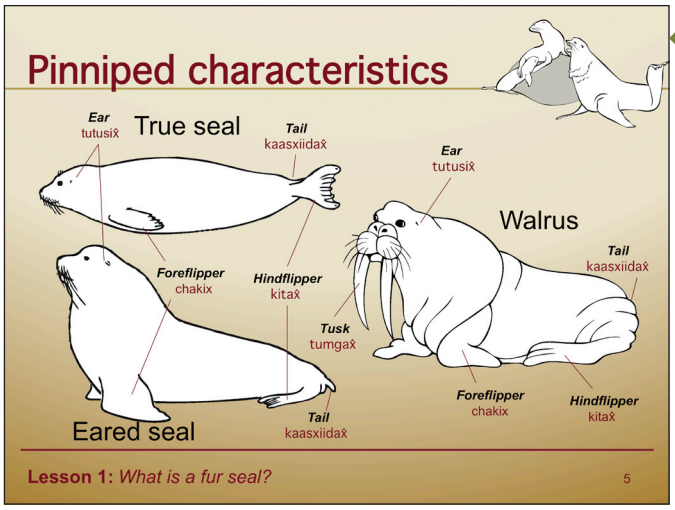
PHOCID, OTARIID, and ODOBENID are the scientific names for these pinniped groups. Every animal has only one scientific name, but may have several common names (for example, northern fur seals were called "sea bears" in the past, and the Unangan have several names for fur seals: algamiklu^x, laaquda^x.

We will go through the main characteristics of each group in the next slide.

Unangan Names: True Seal – agdaa^gu^x; Eared Seal – laaquda^ x (fur seal) & qawa^x (sea lion); Walrus – amgaada^x

Most Unangam names refer to a specific type of seal. Examples: Qawa^x – sea lion; Isu^x – harbor seal; Iglagaya^x - ribbon seal

Photos: John Moran, NOAA/AFSC/MML



Things to point out:

Ears – true seals and walrus don't have external ear flaps – they just have a hole in the side of the head. Eared seals have small flaps.

Foreflippers and hindflippers – true seals have short foreflippers, which are mostly used for steering; the hindflippers are used to propel the seal when swimming. Eared seals and walruses have large foreflippers. Eared seals use foreflippers for propulsion when swimming (the animal "flies" through the water), while walruses swim mostly with hindflippers, using foreflippers as rudders.

Locomotion on land – true seals cannot stand on all four flippers because their hindflippers are rotated backwards; when they are on land, they move on their stomach, pulling themselves forward with their foreflippers. Eared seals and walruses can stand on all four flippers and walk when they are on land.

Tail — All three groups have a small tail, even though it may not be visible in this picture.

There are other more subtle differences between the groups (e.g., true seals may have patterns on their fur, like spots, rings or bands, while eared seals and walrus do not).

Source: Figure adapted from Wynne, K. Marine Mammals of Alaska.

Note the pattern on the fur of the true seal (no pattern on eared seal).

True seal has a "torpedo" or sausage shape; eared seal has a long neck in relation to the body.

The true seal in this picture is a harbor seal.

The eared seal is a California sea lion.

Photo: Harriet Huber, NOAA/AFSC/MML

The northern fur seal is one type of eared seal.

Emphasize the size difference between the male and the female (shown in the picture). Males are much larger than females

FEMALES GIVE BIRTH TO ONE PUP EACH YEAR! If the pup dies or is taken for food, the female does not give birth to another pup.

Male fur seals have multiple Unangan names depending on the age of the male. See references for list of Unangan words.

Source for measurements: AFSC/MML website, Northern Fur Seal page, http://www.afsc.noaa.gov/mml/species/species_nfs.php

Photo: Chuck Fowler, NOAA/AFSC/MML

The northern fur seal is one type of eared seal.

What is next??

Learn about the Unangan who have known about the fur seals for thousands of years.

Photo: Lisa Hiruki-Raring, NOAA/AFSC

LESSON ONE | LAB 1.1 SCIENCE | Grade Level 7-12

Review: Mammals, Marine Mammals, and Pinnipeds

OBJECTIVE

Students will review the physical characteristics of mammals, marine mammals, and pinnipeds.

TIME REQUIRED

30+ minutes, depending on background knowledge of students.

BACKGROUND

All of the worksheets in this Lab can be used for pre and post-assessment. If you decided to pre-assess your students then we recommend that you complete the pre-assessment before presenting the information below to your students.

High school students should be encouraged to conduct independent research and present the information in the form of a paper or public presentation.

Scientists have been classifying animals for hundreds of years. Classifying animals helps us understand an animals' origin. For example, fur seals are pinnipeds, pinnipeds are marine mammals, and marine mammals are mammals that live in salt water.

Mammals are animals that have hair or fur, nurse their young with milk, give birth to live young, and are warm blooded.

Marine mammals are mammals that live in marine (salt water) ecosystems. Marine mammals have all the characteristics of mammals but they live all or much of their lives in the ocean. There are four main groups of marine mammals:

- cetaceans (si-TAY-shens) – whales, dolphins, porpoise
- pinnipeds (PINN-i-peds) – true seals, eared seals, walrus
- sirenians (si-REHN-ee-ans) – manatees and dugongs
- marine fissipeds (FIS-si-peds) – sea otters, polar bears

Fissi-ped = “split-foot”

Pinni-ped = “fin-foot” or “feather foot”

Pinnipeds are marine carnivores (meat-eaters) and are divided into three main groups:

- True seals – do not have an external ear flap; sausage shaped body, can’t stand on all four flippers (crawls on land), swims with hind flippers (example – harbor seal)
- Eared seals – have an external ear flap, can walk on all four flippers on land, swims using front flippers for propulsion, long neck and large flippers (example – Steller sea lion, northern fur seal)
- Walrus – no external ear flap, but can walk on all four flippers on land

In this lab, students will review two subject areas:

1. Mammals, marine mammals, and pinnipeds.
2. Pinnipeds

MATERIALS

- Pre-and Post-assessment Worksheets
- 1.1.1 Mammals, Marine Mammals, Pinnipeds
- 1.1.2 Label a Pinniped
- 1.1.3 Describe a Pinniped
- 1.1.4 Venn Diagram
- Plastic animals, or stuffed animals (a variety of mammals, marine mammals, and non-mammals).
- Pictures of northern fur seal, Steller sea lion, harbor seal, and walrus (optional: include pictures of ice-associated seals – ringed, bearded, ribbon, spotted seals)
- Marine mammal reference books (from library) or “Guide to Marine Mammals of Alaska” by Kate Wynne, for older students (grades 7-12)
- List of Unangam names for seals (provided below)

PROCEDURES

Worksheet 1.1.1 Mammals, Marine Mammals, Pinnipeds

- Review the characteristics of mammals, marine mammals, and pinnipeds as a class or have the students research the characteristics and complete the worksheet independently.

Worksheet 1.1.2 Label a Pinniped

- Students can label the diagrams in English or Unangan.

Worksheet 1.1.3 Describe a Pinniped

- Assign each student or pair of students a picture of a pinniped. At minimum, northern fur seal, Steller sea lion, harbor seal and walrus should be used. Choose four or five characteristics that the students need to describe based on the picture (see examples below), or have the students come up with their own categories.
  - Body shape
  - Length and shape of flippers
  - Shape of head, presence or absence of ear flaps
  - Patterns on fur (e.g., spots or rings; lighter fur on underside)
  - Whether the animal can stand up on its flippers or lies on its stomach
  - Any other characteristics they can come up with
- Use reference books to look up facts about the animal, including length, weight, and distribution.
- Have each group present their results to the class. Create a class summary of characteristics.
- Lay out all of the pictures of their animal. Ask the class to sort pictures into groups based on common characteristics of the animals.

Worksheet 1.1.4 Venn Diagram

- This lab can be used as an assessment by providing the students with the characteristics and asking them to place them in the appropriate area of the Venn Diagram.
  - Use descriptions of species from a previous lab choose one eared seal, one true seal, and walrus.
  - Fill in the Venn diagram with the characteristics of the three pinniped groups, showing characteristics that the three groups have in common and characteristics that are unique to each group.

DISCUSSION

Discuss how different marine mammals are adapted to their environment.

Discuss similarities and differences between the three groups of pinnipeds.

EXTEND AND EXPLORE

- Vsit an elder in the community and ask about the animal they researched.
- Research the correct format for citing a book as a reference. Use the *Guide to Marine Mammals of Alaska* as an example.
- Research how many marine mammals are currently listed under the Endangered Species Act.
- What are the biggest threats to marine mammals today?

REFERENCES

Wynne, Kate. Folkens, Pieter. *Guide to Marine Mammals of Alaska*. Alaska Sea Grant Program. Fairbanks, AK: University of Alaska Fairbanks, 2009.

Bergsland, Knut. *Aleut Dictionary*. Fairbanks, AK: University of Alaska Press, 1994.

LAB 1.1 WORKSHEET 1.1.1 Mammals, Marine Mammals, Pinnipeds

Student Name: _____ Date: _____

There are four characteristics of a mammal.
List as many as you can.

_____

_____

_____

_____

Marine mammals are a type of mammal. Name at least three marine mammals.

_____

_____

_____

Pinnipeds are a type of marine mammal. Name at least three pinnipeds.

_____

_____

_____

LAB 1.1 TEACHER KEY 1.1.1 Mammals, Marine Mammals, Pinnipeds

Student Name: _____ Date: _____

Answers may vary

There are four characteristics of a mammal.
List as many as you can.

- Has hair or fur.
- Most mammals have live babies.
- Have mammary glands to nurse their young.
- Endothermic (warm-blooded) they maintain their body temperature independent of their environment.

Marine mammals are a type of mammal. Name at least three marine mammals.

- humpback whale, orca or killer whale, blue whale, fin whale, dophin, porpoise
- northern fur seal, walrus, harbor seal, spotted seal, ringed seal, Steller sea lion, California sea lion, elephant seal
- polar bear, sea otter, dugong, manatee
- NOTE: penguins are not marine mammals

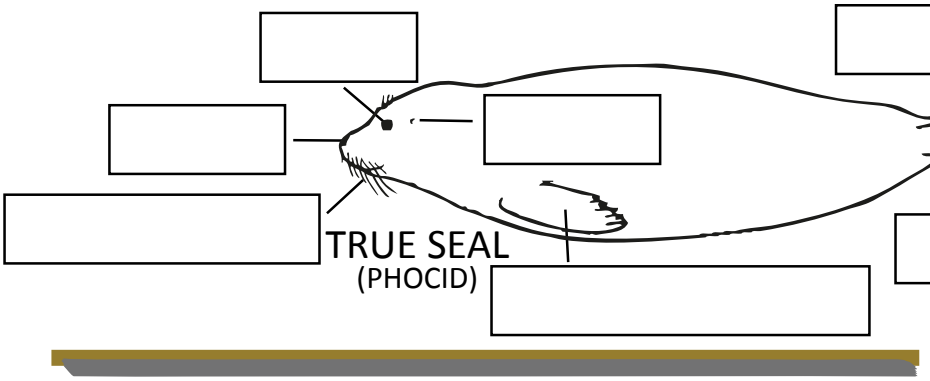
Pinnipeds are a type of marine mammal. Name at least three pinnipeds.

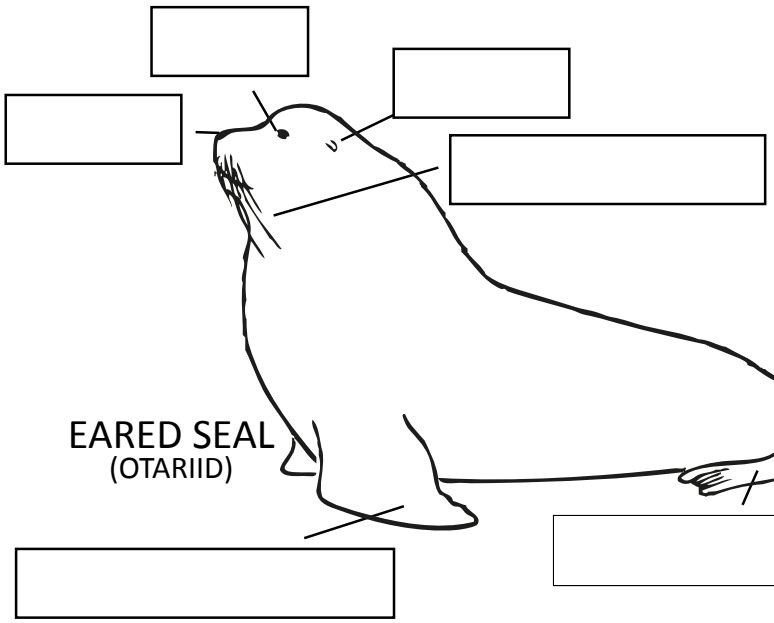
- northern fur seal, Steller sea lion, California sea lion
- harbor seal, ringed seal, ribbon seal, spotted seal, elephant seal
- walrus

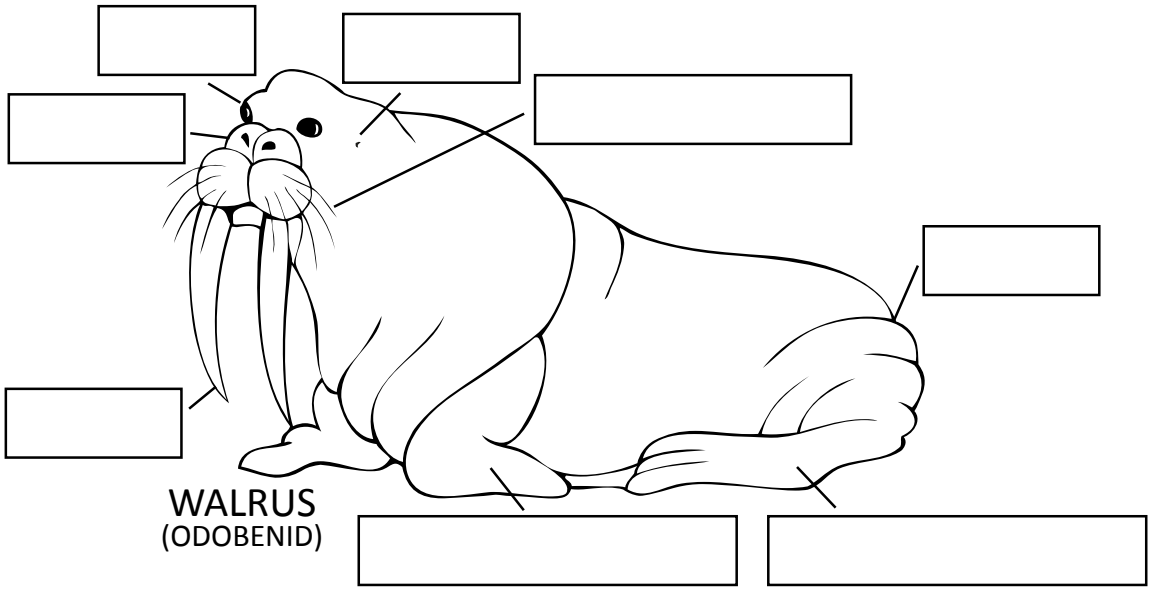
LAB 1.1 WORKSHEET 1.1.2 Label a Pinniped

Student Name: _____ Date: _____

Label the parts of the three pinnipeds in English and Unangan





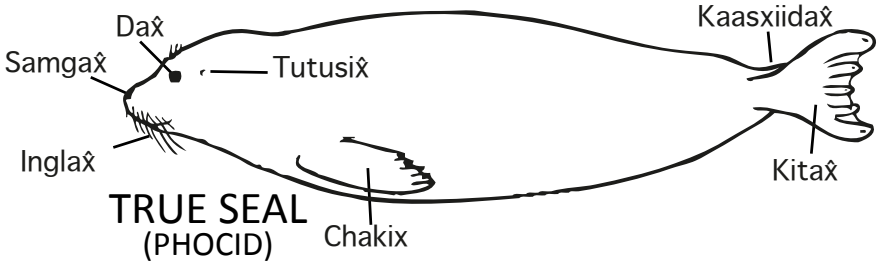


A. Daŷ (Eye)
B. Tutusiŷ (Ear)
C. Tumgaŷ (Tusk)
D. Samgaŷ (Snout)
E. Kaasxiidaŷ (Tail)
F. Inglaŷ (Whiskers)
G. Kitaŷ (Hindflipper)
H. Chakix (Foreflipper)

LAB 1.1 TEACHER KEY 1.1.2 Label a Pinniped

Student Name: _____ Date: _____

Label the parts of the three pinnipeds in English and Unangan



A. Daŷ (Eye)
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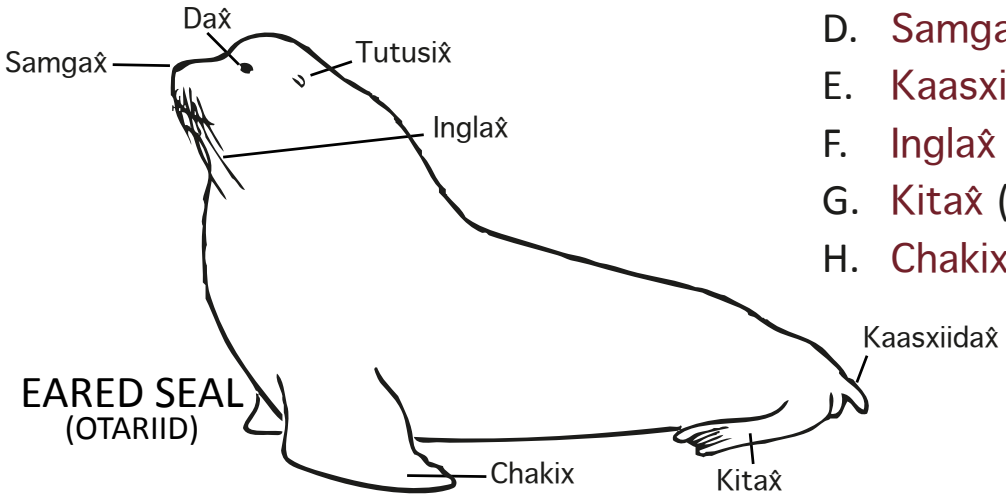
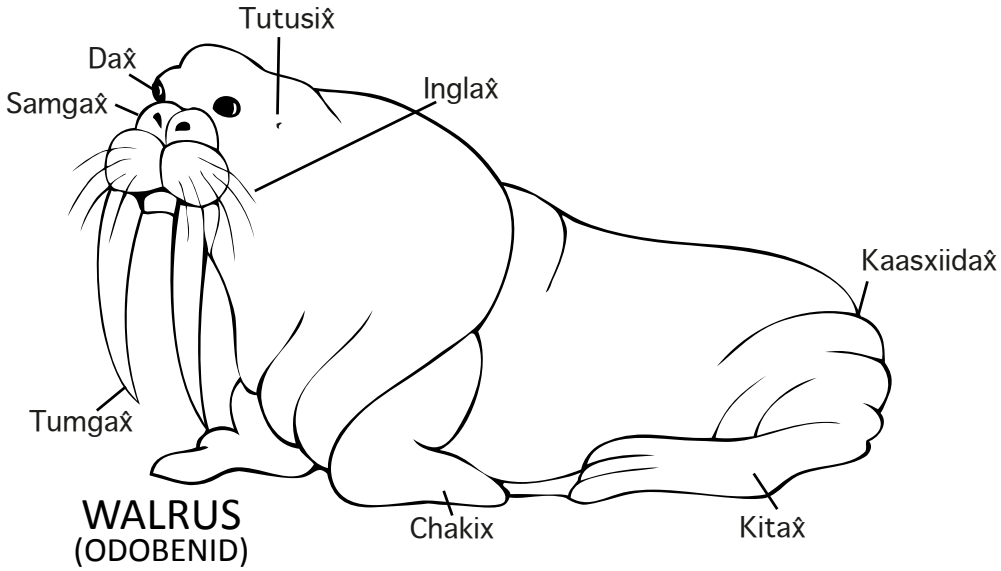




LAB 1.1 WORKSHEET 1.1.3 Describe a Pinniped

Student Name: _____ Date: _____

Animal Name:	
Characteristic	Description

LAB 1.1 TEACHER KEY 1.1.3 Describe a Pinniped*

Student Name: _____ Date: _____

Animal Name: Northern fur seal Unangam Name: Laaqudax̂

Characteristic	Description
Body shape	Big and bulky (adult male); long and sleek, with long neck (female, juvenile)
Head shape	Small in comparison to the rest of the body; nose very short and pointed; eyes large. External ear flaps.
Flipper shape	Large foreflippers; fur stops partway down the flipper. Hindflippers can rotate forward under the body so that the fur seal can stand up on all four flippers. Hindflippers are long and narrow and have very long toes that can be bent. Hindflippers have nails or claws that they use to scratch themselves.
Fur	Fur is dark and thick; on males there is a thicker area of fur on the neck and head. Fur has two layers, a dense underfur and longer guard hairs. Juveniles and females have a silvery-brown coat which is lighter on the underside of the animal, and lighter cream-colored "cheek patches". Male fur color is more uniformly dark brown. Pups have black fur at birth. Pups molt into their first silvery-brown coat by October of their first year.
Length	male: 2.1 m (6.9 ft), female: 1.4 m (4.7 ft)
Weight	male: 185-275 kg (407-605 lbs), females: 30-50 kg (66-110 lbs)
(Add characteristics that you know personally)	
Meat	Darker than sea lion; tastes different than sea lion
Intestine	Used to make waterproof clothing

***** ***create a worksheet for each seal***

LAB 1.1.3 WORKSHEET KEY Describe a pinniped: Unangam names of pinnipeds

Note: numbers in parentheses refer to page numbers in the *Aleut Dictionary* (Knut Bergsland). Refer to P. 727 for words for different types of seal, fur seal and sea lion.

HARBOR SEAL

Isux̂ – (214) – harbor seal

SPOTTED SEAL

ukutux̂ – (432) – small white hair seal with black spots (shows up in winter, sticks head up and looks around) – possibly spotted seal

RIBBON SEAL

iglagayax̂ - (179) – ribbon seal

tux̂tux̂ (403) – small kind of seal (comes from north in cold weather), probably ribbon seal

RINGED SEAL

puchaaskiĝilix (288) – ringed seal

FUR SEAL

Laaqudax̂ – (254) – fur seal (eastern dialect)

Algamiklux̂ – (52) – fur seal (western dialect)

Laaqudaax̂ - (254) – fur seal pup

SEA LION

Qawax̂ – (313) – Steller sea lion

WALRUS

Amgaadax̂ – (64) – walrus

LAB 1.1.3 **WORKSHEET KEY**

Describe a pinniped: Pictures of true seals

 **Harbor seal**	 **Harbor seal**
 **Spotted seal**	 **Spotted seal**
 **Ribbon seal**	 **Ribbon seal**
 **Ringed seal**	 **Ringed seal**

LAB 1.1.3 WORKSHEET KEY

Describe a pinniped: Pictures of eared seals

Fur seal (male)

Fur seal (male and female)

Fur seal (female)

Fur seal (female)

Sea lion (male)

Sea lion (male and female)

Sea lion (female and pup)

Sea lion (female)

LAB 1.1.3 WORKSHEET KEY

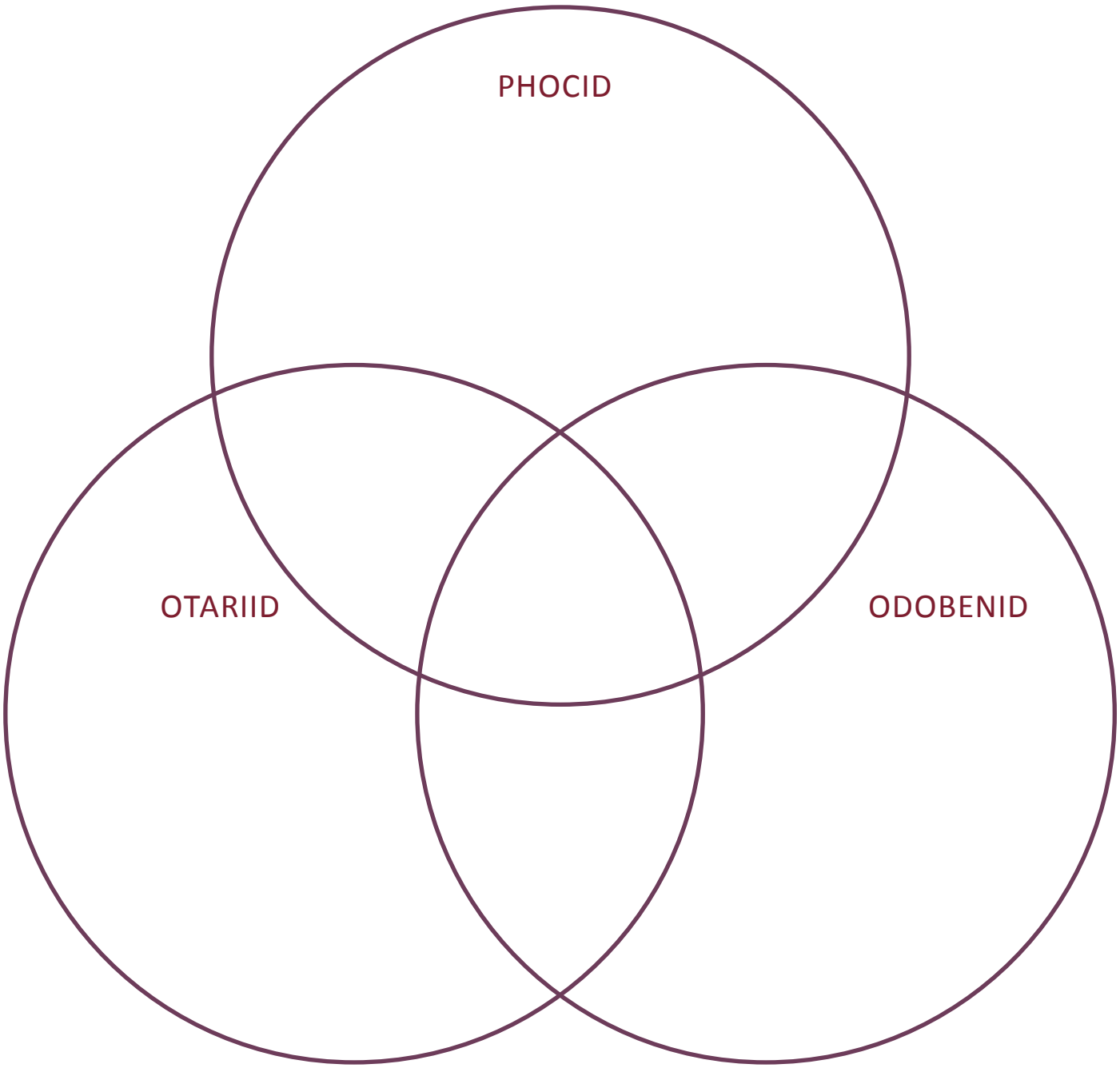
Describe a pinniped: Pictures of walrus

	
Walrus	**Walrus**

LAB 1.1.4 WORKSHEET 1.1.4 Venn Diagram

Student Name: _____ Date: _____

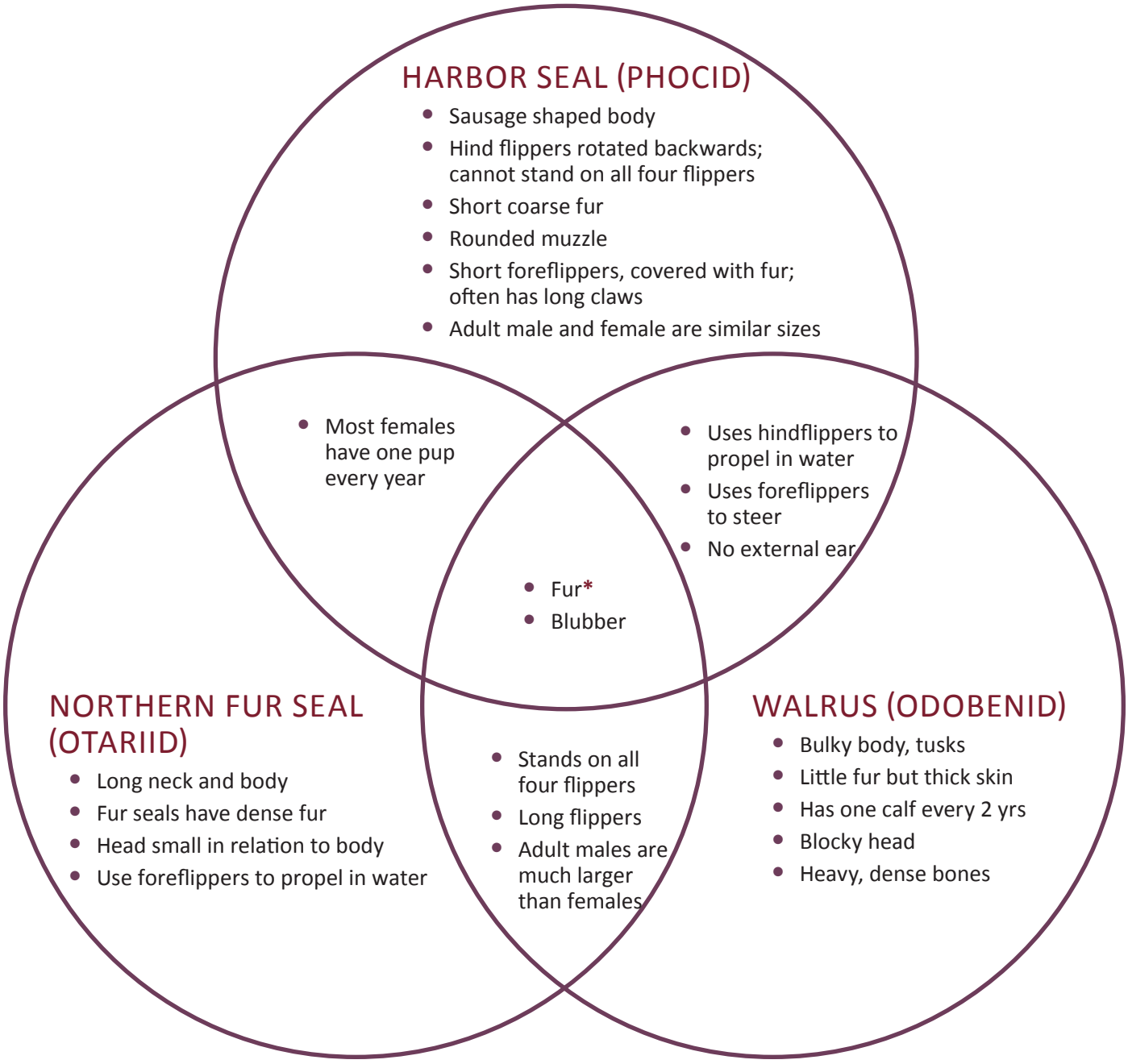
Fill in the Venn diagram with the characteristics of the three pinniped groups, showing characteristics that the three groups have in common and characteristics that are unique to each group



LAB 1.1 TEACHER KEY 1.1.4 Venn Diagram

Student Name: _____ Date: _____

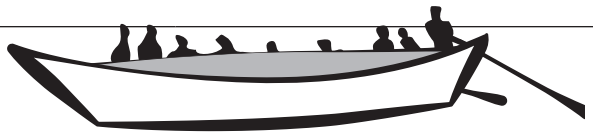
Fill in the Venn diagram with the characteristics of the three pinniped groups, showing characteristics that the three groups have in common and characteristics that are unique to each group



Fur: True seals and sea lions have short, coarse fur. Fur seals have two layers of fur, dense underfur and outer guard fur. Walrus have very little fur.

LESSON TWO

Who are the Unangan?



Subject Area(s): Life science, history, cultural	**Grade Levels:** 7-12	Presentation – 15 minutes Labs – variable

Lesson Topics:	Geography, Unangam culture and history, Unangan relationship to northern fur seals	**Focus Questions**	• Where are the Aleutian and Pribilof Islands? • Who are the Unangan? • How have historical events affected Unangam history?
Learning Objectives:	Students will: • investigate the geography of the Aleutian and Pribilof Islands • interpret the Unangam culture through film and literature	**Key words:**	Unangan (noun), Unangam (adjective), Aleutian Islands, Pribilof Islands, culture, history, internment

LABS		ALASKA STANDARDS			
		Science	History	Minutes	Grades
Lab 2.1	Where are the Aleutian Islands and the Pribilof Islands? (mapping)	SF1-3	PPE1	50	7–12
Lab 2.2	Who Are the Unangan? (read and discuss)		IGCP2	50	7–12
Lab 2.3	*People of the Seal* (watch and discuss)		ICGP2,9, CC1-4	2x50	7-12
Lab 2.4	*Aleut Story* (watch and discuss)		ICGP2,5,9, CC1-4	3x50	7-12
Lab 2.5	*Aleutian Sparrow, The White Seal, Libby* (read and discuss)		ICGP2,5,9, CC1-4	30-50	7-12

Targeted Alaska Grade Level Expectations (GLEs)

Cultural, Social, Personal Perspectives, and Science

SF1 Students develop an understanding of the interrelationships among individuals, cultures, societies, science, and technology.

SF2 Students develop an understanding that some individuals, cultures, and societies use other beliefs and methods in addition to scientific methods to describe and understand the world.

SF3 Students develop an understanding of the importance of recording and validating cultural knowledge.

American History-People, Places, Environment (PPE)

The student demonstrates an understanding of the interaction between people and their physical environment by:

PPE 1 comparing and contrasting geographic regions of Alaska.

Individual, Citizenship, Governance, Power (ICGP)

The student demonstrates an understanding of the historical rights and responsibilities of Alaskans by:

ICGP 2 using texts/sources to analyze the impacts of the relationships between Alaska Natives and Russians (i.e., Russian Orthodox Church, early fur traders, Russian American Companies, enslavement, and Creoles).

ICGP 5 explaining the impacts of military actions relative to Native communities (e.g., Naval bombardment of Angoon, Aleut internment, military expeditions.)

ICGP 9 exploring the federal government's influence on settlements in Alaska (e.g., Matanuska Colony, Anchorage, Adak, Tok, Hydaburg) by establishment of post offices, military facilities, schools, courts, and railroads.

Continuity and Change (CC)

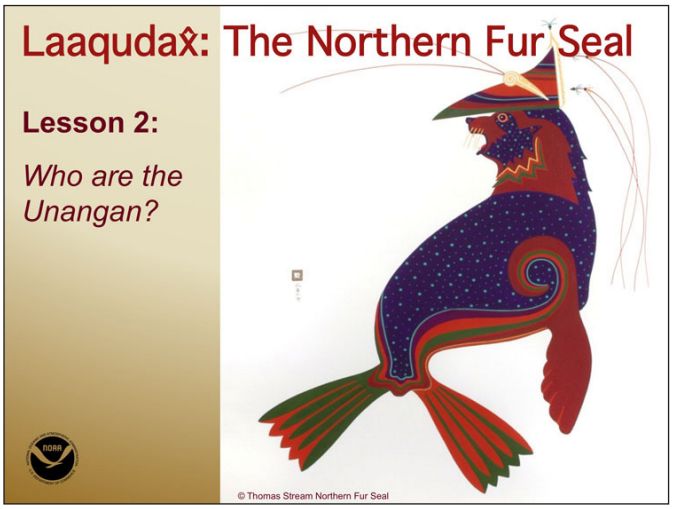
The student demonstrates an understanding of the chronology of Alaska history by:

CC 1 using texts/sources to recognize and explain the interrelationships among Alaska, national, and international events and developments (e.g., international interest, trade, commerce).

CC 2 describing how policies and practices of non-natives (e.g., missionaries, miners, Alaska Commercial Company merchants) influenced Alaska Natives.

CC 3 describing how the roles and responsibilities in Alaska Native societies have been continuously influenced by changes in technology, economic practices, and social interactions.

CC 4 giving correct and incorrect examples to explain subsistence as a way of life.



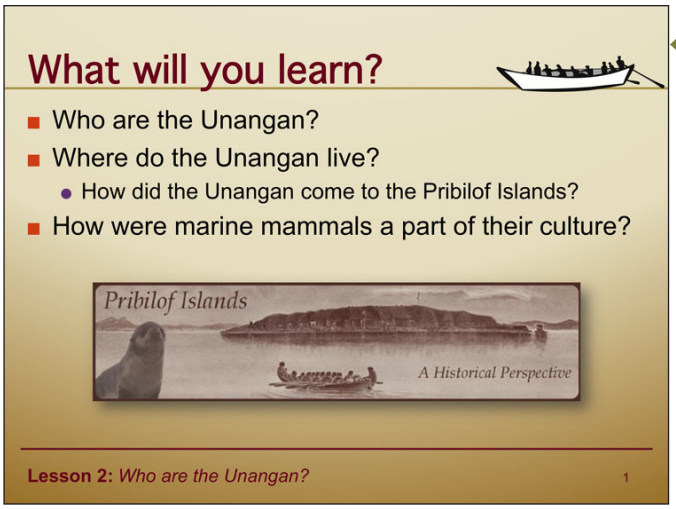
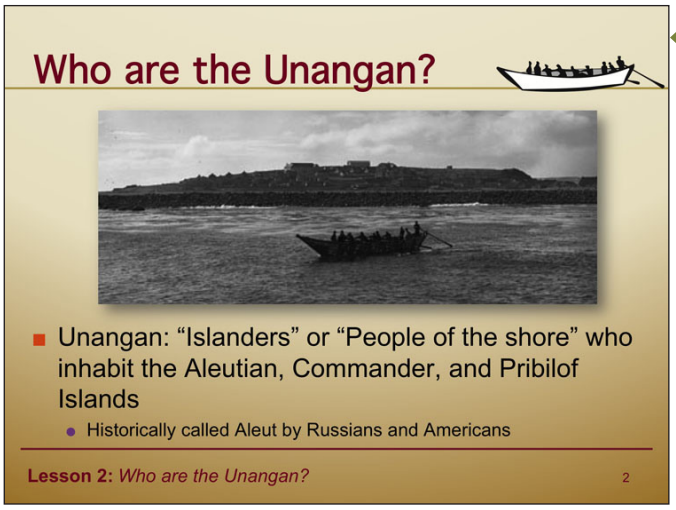


Image: Pribilof Islands Preserving the Legacy; MML collection/NOAA/AFSC



The Unangan traveled to the Aleutian Islands from Asia, across the Bering Land Bridge. The term "Aleut" was first used by the Russians, but they also used the term "Aleut" to refer to other, non-Unangan people (Koniag Eskimos from Kodiak Island and other southern Eskimos, who had a different culture and language).

The Unangan lived in the Aleutian Islands for thousands of years, had a rich material culture in which each Unangan owned many possessions, and a complex intellectual culture that included their own written language and a detailed knowledge of human anatomy. Unangan were skilled sailors and navigators, and traveled among the Aleutian Islands for hundreds of miles in their kayaks (ulluxtaq).

Source: Laughlin, W. 1980. Aleuts: Survivors of the Bering Land Bridge; Torrey, B. 1978. Slaves of the Harvest.

Photo: Baidar near East Landing, St. Paul Island, Alaska – Pribilof Islands Preserving the Legacy; MML collection/NOAA/AFSC

Where did Unangan traditionally live?

- Aleutian and Commander Islands
- Beginning in the 1780s, Unangan lived on the Pribilof Islands
- Unangan called the Pribilof Islands **Tanax̂-Amix̂**

Lesson 2: *Who are the Unangan?* 3

The Unangan originally arrived in the Aleutian Islands on Umnak Island, then migrated in two groups: west towards Attu Island and east towards the Alaska Peninsula.

Today Unangan live all over Alaska and the lower 48 states.

Source: Laughlin, W. 1980. Aleuts: Survivors of the Bering Land Bridge.

Unangan and the Pribilof Islands

- Brought to the Pribilof Islands by Russian fur traders in 1788
- Forced to harvest fur seals for Russians and Americans

Lesson 2: *Who are the Unangan?* 4

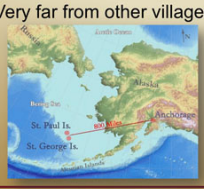
Russians arrived in the Aleutian Islands in 1741, and fought with the Unangan. Russian fur hunters forced the Unangan to hunt sea otter for Russian markets after they captured Unangam villages. 3,000-5,000 Unangan were killed in the Umnak-Unalaska area, and overall almost half of the original population of 16,000 Unangan had died by 1778. Source: Laughlin, W. 1980. Aleuts: Survivors of the Bering Land Bridge.

Gerasim (Gavriil) Pribylov discovered St. George Island (1786) and its fur seal rookeries, and his men discovered St. Paul Island in 1787. Unangan were taken to the Pribilof Islands from Atka and Unalaska in 1788 and forced to harvest fur seals. Source: Hanna, G.D (2008) The Alaska Fur Seal Islands. Torrey, B. 1978. Slaves of the Harvest.

Image: Henry Wood Elliott illustration, Pribilof Islands Preserving the Legacy; MML collection/NOAA/AFSC

Life on The Pribilof Islands Before the Fur Trade

- Pribilofs were uninhabited by people until 1788
- Challenges for People
  - No fresh water streams
  - No protected bays for boat landings
  - Harsh weather conditions
  - Very far from other villages
- Benefits
  - Abundant wildlife: fur seals, harbor seals, sea lions, walrus, birds, halibut, crab



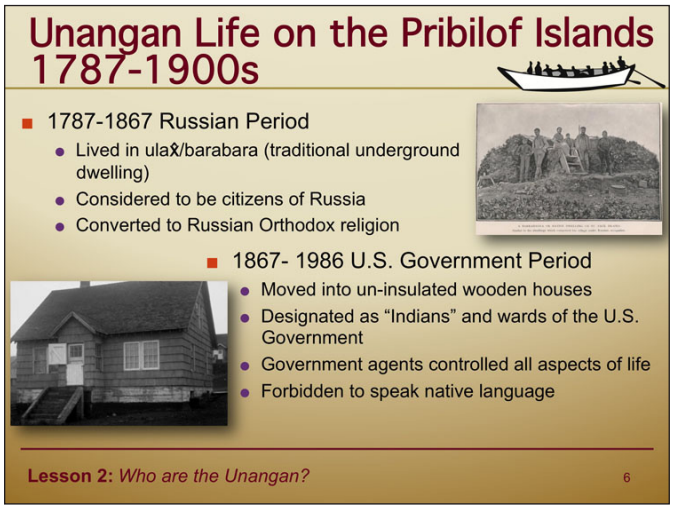
Lesson 2: *Who are the Unangan?* 5

The Pribilof Islands are flat, treeless, volcanic islands covered in grass and sedge. Wind, rain, and fog are common throughout the year. The Pribilof Islands sit in the middle of the Bering Sea at the edge of the continental shelf. In the 1700s neither island provided a good harbor or protected bay for anchoring or landing a vessel. The islands are roughly 800 miles from Anchorage and 250 miles from Unalaska Island in the Aleutian chain.

Source: Laughlin, W. 1980. Aleuts: Survivors of the Bering Land Bridge, Marine Exchange of Alaska: http://www.mxak.org/ports/northern_west/st_paul/st_paul.html

Map: NOAA Office of Response and Restoration: Pribilof Island Restoration Project http://archive.orr.noaa.gov/pribilofs

Photos: Pribilof Islands Preserving the Legacy; MML collection/NOAA/AFSC



1787-Russian fur traders first brought Unangan to the Pribilof Islands to harvest seals for the fur trade. Hunters were brought to the islands on a seasonal basis until 1820 when permanent encampments were established.

Unangan lived during the winter in subterranean houses called ulax or barabara. The houses had a framework of driftwood or whale bone. Family members entered through a portal in the roof. These dwellings were large, warm, and safe during the long Aleutian winters. It was not uncommon for several related families to live in one ulax.

Under Russian rule the Unangan were considered Russian citizens. They were allowed to keep their community based governing and to speak Unangan. Russian orthodox religion was introduced. Most Unangan were bilingual.

1867-US purchases Alaska from Russian. Private companies manage the fur seal harvest.

1911 –US government takes over managing the harvest and life on the Pribilofs. All aspects of the lives of the people on the islands are controlled by the government including marriage, housing, food, laws, travel, work, and socializing.

1960 US govt begins to phase out its administrative duties.

1983 Pribilofs become independent from US govt.

For more information see the Aleutian Pribilof Island Association (APIA) website: http://www.apiai.com/culture.asp?page=culture

Photos: http://docs.lib.noaa.gov/noaa_documents/NOS/ORR/TM_NOS_ORR/TM_NOS-ORR_17/HTML/Pribilof_html/Images/Gallery/Gallery_NARA_4/No475_native_house_with_dutch_door.html

Ulax̂/barabara— http://docs.lib.noaa.gov/noaa_documents/NOS/ORR/TM_NOS_ORR/TM_NOS-ORR_17/HTML/Pribilof_html/Images/Gallery/Gallery_Jordan/Barrabarra_face_p8.html

Challenges – Everything must be shipped to the Islands by plane or boat. The only food available on the Islands is seal, birds, fish, crab, berries, shellfish, and native plants.

Weather can also be a challenge – fog, wind, snow, and ice can affect air travel, and the islands can go for a week or longer without planes being able to land (affects food availability as well as travel to and from the islands).

Only basic medical care is provided on the islands.

Advantages – Two types of fishing quotas

1. CDQ- The Western Alaska Community Development Quota (CDQ) Program allocates a percentage of all Bering Sea and Aleutian Islands quotas for groundfish, prohibited species, halibut, and crab to eligible communities. The purpose of the CDQ Program is to (i) to provide eligible western Alaska villages with the opportunity to participate and invest in fisheries in the Bering Sea and Aleutian Islands Management Area; (ii) to support economic development in western Alaska; (iii) to alleviate poverty and provide economic and social benefits for residents of western Alaska; and (iv) to achieve sustainable and diversified local economies in western Alaska. https://alaskafisheries.noaa.gov/cdq/
2. IFQ- individual fishing quotas go to individual fisherman who are involved in the fixed gear (ie: longline or pots) for halibut or sablefish in Alaska.

Photos: Pribilof Islands Preserving the Legacy; MML collection/ NOAA/AFSC. Pribilof Islands Environmental Restoration Project Photographs

How are marine mammals part of the culture?

- Hunted marine mammals for thousands of years for food and clothing
- Resources from marine mammals were shared in the community
- Stories and songs told about the fur seal islands (Tanaŷ-Amiŷ, the Pribilof Islands)

Lesson 2: *Who are the Unangan?* 8

Emphasize the concepts of subsistence hunting vs. commercial harvesting, which are two very different activities:

Subsistence hunting: hunting for the sake of survival and community sharing rather than for entertainment or monetary gain.

Commercial harvest: to catch, shoot, trap, etc. (fish or wild animals) usually in an intensive, systematic way as for commercial purposes. Benefits go to individuals or companies, not to the community.

Unangan hunted marine mammals for subsistence for thousands of years but were forced to harvest sea otters and fur seals for the Russians starting in the 1740s, and fur seals for the Americans after 1867, for monetary gain. The number of animals harvested was determined by Russians and Americans.

Based on the stories and songs, the Unangan knew about the Pribilof Islands from long ago.

Source: Torrey, B. 1978. Slaves of the Harvest

Image: Henry Wood Elliot Illustration — 1884, Repository, University of Washington, University of Washington Libraries, Freshwater and Marine Image Bank.

How are seals and sea lions part of everyday life?

- Animal parts used in clothing, hunting, and ceremonies
  - Flippers - soles of boots
  - Fur – trim on clothing, not used for coats
  - Stomach, intestines – waterproof clothing and floats
  - Teeth - fish hooks and decorations
  - Shoulder blades (scapulas) – musical instruments
  - Bones – toys

Lesson 2: *Who are the Unangan?* 9

The Unangan never used marine mammal fur for coats. Marine mammal fur was used for trim and decoration. Due to the very wet environment in the Aleutians, fur was not a practical choice for a coat. Waterproof coats were made from marine mammal gut or intestine.

See Aleut Corporation for good definition of clothing (http://www.aleutcorp.com/index.php?option=com_content&view=section&layout=blog&id=6&Itemid=24)

Photos: gut parkas — Waldemar Jochelson, "History, Ethnology, and Anthropology of the Aleut." Smithsonian Institution, Alaska Native Collections
scapulas — Pam Goddard, Thalassa

How are seals and sea lions part of everyday life?

- Food
  - Lusta – salted fur seal flipper
  - Braided seal meat – seal meat braided with intestines
  - Salted seal meat stew
  - Seal tongue soup
  - Seal pie
  - Alagnosa – salted seal
  - Stuffed seal stomachs
  - Kukleetka – sea lion meatballs
  - Piroshki – meat filled pastry
  - Hearts and livers
  - Stinky oil
  - Sea lion soup
  - Studen – sea lion flipper in a jellied salad

Lesson 2: *Who are the Unangan?* 10

All parts of the fur seal were used including the internal organs and flippers.

Source: Alaska's Child 1985. Fur Seal Flippers and other Delicacies – The Aleut People of Saint Paul Island Cookbook

Photos: Millie McKeown, Aleutian Pribilof Islands Association (APIA), used with permission .

Fur Seals in Stories and Songs

- Stories and Songs
  - Harvest dance
  - Aleut Tales and Narratives
  - Tanax̂-Amix̂ – Legend of the Fur Seal Islands

Lesson 2: *Who are the Unangan?* 11

See video of Ms. Edna, Aleut culture and dance teacher: http://www.youtube.com/watch?v=ZWGpO5eChGk&feature=related.

Aleut Tales & Narratives by Waldemar Jochelson; edited by Knut Bergsland and Moses L. Dirks, 1990.

Tanax Amix: Legend of the Fur Seal Islands, Reprinted from Slaves of the Harvest by Barbara Boyle Torrey, Tanadgusix Corporation, St. Paul Island, 1978.

http://www.ankn.uaf.edu/ancr/aleut/culturalchange/chap.1-5.html

Photo: Lisa Hiruki-Raring, NOAA/AFSC

Summary

- Unangan traditionally lived on the Aleutian and Commander Islands
- Russians forced the Unangan to live on the Pribilof Islands and harvest fur seals in the 1780s
- Unangan used marine mammals for food, clothing, tools, and boats
- Today, the Unangan live all over the world

Lesson 2: *Who are the Unangan?* 12

Photo: Pam Goddard, Thalassa

Where Are the Aleutian Islands and the Pribilof Islands?

OBJECTIVE

Students will explore the geography and environment of the Aleutian and Pribilof Islands.

TIME REQUIREMENT

50 minutes

BACKGROUND

The Aleutian Islands are a chain of 14 large volcanic islands and 55 smaller ones extending about 1,200 miles (1900 km) westward from the Alaskan Peninsula. The Pribilof Islands are a group of four volcanic islands: two larger islands (St. Paul and St. George) and two smaller islets (Otter and Walrus Islands). The Pribilof Islands are in the Bering Sea, about 200 miles (320 km) north of Unalaska Island in the Aleutian Islands. The islands are home to 600-800 hundred Unangan and non-Unangam residents in addition to diverse wildlife. The Unangan who inhabit the Aleutian and Pribilof Islands are one of many recognized native groups in Alaska.

MATERIALS

- Maps of Alaska, North America, world, or globe
- "*The Bering Sea and Aleutian Islands, Regions of Wonder*"
- Information on physical environment on Pribilofs and town/city of the students are located
- Climate and weather information
- Wildlife and natural resource information

PROCEDURES

Worksheet 2.1.1: Island Communities

1. Divide the class into groups of two to three students depending on the size of the class.
2. Allow the students to choose an island to compare to the Pribilof Islands.
3. Depending on the grade of the students, use the the list below as a guideline and assign each group of students either Worksheet 2.1.1, a comparative essay, or a visual presentation.
4. Ask the students to think about the how the natural elements influence life on an island. Keep in mind the following: tools, language, beliefs, spirituality, education, economy, and transportation.

Physical Environment

- Location: Distance from mainland? Distance to nearest town or city?
- Geology: How were the Pribilof Islands formed? How were the Aleutian Islands formed?
- What is topography? Are there hills, lakes, rivers?

Climate and Weather

- Describe the weather during the seasons: summer, fall, winter, spring.
- What is the average temperature, rainfall, snowfall?
- Is it an extreme environment?

Wildlife and Natural Resources:

- Describe the wildlife: terrestrial and marine animals, birds, mammals, reptiles, invertebrates
- Describe the plants: terrestrial and aquatic

Worksheet 2.2.2: Traditional territories of Alaska Native cultures.

This map shows traditional languages of Alaska Native cultures. Using the list of Alaska Native cultures label and shade in the respective regions.

Divide the class into groups. Assign each group one of the Alaska Native cultures to research and present their information to the class.

DISCUSSION

- If you live on the Pribilof Islands describe how your environment is different from the rest of Alaska.
  - Discuss weather, climate, geography, and wildlife.
- If you don't live on the Pribilof Islands, how are the Pribilof Islands different from where you live?
  - Discuss weather, climate, geography, and wildlife.

EXTEND AND EXPLORE

Research the groups of cultures within each main group on the map on Worksheet 2.1.2. Using the Alaska Native Heritage websire (http://www.alaskanative.net/en/main-nav/education-and-programs/cultures-of-alaska/).

Where Are the Aleutian Islands and the Pribilof Islands?

RESOURCES

Maps of Alaska, North America, world

- https://maps.google.com
- https://www.google.com/earth/
- https://www.mapquest.com/

Climate & weather information

- http://docs.lib.noaa.gov/noaa_documents/NOS/ORR/TM_NOS_ORR/TM_NOS-ORR_17/HTML/Pribilof_html/Pages/pribilof_island_climate.htm
- http://www.nws.noaa.gov/
- http://www.weather.gov/climate/
- http://worldweather.wmo.int/

Wildlife & natural resource information

- http://www.apiai.org/tribes/st-george/l
- http://serc.carleton.edu/research_education/nativelands/pribilofs/floraandfauna.html
- https://www.fws.gov/refuge/Alaska_Maritime/visit/pribilof_Islands.html
- http://www.adfg.alaska.gov/index.cfm?adfg=viewinglocations.pribilofislands

Alaska Native Heritage Center: Native Cultures

- http://www.alaskanative.net/en/main-nav/education-and-programs/cultures-of-alaska/

Adapted from "I Am Where I Am": Mierzejek, B., A.D. Lestenkof, and P.A. Zavadil. 2007. Unangam-Based Environmental Education Primer for St. Paul Island, Alaska.

- "The Bering Sea and Aleutian Islands, Regions of Wonder" by Terry Johnson, 2003. Alaska Sea Grant College Program, Fairbank, AK.

Information on physical environment on Pribilofs and town/city of residence

- http://www.amiq.org/pribilof.html

LAB 2.1 **WORKSHEET 2.1.1** Island communities

Student Name: _____ Date: _____

Where are the Aleutian and the Pribilof Islands?

Fill in the location you are comparing with the Pribilof Islands.

Environment on Pribilof Islands	Characteristic	Environment on _____
	Physical Environment	
	Climate and Weather	
	Wildlife and Natural Resources	

LAB 2.1 **WORKSHEET 2.1.1** **TEACHER KEY**

Student Name: _____ Date: _____

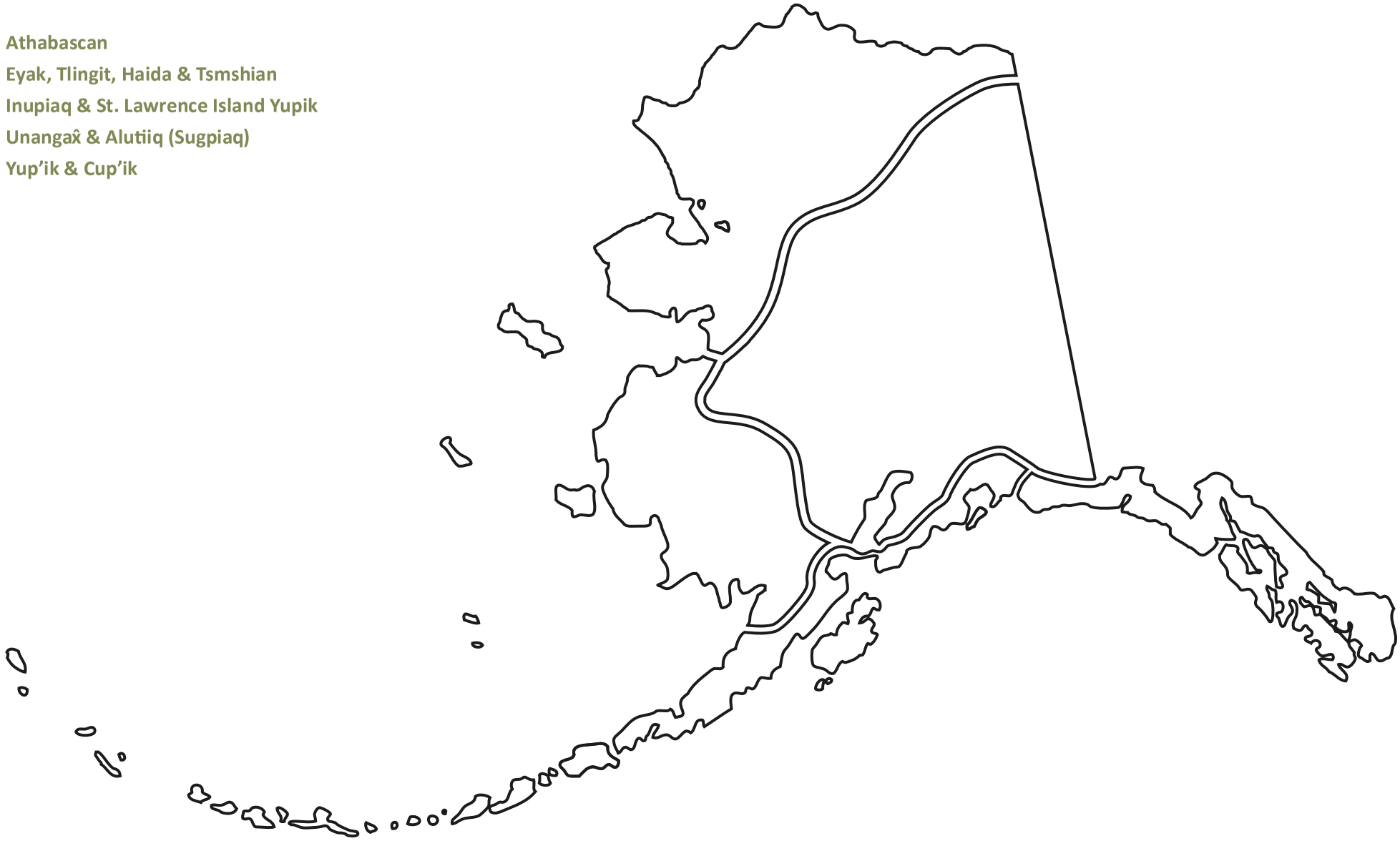
Where are the Aleutian and the Pribilof Islands?

(Example: answers may vary)
Fill in the location you are comparing with the Pribilof Islands.

Environment on Pribilof Islands	Characteristic	Environment on HAWAIIAN ISLANDS
Distance from mainland = 300 miles	Physical Environment	Distance from mainland = 2,045 nautical miles
Nearest mainland town or city = Anchorage, approximately 775 miles away.		Nearest mainland town or city = Point Arena, California Lighthouse
The islands are in Bering Sea		The islands are in North Pacific Ocean
Population St. Paul = 500 Population St. George = 100		Population of largest city: Honolulu = 1 million
Geology – volcanic origin		Geology – volcanic origin
Summer weather, avg. temp: 46˚ Winter weather, avg. temp: 29˚	Climate and Weather	Summer weather, avg. temp: 94˚ Winter weather, avg. temp: 87˚
Typical weather, foggy in summer… etc.		Typical weather, sunny with frequent rain on windward side of island
Native mammals – northern fur seal, fox, Priblof Island shrew, orca whale, other whales (gray whales, humpbacks) Steller sea lion, harbor seal, sea otter, walrus	Wildlife and Natural Resources	Two native mammals, bat and Hawaiian monk seal
Introduced mammals – reindeer, cat		Introduced or invasive species - Norway rat, mongoose
Birds – over 200 species have been identified including: tufted puffin, Black-legged kittiwake, Red-legged kittiwake, Common murre		Native birds – examples ‘iiwi, Hawaiian goose (nene), tropicbirds, albatross
Fish – halibut, pollock, cod		Introduced birds – Mallard, Japanese Quail, Zebra Dove
Plants – native grass, wild celery - putschki, chocolate lily, willow, mossberries	**NOTE: Other categories can be added**	Fish – blackfin barracuda, angelfish, Hawaiian zebra blenny, and many more
Trees – none		Plant – ohai, viola, hibiscus, geranium, club moss, ferns, orchids
		Trees – king koa, banyan, Hawaiin coral tree, royal sandalwood

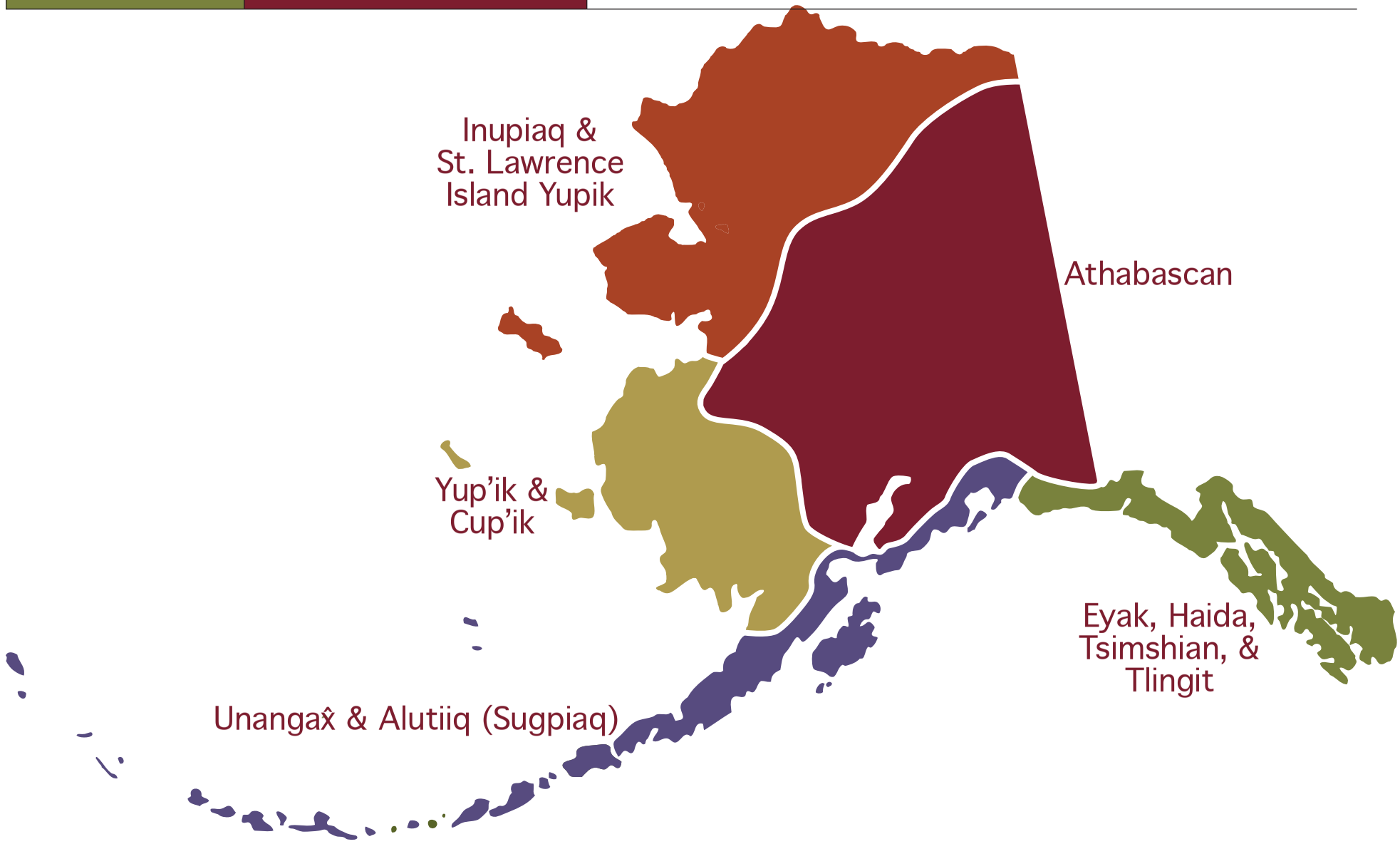
Map of Traditional Territories of Alaska Native Cultures

Athabascan
Eyak, Tlingit, Haida & Tsmshian
Inupiaq & St. Lawrence Island Yupik
Unangax̂ & Alutiiq (Sugpiaq)
Yup'ik & Cup'ik



Adapted from source map by: Alaska Native Heritage Center, Anchorage, AK, http://www.alaskanative.net/

Map of Traditional Territories of Alaska Native Cultures



Adapted from source map by: Alaska Native Heritage Center, Anchorage, AK, http://www.alaskanative.net/

LESSON TWO **LAB 2.2 WRITING** Grade Level 7-12

Who are the Unangan?

OBJECTIVE

Encourage students to explore their personal and ethnic identities and what these identities mean to them.

TIME REQUIRED

50 minutes

BACKGROUND

These activities allow for exploration of self in various contexts from families to communities to being a U.S. citizen. They are purposely chosen to make students aware that part of being a responsible productive community member is to possess and practice an appreciation for self in relation to one's people and culture. Furthermore, the activities proceed in an effort to teach that one must understand and, better yet, utilize the cultural knowledge and wisdom and its relationship to the physical environment, as cultural interactions are an integral part of the environment and vice versa. Creating and implementing culturally responsive and/or place-based curricula must be an ongoing collaborative and coordinated process involving cultural specialists, community members, teachers and students.

In Unangam culture, history was passed from generation to generation through stories and songs. Lessons were learned or taught using stories.

MATERIALS

- *There is no such thing as an Aleut*
- Worksheet 2.2.1 Cultural Identity
- Worksheet 2.2.2 Cultural Comparison (Venn Diagram)
- Worksheet 2.2.3 Traditional Unangam Clothing
- Activity 2.2.4 Sharing Knowledge

PROCEDURES

- Read *There is no such thing as an Aleut*.
- Worksheet 2.2.1 Cultural Identity
  - Find out more about the name “Unangan” and what it means. Why is it the name of the people?
  - Discuss cultural identity.
  - How many different cultures are represented in the classroom?
  - How do the students celebrate their culture? Have each student go home and discuss with their family how they celebrate their culture and report back to the class.
- Worksheet 2.2.2. Cultural Venn Diagram
  - Use as a tool to visually compare the student’s culture to the Unangam culture.
  - Do some cultures have more in common with the Unangan?
  - Why is that?
- Worksheet 2.2.3 Traditional Unangam Clothing
  - Compare traditional Unangam clothing to present clothing.
  - What resources are needed to produce each item?
  - Who makes the items?
- Activity 2.2.4 Sharing Knowledge: Create a song, dance, story, poem, or picture that relates to the student’s cultural identity.

DISCUSSION

How is the Unangam culture similar or different from other cultures?

After completing the Sharing Knowledge Lab discuss how communicating without written words is different from communicating with written words.

This lesson was adapted from: Unangam-Based Environmental Education Primer for St. Paul Island, Alaska. Mierzejek, B., A.D. Lestenkof, and P.A. Zavadil. 2007, and used with permission

There Is No Such Thing as an Aleut

By: Barbara Švarný Carlson,
Qawalangix̂ originally from Iluulax̂, Unalaska

We call ourselves Unangan or Unangas (Atkan dialect). This is our autonym, our name for ourselves, the group identity for the indigenous peoples of the Aleutian Archipelago (including nine distinct subgroups) prior to contact with Europeans.

When Russian explorers came to our land, charting and mapping the area for their Czar, the first island group that they came upon were inhabited by the people who called themselves, Sasignan. For unclear reasons the Russians called them Aleut. They lived in what the Russians named the Near Islands, because of their proximity to Russia at the western end of the Aleutian Islands. As they moved eastward on their journeys, the Russians continued to call the people Aleut, even as they crossed a major dividing line of language and culture, encountering the Sugpiaq (many of whom now call themselves Alutiiq) Sugcestun-speaking people of the Alaska Peninsula.

The Russian language became the common acculturation denominator among these diverse groups. What is my point? We "Aleuts" are actually three different maritime peoples who had our own identities and subdivisions prior to our contact with the Russians: The Alutiiq speakers, the Central Yupik speakers of Bristol Bay, and the Unangam Tunuu (language of the Unangax̂) speakers. Why should we hang onto that foreign name, "Aleut?" To show the pride we have in our cultural heritage and reclaim and maintain our identities as a distinct people we should revive the original words we used to describe ourselves.

Our Unangam identities have become so tenuous that we, as a people, are excavating, sifting, and meticulously labeling the artifacts of various segments of our society with increasing fervor. If we do not, they may disappear forever, or be claimed by another group as their own, muddying our uniqueness and diffusing our very identity. So there is inherent in this work that element of reclamation that is necessarily a part of any revitalization of an indigenous culture.

It is not just material objects that make up our heritage. The endangered Unangam Tunuu, the Unangax̂ language, with its extant dialects is a virtually untapped resource concerning the clues it can provide to found objects, an understanding the profound relationship with land and sea, rules to live by, history, and perhaps most importantly, a unique view of the world to be shared and appreciated. Unangam folklore is a vital aspect of this contribution to the world bank of knowledge. It is like a gigantic puzzle in which museum artifacts fill another missing gap.

Common among Alaska Natives, people who were either raised away from our home villages, or who had to leave at some point during our lives, and had to remain away for some length of time, displaced Unangan/Unangas have a deepened sense of the sacred value of our origins. We feel a loss for what we have been missing, be it Native foods, songs, dance, stories, or seeing beauty reflected in artfully made objects. We miss seeing people who physically resemble ourselves and physically feeling the common elements with which our own people relate - elements such as wind, fog, salty air, and horizontal rain. We need to know these things about our cultural heritage and be able to share that common knowledge with family and community. We need to delight in hearing someone shout,

"Aang, Unangax̂! " (Hello, 'Aleut'). These are what many of those people returning from other places are searching for when they return to the village, or to Alaska. Many of us reside in the densely populated areas such as Anchorage and Fairbanks. Large numbers of Unangan/Unangas with close ties similarly reside on the west coast, particularly in Washington and Oregon. We consider our original villages home even if we have not been able to return there for many years. We share a need to assert, "Where we are from is important to us. What we like to eat is important. Our art is important. Our dance and music are important."

The Unangam foods are elemental to our culture. To have our Native foods sent to us when we are away is one of the most vitalizing, identity-rich gifts one's friends or family can bestow. Some of our traditional subsistence foods include aalax̂ (whale), isux̂ (hair seal), aanux̂ (red salmon), and qax̂ (any kind of fish). From the beaches some favorites are chiknan (limpets), wayĝ in (blue mussels), aguĝaadan (sea urchins), qasiikun (chitons or gumboots), chuxlan (clams), and kahngadgin (seaweed). Saaqudan (aka Puuchkiis (R)), qaniisan (aka petrushkies (R)), fiddlehead ferns, and other native vegetables seem to make one feel healthier. My favorite is udax̂, dried fish with chadux̂, seal oil. When we eat these foods we know more strongly who we are.

These valuable links to the Unangam culture are validation of our origins, touchstones to our self- and group-identities. It is an awesome responsibility that pairs us with various types of scholars and researchers as partners as we search for culturally appropriate ways to document traditional knowledge and skills. We are not just an exploitable resource, but an equal partner in this compilation of our world knowledge bank. The more any of us can know about who we are and where we come from, the more sensitive and confident we can be in our interactions among culturally diverse societies. Qax̂ aasakung.

Thank you, for listening.

A version of this essay was printed in the Arctic Studies Center's publication of *Crossroads Alaska: Native Cultures of Alaska and Siberia* (1995) and *Alaska Native Writers, Storytellers and Orators: The Expanded Edition,* Alaska Quarterly Review (1999) Ronald Spatz, Executive Editor.

LAB 2.2 WORKSHEET 2.2.1 Cultural Identity

Student Name: _____ Date: _____

Directions: *Fill in the blanks with your unique answer.*

1. Research the words Aleut and Unangan. What does the word Unangan mean? Compare with the meaning of the word Aleut.

2. List other examples of Western explorers misnaming native populations.

3. Why does the author feel that the Unangam language and foods are important?

4. Name two foods, songs, or dances that are culturally important to you or your family.

5. How is the Unangam culture different from yours?

6. How many cultures are represented in your classroom?

7. Name two of the cultures and list two ways in which they are similar and two ways in which they are different.
   - Similarities
   -
   - Differences
   -

8. List something new you learned about one of the cultures represented in your classroom.

LAB 2.2 WORKSHEET 2.2.1 TEACHER KEY

Student Name: _____ Date: _____

Directions: *Fill in the blanks with your unique answer.*

1. Research the words Aleut and Unangan. What does the word Unangan mean? Compare with the meaning of the word Aleut.

   "Aleut" is a word that the Russians used to describe the native people living in the Aleutian, Commander and Shumagin Islands and the western part of the Alaska Peninsula. The Russians used the same word to describe people of several different cultural backgrounds.

   "Unangan" is the term that the people of the Aleutian Islands used to describe themselves (or Unangas, in the dialect of Atka Island).

   The word "Aleut" is a word that Russians used to describe several groups of people with different languages and cultures (Unangan/Unangas, Sugpiaq and Alutiiq), while the word "Unangan" is the term that the people used to describe their own communities and culture.

2. List other examples of Western explorers misnaming native populations.

   E.g., American Indians, different tribes

3. Why does the author feel that the Unangam language and foods are important?

   She feels that language, goods, artifacts, dance, and music are connections to the Unangam culture, a way to share common knowledge between family and community members, and very important to the Unangam identity (both a person's individual identity and the group's identity) as a connection to their history.

4. Name two foods, songs, or dances that are culturally important to you or your family.

   Answers will vary.

5. How is the Unangam culture different from yours?

   Answers will vary – guide students to consider who are leaders in the culture, how culture is passed on, how history is remembered, clothing, food, celebrations.

6. How many cultures are represented in your classroom?

   Answers will vary.

7. Name two of the cultures and list two ways in which they are similar and two ways in which they are different.

   Similarities – example: Mexican and Japanese cultures, both have a celebration to honor one's ancestors (Dia de los Muertos in Mexico, and Obon in Japan); in both countries, the extended family is important and traditional, with the father as the head and the decision-maker; in both cultures, hierarchical relationships are important

   Differences - Answers will vary.

8. List something new you learned about one of the cultures represented in your classroom.

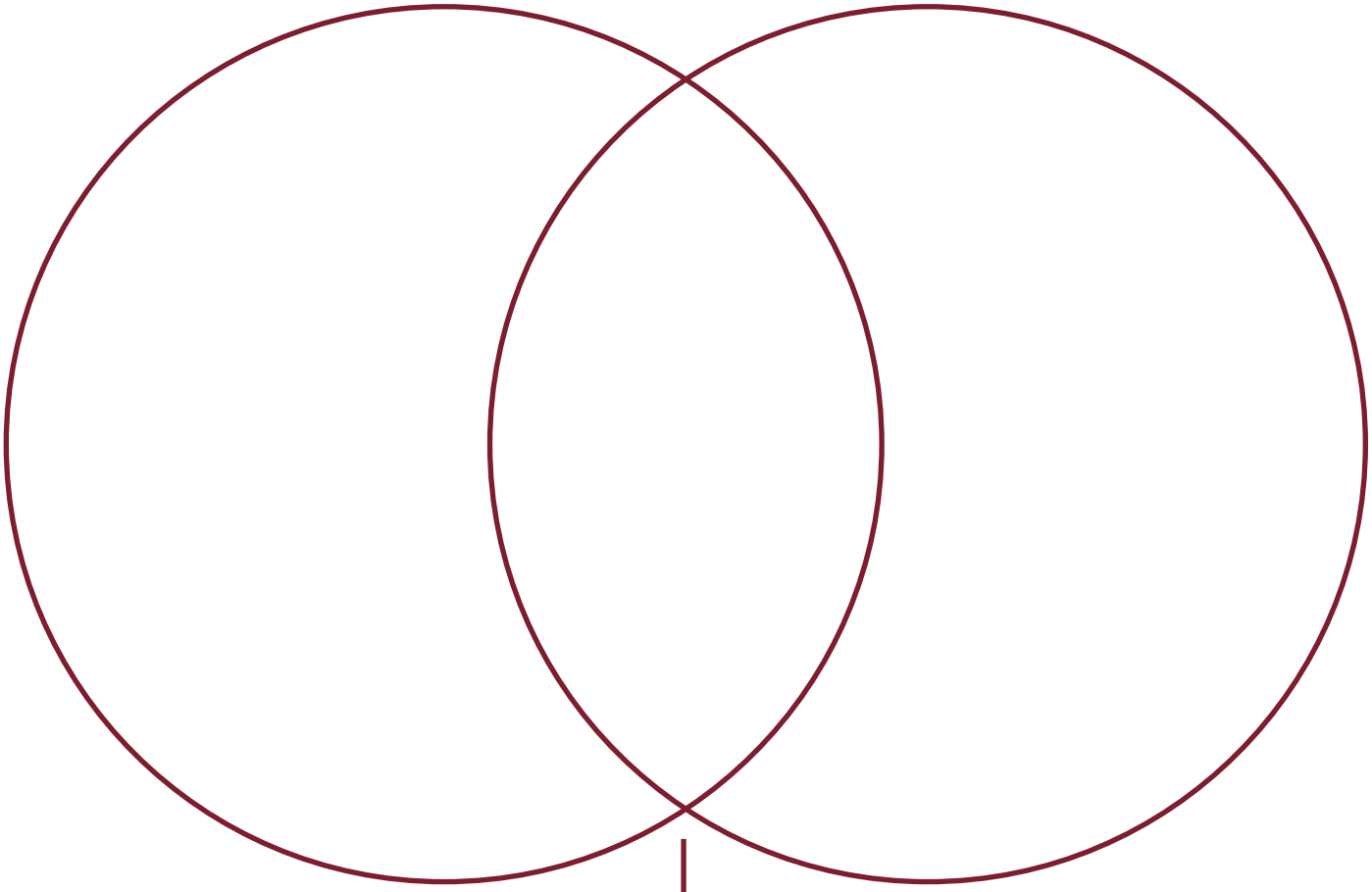
   Answers will vary

LAB 2.2 WORKSHEET 2.2.2 Cultural Comparison

Student Name: _____ Date: _____

Cultural Comparisons (Venn Diagram)

Compare Unangam values or ceremonial traditions with the values and ceremonial traditions of others.



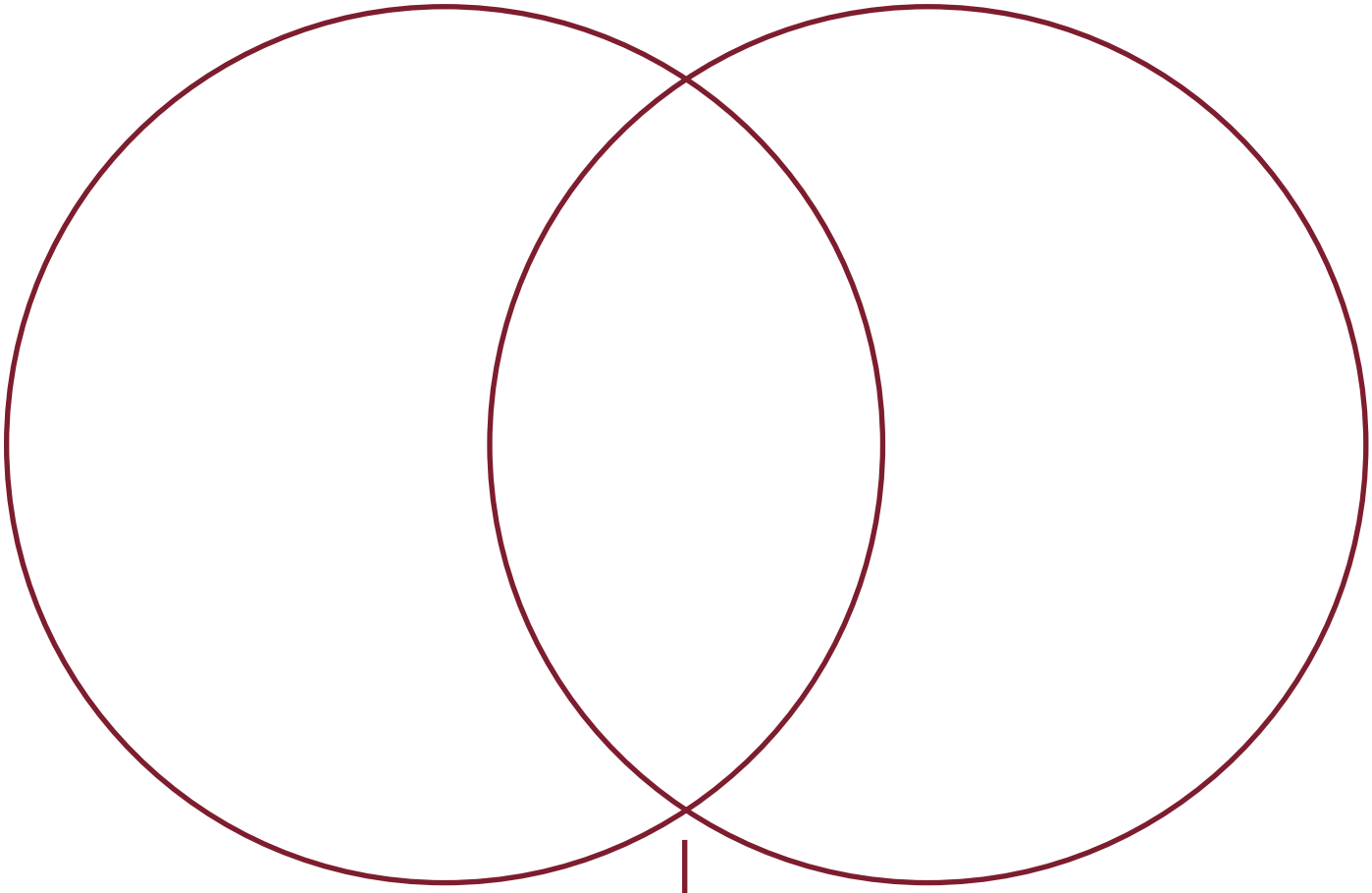
Unangan

LAB 2.2 WORKSHEET 2.2.2. TEACHER KEY

Student Name: _____ Date: _____

Cultural Comparisons (Venn Diagram)

Compare Unangam values or ceremonial traditions with the values and ceremonial traditions of others.



Unangan	Other Culture
• strong sense of community • elaborate hunting ceremonies • food is a part of the culture • oral history • subsistence hunters • respect for all creatures • only take what is needed • share take with elders • very spiritual	*Students can compare to urban cultures, other countries, or other indigenous cultures.*

LAB 2.2 WORKSHEET 2.2.3 Traditional Unangam Clothing

Student Name: _____ Date: _____

Traditional Unangam Clothing	Characteristic	Clothing from _____
	Clothing Item	
	Purpose	
	Material	

LAB 2.2 TEACHER KEY 2.2.3 Traditional Unangam Clothing

Student Name: _____ Date: _____

(Example: answers may vary)

Traditional Unangam Clothing	Characteristic	Clothing from Today
chaĝtalisax̂ or kamleika **gut parka with hood and draw string**	Clothing Item	**Rain coat/parka**
Waterproof kayaking and hunting parka **Drawstring at the bottom of the parka can be tied around the opening of the kayak to prevent water from entering, similar to kayak skirts worn today.**	Purpose	**Waterproof jacket. Drawstring hood and elastic wrists. Used to stay dry when outside during rainstorms.** **Some coats have a kayak skirt attached.**
Fur seal or sea lion gut (intestine) **Sinew from fur seal or sea lion used as thread.** **Bird or fish bone needles were used to sew.**	Materials	**Nylon/Gortex, rubber, or vinyl** **Cotton or nylon thread**
women	Made by	**Mostly made by factory workers in China, Indonesia, and India. A few companies sell parkas made in the United States.**
Source: Alaska Native Collections **Smithsonian Institution http://alaska.si.edu/record.asp?id=265**	**NOTE:** **Other categories may be added**	

BACKGROUND

This Lab provides the opportunity for students to hone their communication skills. Tell the students to pretend they don't know how to write words. Then ask them to come up with other ways to communicate, share what they know, or what they have learned without writing words – song, dance, story, poem, picture writing, dramatization.

PROCEDURES

Divide students into groups. Have them pick one communication method to express what they have learned in this lesson. It's up to you to decide how much writing of words they can use as they develop a chosen reporting method. They may be uncomfortable and therefore "funny". Try not to dissuade "funny" but tell them that it should not distract from the information they are imparting and ask them to try to employ humor purposefully, in such a way that their audience remembers the information they share. Try different approaches.

One approach you can try is improvisation. For example, one group may have their report in story form with a lot of action words and may be allowed to select another group to act it out as it is being read. You can demonstrate this method with the whole group to loosen them up using one of the Aleut Stories in the K-6 northern fur seal curriculum or another traditional story from your culture.

Following are suggestions for using various mediums:

Song: A group may compose only the chorus (for example, the core of the information they are trying to impart), a whole song, or music without words. Encourage students to create both words and music, but just one or the other will do.

Dance: A group may come up with motions that impart the information they wish to share. Students can decide if the group dances the story or just one person. They may feel the need to have music to go with the dance but should not be too dependent on words. Encourage actions to speak louder than words. This is a good time to encourage the use of humming or a simple chant such as "*la la la la*" or "*ay-ya ay-ya.*"

Story or Poem: A group may choose tell a story because it's more comfortable. Fine, but expand on this by applying more structure. Such as, "Make the story or poem so as 3 and 4 year olds will understand it." Or "Make the story or poem into a wise tale."

Picture Writing: Picture writing is someone telling and drawing [no words] a story and the listeners draw what the storyteller is saying, too. The storyteller may even tell the others exactly what to draw. For example, the storyteller may say, *"One day, grandfather was walking by a lake. Okay, you all draw a lake at the bottom of your paper and draw grandfather on the right side of the lake. There were six ducks at the east end of the lake. Draw six ducks, and make one bigger than the others..."* All members of the group may have a chance to be the storyteller. Picture writing can be two-tiered. The group can do this among themselves and then display all their picture writings; or use them to tell "the story" to another audience or the whole class.

Dramatization: All forms of theatrical Lab can be used. Employing song, dance, stories, poems, or picture writing in dramatization can be encouraged by providing additional incentives such as extra credit for using multiple techniques to tell a story.

Adapted with permission by Aquilina D. Lestenkof, St. Paul Island, Alaska

LESSON TWO | LAB 2.3 WRITING | Grade Level 7-12

People of the Seal

OBJECTIVE

Students will learn about the history and culture of one family on the Pribilof Islands. Students will be asked to think critically about their culture and traditional foods.

TIME REQUIRED

2- 50 minute class periods

BACKGROUND

People of the Seal explores the centuries-old connection between the northern fur seal and the Unangan of Alaska's Pribilof and Aleutian Islands in the middle of the Bering Sea. Aquilina Lestenkof traces five generations of her own family's history in this remote part of the world, weaving together native, Russian, and American cultural threads. At the heart of the story are the fur seals. Like the Unangan, the fur seals are struggling to survive. As Aquilina says, 'if they're not here, then we won't be either.'

MATERIALS

- *People of the Seal* (DVD or online video)

PROCEDURES

- Watch *People of the Seal*
- Conduct a guided discussion on family ancestry, home, sense of place.
- Worksheet 2.3.1 Food and Culture
  - Ask each student to research a food item that is culturally important to their family
- Worksheet 2.3.2 Farm to Plate
  - Using the food they researched for Worksheet 2.3.2, students will now investigate how that food arrives on their plate. Do they hunt it themselves? Do they buy it in a store? If it comes from a store, how far did it have to travel to get to their plate?

DISCUSSION

- What happens to a culture when the food it has depended on for thousands of years is no longer available?
- How would the students feel if they were told that they could no longer eat a food that was culturally important to them?
- What would they do?

EXTEND AND EXPLORE

- Research other native cultures who lost culturally significant food sources, e.g., Plains Indians and buffalo; Makah and gray whales
- Read this article published online by Foodtank about historically important foods from North America. Add to the list or make one of your own.
  - https://foodtank.com/news/2016/07/indigenous-foods-historically-and-culturally-important-to-north-americ/

LAB 2.3 WORKSHEET 2.3.1 Food and Culture

Student Name: _____ Date: _____

Directions: Research a food item that is culturally significant to your family. Interview family members if necessary. *Fill in the blanks with your unique answers.*

1. Name a food item that is culturally important to you or your family.

2. What is the origin of the item?

3. Why is it important to you or your family?

4. When is the item served (time of year, time of day)?

5. Has the item been altered to accommodate your family or newer traditions?

6. Is this something you will continue to eat once you leave home? Would you share it with friends? Explain why or why not.

LAB 2.3 TEACHER KEY 2.3.1 Food and Culture

Student Name: _____ Date: _____

Directions: Research a food item that is culturally significant to your family. Interview family members if necessary. *Fill in the blanks with your unique answers.*

EXAMPLE: Answers will vary - a food can be significant culturally to a community.

1. Name a food item that is culturally important to you or your family.

   Roast pork and sauerkraut on New Year's Day.

2. What is the origin of the item?

   The Pennsylvania Dutch eat pork and sauerkraut on new Year's Day for good luck. My father's family is from Pennsylvania so he grew up with this tradition.

3. Why is it important to you or your family?

   This is a tradition that is supposed to give good luck for the year, but it also provides a holiday meal that the family looks forward to every year.

4. When is the item served (time of year, time of day)?

   New Year's Day at dinner-time.

5. Has the item been altered to accommodate your family or newer traditions?

   Additional side dishes have been added to the holiday meal that reflect different family members' preferences.

6. Is this something you will continue to eat once you leave home? Would you share it with friends? Explain why or why not.

   Yes, I will cook it this way after I leave home because it is a way to remember my family and my memories of growing up and having this meal.

LAB 2.3 WORKSHEET 2.3.2 Farm to Plate

Student Name: _____ Date: _____

Introduction: In "*People of the Seal*" the Unangan people were connected their food through subsistence hunting. The hunting of fur seals played an important role in their traditions and culture. In this exercise we ask you to investigate the origin of a particular food item and determine how far that item had to travel before you ate it.

Directions: Pick one item that you ate today or yesterday and research its origin. *Fill in the blanks with your unique answers.*

1. Name the item you chose to research.

2. Name the main ingredient if there is more than one.

3. Where did main ingredient come from?

4. How many miles did the item travel to reach you?

5. What did it take for that food item to reach your plate? Did someone have to pick it or kill it? Was it processed in a factory? Was it packaged?

6. Compare your item to an item that was obtained through subsistence hunting or a home garden?

7. How would you feel if someone told you that your favorite food item was still available but you were no longer allowed to eat it? What would you do?

LAB 2.3 TEACHER KEY 2.3.2 Farm to Plate

Student Name: _____ Date: _____

Introduction: In "*People of the Seal*" the Unangan people were connected their food through subsistence hunting. The hunting of fur seals played an important role in their traditions and culture. In this exercise we ask you to investigate the origin of a particular food item and determine how far that item had to travel before you ate it.

Directions: Pick one item that you ate today or yesterday and research its origin. *Fill in the blanks with your unique answers.*

EXAMPLE: Answers will vary.

1. Name the item you chose to research.

   macaroni and cheese

2. Name the main ingredients if there is more than one.

   macaroni noodles, cheese sauce mix

3. Where did main ingredient come from?

   The macaroni noodles were made in Northfield, IL.

4. How many miles did the item travel to reach you?

   Northfiled, IL to Seattle, WA

   2,059 miles

5. What did it take for that food item to reach your plate? Did someone have to pick it or kill it? Was it processed in a factory? Was it packaged?

   It was made in a factory in Illinois, packaged, and flown or driven to a grocery store in my home town, and then driven to my home.

6. Compare your item to an item that was obtained through subsistence hunting or a home garden?

   Peas from my garden are picked every day in the early summer.

7. How would you feel if someone told you that your favorite food item was still available but you were no longer allowed to eat it? What would you do?

   I would be sad and angry. I would find out why I am not allowed to eat it and see if I could do anything to change the situation.

LESSON TWO | LAB 2.4 WRITING | Grade Level 7-12

Aleut Story

OBJECTIVE

Students will investigate the internment of Aleuts (Unangan) during World War II Students will expand their knowledge of World War II and improve understanding of indigenous Americans' social and political experience.

TIME REQUIRED

Three 50 minute class periods

BACKGROUND

Compared to other events in World War II history, little information has been produced either in print or on film about the Aleut American experience. The lesson plans that accompany this film are designed first and foremost to introduce students to this relatively unknown chapter of United States history. It is hoped the students will also be inspired to learn more about the civil rights history. if the United States.

MATERIALS

- *Aleut Story*
  - Purchase DVD from VisionMaker: www.visionmaker.org
  - View online at Snagfilm: www.snagfilm.com
- *Aleut Story Teacher's Guide* (http://alt.aleutstory.tv/classroom/teachers-guide/)
- *Teaching the Film: An Introduction* by Marla Williams (http://alt.aleutstory.tv/classroom/teachers-guide/)

PROCEDURES

The lesson plans listed below were designed by Marla Williams, producer of *Aleut Story*. To make the best use of these lessons, watching the film in 30 minute segments is highly recommended. Remaining class time may be designated for discussion and/or completion of the Viewing Guide worksheets provided below and in online Teacher's Guide

Using the Viewing Guide and Film Worksheets below, discuss and analyze the film.

Day 1

- Complete Previewing & Viewing Introduction
- Segment One (14 minutes)
- Segment Two (11 minutes)

Day 2

- Segment Three (19 minutes)
- Segment Four (11 minutes)

Day 3

- Segment Five (8 minutes)
- Segment Six (17 minutes)
- Segment Seven (6.5 minutes)

ACKNOWLEDGEMENTS

Teacher's Guide and worksheets for this lesson were used with permission by Marla Williams, director and producer of Aleut Story.

TERMINOLOGY:

Aleut Story Teacher's Guide and Worksheets use the term "Aleut" to refer to the Unangam people.

NOTE

These film worksheets are adapted from the Aleut Story curriculum (http://www.aleutstory.tv/) and use the term "Aleut" to refer to the Unangam people.

Day One—viewing time 25 minutes
Segment One/*The Untold Story* (14 minutes)
Segment Two/*Invasion, Evacuation, Relocation* (11 minutes)

Day Two—viewing time 30 minutes
Segment Three/*The Camps* (19 minutes)
Segment Four/*Hardest Childhood Days* (11 minutes)

Day Three—viewing time 31.5 minutes
Segment Five/*Home At Last* (8 minutes)
Segment Six/*Seeking Simple Justice* (17 minutes)
Segment Seven/*Restoration* (6.5 minutes)

PRE-VIEWING QUESTIONS

Documentaries represent a unique genre of filmmaking. Although documentary films and feature films may use some of the same equipment, creative techniques and storytelling devices, there are critical differences between the two types of film.

1. What is a documentary film? List some of the characteristics of a documentary film?

2. An increasing number of documentary films are incorporating dramatic re-enactments or scenes of historical events performed by actors. What do you think of this creative approach?

When renting or buying a DVD, often the first thing we look at is the packaging. Take a good look at the cover and then answer the following questions. (If viewing a copy recorded off air, answer only questions 6, and 8—10)

3. What information does the DVD cover provide about the film? What information isn't on the cover that you'd like to have?

4. Using only this information, what might you conclude about the film?

5. Does the information on the cover make you want to know more? Why or why not?

6. Based only on the film's title, what might you expect to learn from the film?

7. Based on what you know from the cover, and your understanding of documentaries, list three concepts, ideas or experiences you expect to see explored in the film.

8. Before beginning this unit of study, did you know anything about Aleuts? If yes, briefly describe.

9. Do you know anyone who has experienced war, or been held in a government relocation facility? Briefly describe how this affects your expectations for the film?

10. Think about what you know about American citizens' efforts to protect their constitutional rights. Relate this to your expectations for the film in a short paragraph.

VIEWING

Documentary films chronicle the lives of real people. However, the central characters are often "cast" much like actors in a feature film. Documentary producers and directors seek out people they believe will do the best job telling a given story.

The script provides a framework for the story. Often, a narrator reads part of the script in order to present facts and other information. The script also includes excerpts of interviews with subject experts and people having first-hand knowledge of an event.

Information is presented in a variety of ways—by the narrator, in interviews with subject experts, and through interviews and activities with central characters.

Visual elements such as location cinematography, archival footage and photographs, maps and text on screen also present important information. Music provides important cues as well.

Dramatic elements such as music, lighting, text on screen, re-enactments, special camera effects, and editing are also used to create a compelling story.

As you view the film, watch and listen carefully. Consider the central characters and the many, different dramatic elements and how they were intended to shape your understanding of events.

To complete the worksheets, you will need to recall facts, events, people and places—as well as discuss some of the basic film techniques used to tell the story. You'll also be asked to reflect on how the film made you feel, whether it challenged any of your views, and how knowledge of the Aleut experience might be useful today.

Your film worksheets may be used as a reference when working on related *Aleut Story* lesson plans.

Note: The film worksheets are adapted from the *Aleut Story* curriculum (website link) and use the term "Aleut" to refer to the Unangam people.

Aleut Story is 90-minutes, not including bonus scenes. For the typical, 50-minute class, it is recommended students view the film over the course of three class periods. This allows students to complete the Film Worksheets.

Day One—viewing time 25 minutes
Segment One/*The Untold Story* (14 minutes)
Segment Two/*Invasion, Evacuation, Relocation* (11 minutes)

Day Two—viewing time 30 minutes
Segment Three/*The Camps* (19 minutes)
Segment Four/*Hardest Childhood Days* (11 minutes)

Day Three—viewing time 31.5 minutes
Segment Five/*Home At Last* (8 minutes)
Segment Six/*Seeking Simple Justice* (17 minutes)
Segment Seven/*Restoration* (6.5 minutes)

PRE-VIEWING QUESTIONS

Documentaries represent a unique genre of filmmaking. Although documentary films and feature films may use some of the same equipment, creative techniques and storytelling devices, there are critical differences between the two types of film.

1. What is a documentary film? List some of the characteristics of a documentary film?
   Possible Answers:
   - Documentary filmmaking is a broad category of visual expression and includes experimental work.
   - Generally, documentaries are considered a creative work of non-fiction.
   - Among other things, documentaries record and present actual events, profile real people and places, portray historic events.
   - Documentaries may explore ideas, offer opinions, and seek to generate public interest or action.
   - Documentaries may use a variety of elements such as interviews, location footage (e.g. film or video taken as an event happens, or where the event happened), archival footage, still photographs, artificial scenes referred to as dramatic re-enactments or reconstructions.

2. An increasing number of documentary films are incorporating dramatic re-enactments or scenes of historical events performed by actors. What do you think of this creative approach?
   - Do you like or dislike the use of dramatic re-enactments or portrayals in documentary films?
   - How do dramatic re-enactments or portrayals help or hinder viewers understanding?
   - How can you tell the difference between actual footage and dramatic re-enactments?
   - How "real" do you think a documentary should be? Should actors, special effects or studio sound effects be used?
   - Would you be more or less inclined to question the accuracy of a documentary film if it includes dramatic re-enactments, special effects or studio sound effects?

When renting or buying a DVD, often the first thing we look at is the packaging. Take a good look at the cover and then answer the following questions. (If viewing a copy recorded off air, answer only questions 6, and 8—10)

3. What information does the DVD cover provide about the film?
   Possible Answers:
   - Title of film
   - Production Company
   - Production Credits
   - Major Underwriters
   - Presenting organization
   - Distributor
   - Description of film
   - Key talent (Narrator, Music)
   - Images suggesting story or content, e.g. 1940s era American flag, family standing on a dock, mountains

4. Using only this information, what might you conclude about the film?
   Possible Answers:
   - The film is about a group of people in Alaska known as Aleuts, during a time of war. They were sent to internment camps in Southeast Alaska. They faced difficult challenges, and were engaged in a long struggle for civil rights.
   - It is probably a true story (nothing on the package says it is, in fact, a true story).

- The flag and the clothing of the people suggest an earlier time, probably the 1940s.
- In the title, the use of the orthodox cross in the word "Story" suggests there may be a special cultural element to the film.
- Narrator Martin Sheen and musician Mary Youngblood have both won major awards and may help attract viewers.
- Who helped pay for the film (Aleutian Pribilof Restitution Trust, Rasmuson Foundation, Paul G. Allen Family Foundation).
- The film received support from national public television (CPB and NAPT)

5. What information isn't on the cover that you'd like to have?

6. Does the information on the cover make you want to know more? Why or why not?

7. Based only on the film's title, what might you expect to learn from the film?

   Possible Answers:
   - Who or what are the Aleut?
   - Aleut History
   - A single story about the Aleut

8. Based on what you know from the cover, and your understanding of documentaries, list three concepts, ideas or experiences you expect to see explored in the film:

   Possible Answers:
   - Aleut's wartime experience
   - Aleut civil rights struggle
   - How one or both of those experiences affected Aleuts, individually and as a group
   - How Aleuts influenced American political and social policy, culture, and history

9. Before beginning this unit of study, did you know anything about Aleuts? If yes, briefly describe.

10. Do you know anyone who has experienced war, or been held in a government relocation facility? Briefly describe how this affects your expectations for the film?

11. Think about what you know about American citizens' efforts to protect their constitutional rights. Relate this to your expectations for the film in a short paragraph.

VIEWING

Documentary films chronicle the lives of real people. However, the central characters are often "cast" much like actors in a feature film. Documentary producers and directors seek out people they believe will do the best job telling a given story.

The script provides a framework for the story. Often, a narrator reads part of the script in order to present facts and other information. The script also includes excerpts of interviews with subject experts and people having first-hand knowledge of an event.

Information is presented in a variety of ways—by the narrator, in interviews with subject experts, and through interviews and activities with central characters.

Visual elements such as location cinematography, archival footage and photographs, maps and text on screen also present important information. Music provides important cues as well.

Dramatic elements such as music, lighting, text on screen, re-enactments, special camera effects, and editing are also used to create a compelling story.

As you view the film, watch and listen carefully. Consider the central characters and the many, different dramatic elements and how they were intended to shape your understanding of events.

To complete the worksheets, you will need to recall facts, events, people and places—as well as discuss some of the basic film techniques used to tell the story. You'll also be asked to reflect on how the film made you feel, whether it challenged any of your views, and how knowledge of the Aleut experience might be useful today.

Your film worksheets may be used as a reference when working on related *Aleut Story* lesson plans.

LAB 2.4 WORKSHEET 2.4.2 Aleut Story Segment 1

Aleut Story Classroom Materials	**VIEWING GUIDE & WORKSHEET**
SEGMENT ONE: *The Untold Story* for Students (14 minutes)	

1. What is your first impression of the film? What do opening visuals, music and voice-over suggest?

2. List three of the *dramatic elements* used to establish story.

3. What information about the story do you learn from the voice-over as the film opens? What, if anything, can you determine about who is speaking?

4. Following the list of underwriters (timecode 01:45:00), the film introduces key information about the story. List at least three facts, ideas or opinions.

5. Where are the Aleutian and Pribilof Islands?

6. An Aleut legend tells of the discovery of Pribilof Islands. What does the story suggest?

7. List three key facts about the history of Aleuts in American history.

8. When World War II arrived in Alaska, Aleuts were removed from their homes in the Pribilof Islands. List three key facts about the evacuation.

LAB 2.4 WORKSHEET 2.4.2 Aleut Story Segment 2

Aleut Story Classroom Materials	**VIEWING GUIDE & WORKSHEET**
SEGMENT TWO: *Invasion, Evacuation, Relocation* for Students (11 minutes)	

1. List three of the *dramatic elements* used to establish the mood of this segment.

2. What do you learn about the situation leading up to the evacuation?

3. Who was in charge of the Alaska Defense Command?

4. Were the Aleuts aware of the threat of war? Give an example that explains your answer.

5. Authorities lacked a clear evacuation strategy for all civilians. What issues were at the center of the debate?

6. When did the Japanese invasion of the Aleutian Islands take place? Name the major assaults and briefly describe what happened.

7. Some historians and scholars argue paternalism and prejudice were factors in the decisions regarding Aleuts. Do you agree or disagree? Give examples.

8. Where Aleuts satisfied with their government's actions during this time? Why or why not?

*Archival footage was obtained from the National Archives, Library of Congress and other repositories. Included in the footage is Department of Defense, World War II propaganda documentary, "Report from the Aleutians," directed by legendary filmmaker John Huston. This film is in the public domain and may be viewed, in part, online.

More about this film may be found at www.archive.org/details/Report_From_The_Aleutians or at www.lib.berkeley.edu/MRC/propaganda.html.

LAB 2.4 **WORKSHEET 2.4.2** Aleut Story Segment 3

Aleut Story Classroom Materials	**VIEWING GUIDE & WORKSHEET**
SEGMENT THREE: *The Camps* for Students (19 minutes)	

1. When the Aleuts were evacuated, where were they taken?

2. What were the Aleuts' initial reactions when they arrived at Funter Bay?

3. What changed the Aleuts' feelings? Describe conditions at the camps.

4. Aleut Jake Lestenkof, who was interned at Funter Bay, says he thought the conditions at the camps were "criminal." Why does he say that? What do you think of that statement?

5. How many Aleuts were at Funter Bay?

6. Were Aleuts confined to the camps? Why?

7. Reporter Joseph Driscoll writes about the Aleuts' arrival at Funter Bay. What does his description of the people, place and events tell you about societal attitudes? Be sure to identify key words or phrases that are particularly revealing about that time.

8. What happened to Aleuts at Wrangell?

9. What were conditions like for German prisoners of war at a nearby camp? Compare and contrast the Aleuts' experience with that of the Germans.

10. The Aleuts had survived for centuries in one of the harshest climates on earth. Why was survival at the duration camps a challenge? Give examples.

11. What actions did the Aleuts take to try and improve their situation?

Aleut Story Classroom Materials	**VIEWING GUIDE & WORKSHEET**
SEGMENT FOUR: *The Hardest Childhood Days* for Students (11 minutes)	

1. In what ways did Aleuts share the American Dream? Give an example.

2. Flore Lekanof, an Aleut internment survivor, described the experience as “a big educational process.” What did the Aleuts learn?

3. Why did the federal government want to control the Aleuts' movements?

4. A conference was called in Washington, D.C. to discuss whether Aleuts should be allowed to leave the camps to work. What was the outcome of that meeting?

5. An estimated 10 percent of Aleut evacuees died in the camps. Describe how that affected the people and the culture.

LAB 2.4 WORKSHEET 2.4.2 Aleut Story Segment 5

Aleut Story Classroom Materials	**VIEWING GUIDE & WORKSHEET**
SEGMENT FIVE: *Home at Last* for Students (8 minutes)	

1. What did the Aleuts find when they finally returned home?

2. Describe what lead up to the Aleut independence movement? What motivated the Aleuts' to fight for recognition of their civil liberties?

3. What happened in 1964 when a political candidate tried to campaign in the Pribilof Islands? Do you think that could happen today? Why or why not?

4. How long did it take for the Aleuts' lawsuit to be adjudicated?

LAB 2.4 **WORKSHEET 2.4.2** Aleut Story Segment 6

Aleut Story Classroom Materials	**VIEWING GUIDE & WORKSHEET**
SEGMENT SIX: *Seeking Simple Justice* for Students (17 minutes)	

1. Attorney John Kirtland talks about the "nature of injustice." Explain Kirtland's view of "injustice" in your own words.

2. The federal Commission on Wartime Relocation and Interment of Civilians was established with what two, principle responsibilities? What did the commission conclude?

3. What did Congress do in response to the CWRIC recommendations?

4. Why is the story of Aleut's experience during World War II important to remember?

LAB 2.4 WORKSHEET 2.4.2 Aleut Story Segment 7

Aleut Story Classroom Materials	**VIEWING GUIDE & WORKSHEET**
SEGMENT SEVEN: *Restoration* for Students (6.5 minutes)	

1. How do you feel after watching this film?

2. What part of the story affected you most and in what way?

3. Do you think the same thing could happen today? Why or why not?

4. At the end of the film, Aqualina Lestenkof says: "My father and my grandfather, and people of that generation, their history has given us energy that we can use but, at the same time, we cannot carry some of the burdens of it with us. We didn't go through the internment, we are not slaves of the harvest—those days are gone. We have an opportunity to restore ourselves and our purpose here."

   Explain what you think she means, and how her statement might apply to you and other people in this country.

LESSON TWO | LAB 2.5 WRITING | Grade Level 7-12

Aleutian Sparrow, White Seal, Libby

OBJECTIVE

Students will read either fiction or nonfiction literature regarding the Unangan and fur seals. Students will gain a better understanding of the facts and effects of the evacuation and relocation of the Unangan during World War II, fur seal life history, and life on the Pribilof Islands for an American woman in the 1800s.

BACKGROUND

Aleutian Sparrow (fiction)

In June 1942, the Japanese attacked the Aleutian Islands. Within days of the attack, the U.S. military removed the Unangan to relocation centers in Wrangell and Ketchikan, Southeast Alaska, supposedly for their own protection. Conditions in these camps were deplorable. The Unangan were held in internment camps until the end of WWII in 1945 and many of them died. In a series of short free verses, Hesse tells this moving story through the eyes and voice of Vera, a girl of Aleut and Caucasian heritage.

The White Seal (fiction)

This story chronicles the life of Kotick, the white fur seal born on St. Paul Island, in the Pribilof Islands. Kotick spends his life trying to find an island where man cannot reach him.

Libby (nonfiction)

Read the journal entries of Libby Beaman, the first non-Unangam woman to live on the Pribilof Islands. Mrs. Beaman traveled to the Pribilof Islands in 1879 with her husband John Warren Beaman an agent for the United States Treasury Department.

MATERIALS

- *Aleutian Sparrow* by Karen Hesse
- *The White Seal* in *The Jungle Book* by Rudyard Kipling
- *Libby, The Sketches, Letters & Journals of Libby Beaman, Recorded in the Pribilof Islands 1879-1880* as presented by her Granddaughter Betty John

PROCEDURES

- Have students choose a book to read, or read excerpts from the three books out loud to the class.
- Students who choose to read one of the books should give a brief synopsis of the book to the class.
- Hold a class discussion.
- Compare the perspective of the main character or author at the time each book was written.
  - 1879-80 for Libby Beaman
  - Late 1800s for *The White Seal*
  - 1940s for Vera in *Aleutian Sparrow*
  - 1990s for Karen Hesse, the author of *Aleutian Sparrow*

DISCUSSION

- What words did Rudyard Kipling use to describe the people living on the Pribilof Islands?
- How does Kipling's description compare to Libby Beaman's description of the people she met on St. Paul?
- How does Karen Hesse's more recent tale about the evacuation compare to the older stories?
- Research *The White Seal* and find out if Rudyard Kipling visited the Pribilof Islands.
- Discuss Kipling's and Beaman's portrayal of the Aleuts, in the context of the social attitudes of their time.

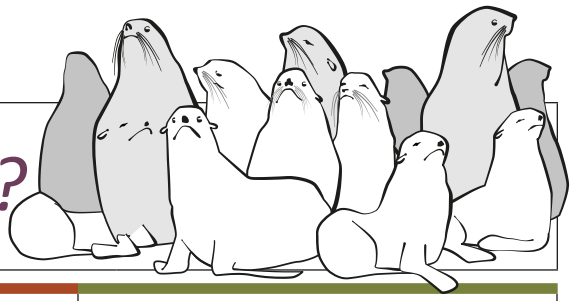
EXPLORE AND EXTEND

- Watch *The White Seal* video produced by Walt Disney.
- Discuss the differences between the original story and the video.
- Why do you think Walt Disney felt the need to change the story in the video?

Secondary Curriculum: Grades 7–12

LESSON THREE

What is a fur seal rookery?



Subject Area(s): Life science, genetics, reading	**Grade Levels:** 7-12	Presentation – 15 minutes Labs – variable

Lesson Topics:	Fur seal rookery structure, location, and seasonal changes	**Focus Questions**	• What is a fur seal rookery? • What information can scientist gather from a rookery? • How does the structure of the fur seal population change on the rookery?
Learning Objectives:	Students will: • describe the seasonal structure of a fur seal rookery • investigate fecundity • examine genetic relationships • summarize their knowledge with art	**Key words:**	rookery, haulout, fecundity, paternity, maternity, seasonal, age class, genetics

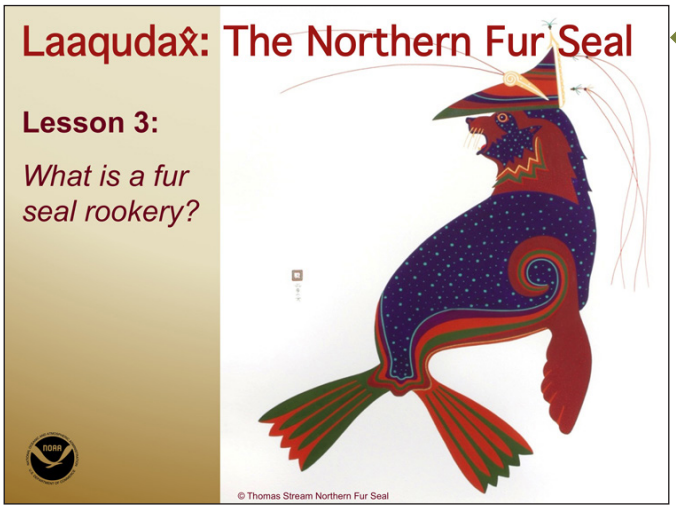
LABS		ALASKA STANDARDS		
		Science	Minutes	Grades
Lab 3.1	What is a Rookery? (review, worksheet, discussion)	SC2	30	7–12
Lab 3.2	Fecundity: The Next Generation (worksheet)	SC2	50	7-12
Lab 3.3	Rookery Timeline (hands-on, spreadsheet)	SC2	50	7–12
Lab 3.4	Paternity and Maternity on the Rookery (worksheet)	SC2	50	7–12
Lab 3.5	Create a Rookery – Rubber Stamp Making (hands-on, art)	SC2	2x50	7-12

Targeted Alaska Grade Level Expectations (GLEs) — SCIENCE

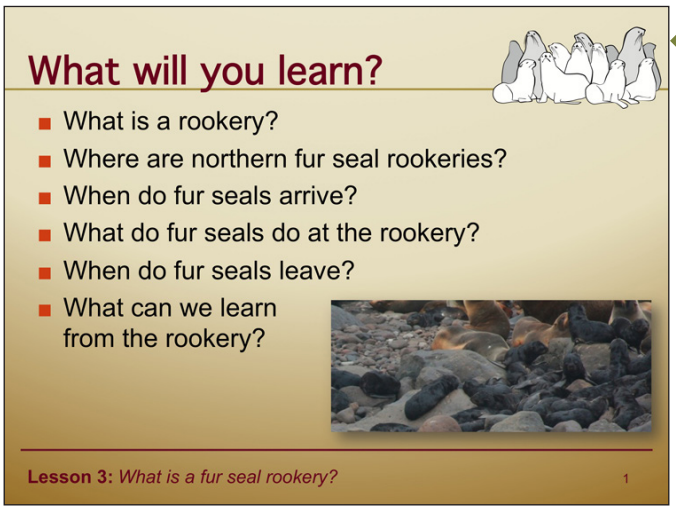
Science

Concepts of Life Science

SC2 Students develop an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms.



Lesson 3 gives an overview of what a rookery is, the timing of fur seals' arrival at and departure from the rookery during the breeding season, and what we can learn from the rookery.



Background on fur seal life history

Northern fur seals spend much of the year at sea, but return to land to breed (mate and have pups) during the summer. They gather in large groups at specific areas, called rookeries, on islands in Alaska, California, and Russia.

Most female fur seals return to the same spot year after year to give birth (a behavior called natal philopatry).

Natal philopatry – returning to their birthplace to breed.

Some females return to the same island and rookery but not the site where they were born (a behavior called breeding-site fidelity).

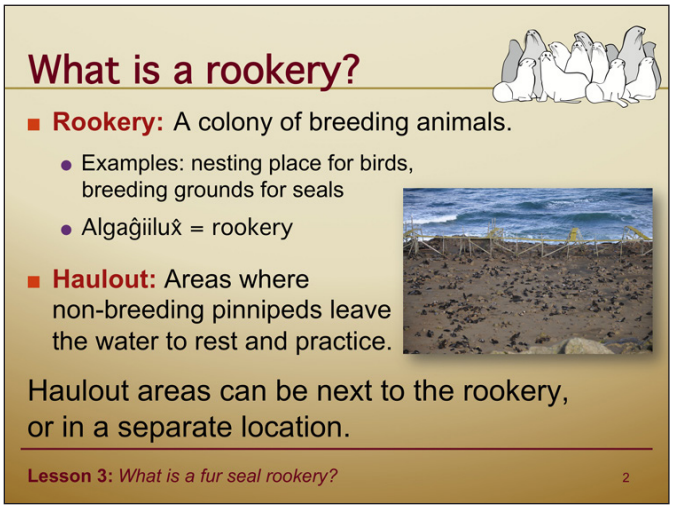
Breeding philopatry or breeding-site fidelity – returning to the same location to breed, year after year.

Because of this, males gather in areas where female fur seals will arrive each year to give birth, and set up territories that they defend against other males.

The biggest, strongest, most dominant males have the most females in their territories.

Sources: Riedman, M. 1990. The Pinnipeds. Gentry, R. 1998. Behavior and ecology of the northern fur seal.

Photo: NOAA/AFSC/MML



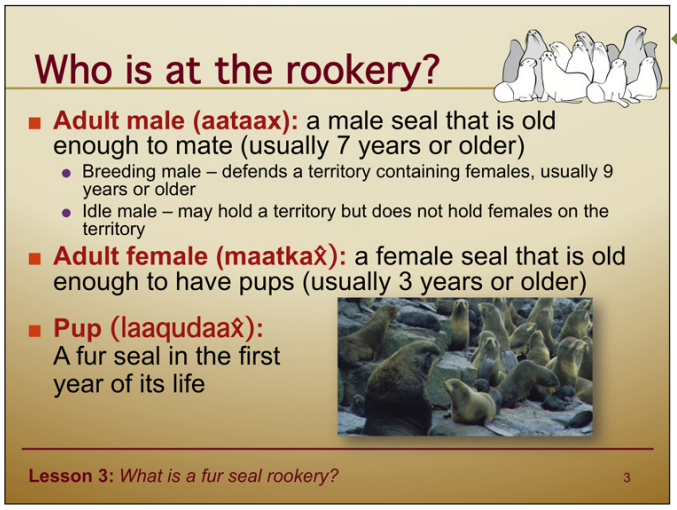
Rookeries are specific areas where animals gather each year to mate and raise young. Many different kinds of animals gather in rookeries; examples are elephant seals, fur seals, seabirds (including penguins). Rookeries are referred to as both a colony of animals and the breeding place of a colony.

There are several Unangam words for "rookery" – algaĝiiluxˆ, angaxˆtaaluĝin, isxaxˆ, tanaxˆ.

Haulout sites are specific areas where pinnipeds who are not breeding gather to rest. Haulout sites may be at the edges of rookeries, or they may be totally separate from rookeries.

Juvenile males sit off to the side at haulout sites and practice territorial behavior.

Photo: Lisa Hiruki-Raring, NOAA/AFSC



Source: Antonelis G. (1992) Northern fur seal techniques manual. U.S. Dep. Commer, Seattle. NOAA Tech Memo NMFS F/NWC-214, 47 p. (adult males); York (1987) – female reproduction

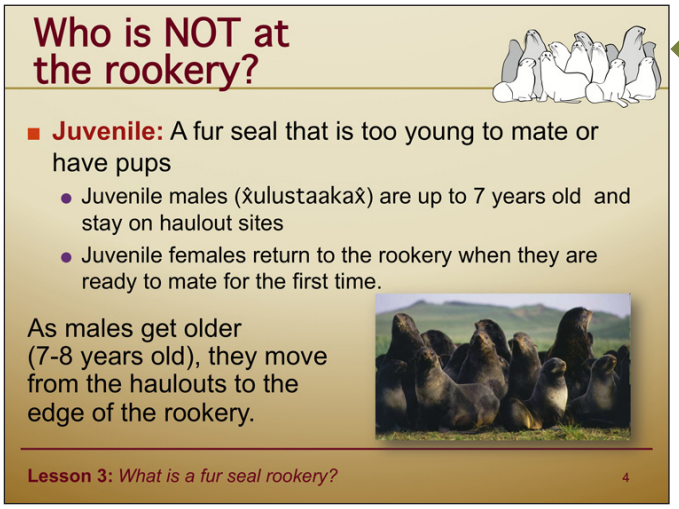
Photo: NOAA/AFSC/MML

The next two slides briefly describe the different age groups of fur seals that are found at the rookery and on haulouts.

- Male fur seals may take up to 7-10 years to become breeding males and may only keep a territory on the rookery for a few years.
- If they become territorial males (adult males who hold a territory on the rookery) they may father many pups per year during the time that they have a territory. Not all males become breeding males; some are idle males (defend a territory but don't have females) and some remain on the haulout areas.
- Female fur seals begin to breed at 3-5 years of age and then have one pup per year until they are 18-20 years old. Females choose a location on the rookery that increases their chances of weaning a pup.
- Pups are born in July and remain on the rookery until they are weaned, four months later.

Adult males who hold a territory exclude all non-adult males from the rookery. Adult males defend territories from May to August. After territorial males leave the rookery in August, they are replaced on the rookery by non-territorial males (usually older subadult males or adult males who have not been able to hold territories). During this time, adult females with pups continue to use the rookery as a nursery area.

The pregnancy rate for females is approximately 60% for females age 3 and greater, and 68% for females age 4 and greater (York 1987). Nearly 90% of females in their reproductive prime, 8-13 years old, are pregnant every year with the pregnancy rate gradually decreasing after 13 years of age.



Most yearlings and 2-year-olds are not at the rookery, they spend the their first two years at sea. Each summer, juveniles 3 years and older return to the Pribilof Islands. Females return to mate while males return to practice mating behavior. Juvenile males gather on haulout sites, which can be on the edge of the rookery or inland of the rookery, or in a separate area of the island.

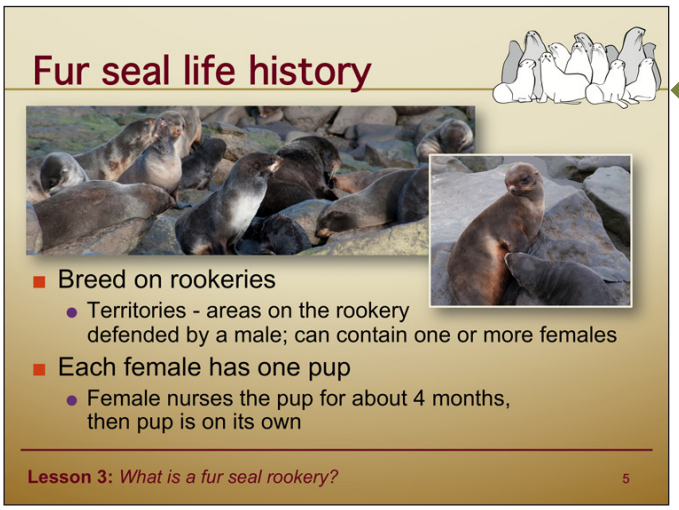
Because it takes males longer to reach breeding age (they do not reach breeding age until 7-9 years old, while females can start breeding between 3-5 years old), there are many more juvenile males than females. Juvenile males spend their time on the haulout practicing herding behavior.

Males can physically mate at 7 years, but most are not socially able to mate (i.e., they are not able to hold and defend territories on the rookery) until they are a few years older. Males who are closer to breeding age start to defend areas at the edge of rookeries. As they gain more experience, they can begin to hold territories and breed.

Xulustaakax – male fur seal too young to have a territory with females.

Source: Gentry R. 1990. Behavior and ecology of the northern fur seal, Antonelis

Photo: Rolf Ream, NOAA/AFSC/MML: http://www.afsc.noaa.gov/mml/gallery_admin/albums/nfs/SNP92juvs.jpg



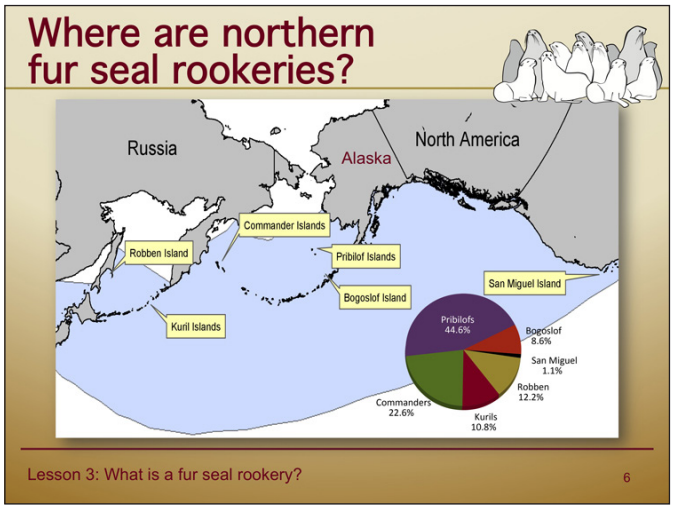
During a given year, a female has one pup.

Males can mate with many females.

Only about 10% of male pups become breeding males, whereas most females become breeding females.

Source: Gentry, R. 1990. Behavior and ecology of the northern fur seal.

Photos: Pam Goddard, Thalassa



Unangam names:

Tanaxˆ-Amixˆ - Pribilof Islands

Agˆasaagˆuxˆ - Bogoslof Island

There are five northern fur seal breeding rookery locations: three in Russia (Commander Islands, Robben Island, Kuril Islands), two in the Bering Sea (Pribilof Islands, Bogoslof Island) and one in California (San Miguel Island). The largest proportion of the northern fur seal population is on the Pribilof Islands. At each location, fur seals breed at specific rookeries (e.g., in the Pribilof Islands, there are 15 rookeries on St. Paul Island and 6 on St. George Island.

Percentage of the worldwide northern fur seal population in different rookery locations (2012):

44.6% Pribilof Islands

22.6% Commander Islands

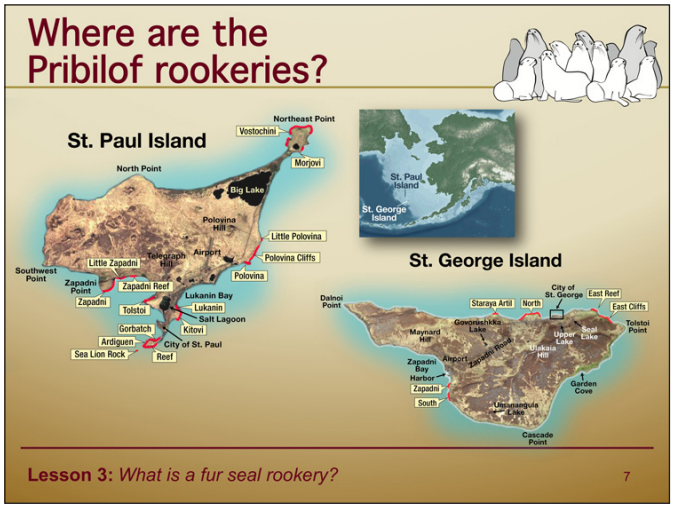
12.2% Robben Island

10.8% Kuril Islands

8.6% Bogoslof Island

1.1% San Miguel Island

Map: NOAA/AFSC/MML observer PowerPoint



Unangam names:

Amixˆ - St. Paul Island

Angˆaaxchaluxˆ - St. George Island

There are 15 rookeries on St. Paul Island and 6 on St. George Island.

Maps adapted from NOAA/AFSC/MML website and NOAA Office of Response & Restoration

Northern fur seals arrive at different times on the rookery and haulout.

Adult males arrive first to set up their territories. Adult males start arriving in the water around the islands in March and are seen on land in late April to June. They get situated on the rookery in May.

Adult females arrive during late June-August, with the peak in July; oldest females arrive first, younger ones arrive later. The pup is born a few days after the female arrives at the rookery.

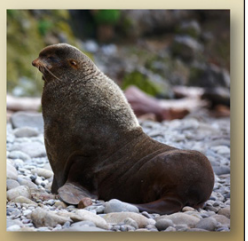
Juvenile males arrive by age with oldest males first, and progressively younger fur seals arriving later. Juvenile males are kept out of the rookery by breeding males until late August-early Sept.

Source: Gentry, R. 1998. Behavior and ecology of the northern fur seal; also, NOAA/AFSC/MML Alaska Ecosystem Program staff

Photo: Mikhail Shlemov (Russian photographer) via Vladimir Burkanov, NOAA, MML (0K9O2848-Shlemov.jpg)

What do seals do at the rookery?

- Adult males
  - Defend territories, herd females within territories, mate with females
  - Do not eat while on rookery
- Adult females
  - Return to the same area each year to give birth to one pup (site fidelity)
  - Mate with an adult male
  - Alternate feeding trips at sea with visits ashore to nurse pup
- Pups
  - Nurse, grow, play



Lesson 3: *What is a fur seal rookery?* 9

The main purpose of fur seals on the rookery is for breeding fur seals to mate and for the females to raise their pups. Therefore, the adult males guard their territories and keep their females in the territory, while the females alternate feeding at sea and coming back to nurse their pups.

Some females return to the rookery where they were born (philopatry). Scientists have seen tagged females who will even come back to a specific rock each year. Other females return to the general area where they were born (site fidelity).

Pups stay on the rookery while their mothers are away feeding, so they play with other pups and learn to swim in the water close to shore. When the mother comes back to the rookery after a feeding trip, she will call and listen for her pup to respond. Mothers recognize their pup's call and then verify the identity of their pup by smelling it when the pup is close enough to touch.

Photo: Mikhail Shlemov (Russian photographer) via Vladimir Burkanov, NOAA/AFSC/MML visiting scientist

What do seals do at the haulout?

- Juvenile males
  - Alternate feeding trips at sea with time ashore to rest and practice breeding behavior
  - Practice holding territories and mating behaviors
  - Molt (shedding old fur and growing new fur)

Lesson 3: *What is a fur seal rookery?* 10

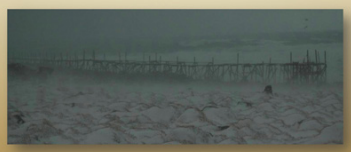
Juvenile males are the only seals on the haulouts. They use time at the haulouts to practice breeding behavior and to molt (shedding old fur and growing new fur). Males will practice herding females and mock fighting with other males.

Source: Riedman, M. 1990. The Pinnipeds. Gentry, R. 1998. Behavior and ecology of the northern fur seal.

Photo: Vladimir Burkanov, NOAA/AFSC/MML visiting scientist

When do seals leave the rookery and haulout?

- Adult males – mid to late August
- Adult females – late Oct. to early Dec.
- Juveniles – late Oct. to early Dec.; older first, younger ones later
- Pups – mid-Nov. to early Dec, after first big storms of the fall



Lesson 3: *What is a fur seal rookery?* 11

Fur seals of all ages molt on land. Male and female fur seals of different ages leave the rookery at different times.

- Because adult males arrive first (in May), and they don't eat while they are on the rookery, they are the first to leave (late July).
- Adult females leave between late Oct. and early Dec. Females who didn't have pups, or whose pups died leave as early as October. All other females leave once their pup has weaned itself, usually in November.
- Juvenile male fur seals leave once molting is complete, up to early Dec.
- Juvenile males leave the rookery in the same order they arrived – older juveniles first, younger ones last.
- Pups leave the rookery in Nov. after the first big storms; tagging data suggests pups leave when the mother is away on a feeding trip.
- Females whose pups have left the island return to the rookery one last time, spend a few days, and then depart for the year.

Source: Lea, M.; Goebel PhD thesis; Ragen 1995; Ream 2005.

Photo: Jeremy Sterling, NOAA/AFSC/MML

What can we learn at the rookery?

- Size of population
- Behavior of fur seals
- Diet and feeding behavior
- Health and diseases
- Which seals are related
- Births and deaths

Lesson 3: *What is a fur seal rookery?* 12

Scientists from around the world come to the Pribilof Islands to study northern fur seals.

Photo: Rolf Ream, NOAA/AFSC/MML

How do we know?

- Observation
- Counts
- Capture live seals
  - Collect tissues (blood, skin, nasal swab, fat)
  - Mark with tags
  - Attach tracking instruments (radio tags, satellite tags, time-depth recorders)
- Collect scats

Lesson 3: *What is a fur seal rookery?* 13

- Size of population and behavior of fur seals is studied by observing the fur seals, conducting counts, putting instruments on seals, and analyzing genetic samples.
- Feeding, diving and migrating behavior can be studied by instrumenting animals.
- Health and diseases can be studied by scat, blood, and genetic analyses of tissues.
- Diet can be studied by examining scat, spews (thrown up bones) and analyzing fat samples.
- Relatedness of seals is studied using genetic samples.
- Photo: Rolf Ream, NOAA/AFSC/MML

Summary

- Northern fur seals return to rookeries once a year to have pups and mate
- Adult males arrive first in May, followed by adult females in late June-Aug.
- Pups are born a few days after females arrive
- By studying the seals on the rookery, scientists learn about their life history both on land and at sea

Lesson 3: *What is a fur seal rookery?* 14

- Seals arrive in reverse order of age, oldest first, youngest last
- Pups wean themselves and most leave by early December (average date of leaving for pups is mid-November); by late December all seals have left the rookery.

Photo: Pam Goddard, Thalassa

LESSON THREE | LAB 3.1 SCIENCE | Grade Level 7-12

What is a Rookery?

OBJECTIVE

Students will review rookery structure, life history, and genetics of northern fur seals.

TIME REQUIREMENT

30 minutes

BACKGROUND

This activity can be used as a pre-assessment to determine what students remember if they have learned about the northern fur seal rookery in previous years. It can also be used at the end of the lesson as a post-assessment if this is the first time students have studied this lesson.

Fur seals gather in rookeries every summer to give birth, mate, nurse their young, and molt. This is also the time when scientists collect valuable information on the biology, physiology, and life history of northern fur seals.

MATERIALS

- Lesson 3 PowerPoint
- Worksheets 3.1.1

PROCEDURE

- Go through Lesson 3 PowerPoint
- Complete Worksheet 3.1.1 Rookery

DISCUSSION

- How do northern fur seals use the rookery?
- What other animals use rookeries?
- Why do animals use rookeries?

LAB 3.1 WORKSHEET 3.1.1 Rookery

Student Name: _____ Date: _____

Directions: *Fill in the blanks.*

1. What is a rookery?

2. What animals gather on a rookery? Give two examples and state where they are located.

3. What is the difference between a northern fur seal rookery and a haulout?

4. Describe the sequence of events that occur on the rookery between May and December. Try to include all of the different age classes: adult males, adult females, juveniles, and pups.

5. Fecundity is the ability to produce offspring. How fecund are female fur seals? (How many pups does a female produce each year?)

6. Some mammals have multiple offspring while others only have one. Why do some animals have more offspring than others?

LAB 3.1 TEACHER KEY 3.1.1 Rookery

Student Name: _____ Date: _____

Answers will vary. These are only examples.

Directions: *Fill in the blanks.*

1. What is a rookery?

   A colony of breeding animals. A rookery can be a nesting place for birds (especially birds that nest in large groups), or breeding grounds for pinnipeds (seals, sea lions and walruses).

2. What animals gather on a rookery? Give two examples and state where they are located.

   NOTE: Answers will vary.

   Animal: northern fur seal

   Location: Pribilof Islands, Bogoslof Island, San Miguel Island

   Animal: Emperor penguin

   Location: Antarctic

3. What is the difference between a northern fur seal rookery and a haulout?

   A rookery is a specific place where animals gather each year to mate and raise their young. It is also a colony of breeding animals. It can be a nesting place for birds (especially birds that nest in large groups), or breeding grounds for pinnipeds (seals, sea lions and walruses).

   A haulout is an area on land or ice where non-breeding pinnipeds (seals, sea lions and walruses) leave the water to rest and practice social behavior.

4. Describe the sequence of events that occur on the rookery between May and December. Try to include all of the different age classes: adult males, adult females, juveniles, and pups.

   See Excel spreadsheet on page 84 for information on the sequence of events on the rookery.

5. Fecundity is the ability to produce offspring. How fecund are female fur seals? (How many pups does a female produce each year?)

   Northern fur seals have one pup each year. If the pup dies, the female cannot have another pup until the following year. Adult male northern fur seals will mate with the female within days of her giving birth but that fertilized embryo will not be fully developed until the following summer.

6. Some mammals have multiple offspring while others only have one. Why do some animals have more offspring than others?

   Breeding strategies: Some mammals have a large number of offspring with little parental investment per offspring (e.g., mice, opossum, fox), so that at least a few of these offspring will live to become adults and reproduce.

   Other mammals have only one or two offspring but tend to the offspring for a long time (e.g., northern fur seal, Steller sea lion, elephant). In these cases, the strategy is tht by caring for one or two offspring, each has a high chance of becoming an adult.

Fecundity: The Next Generation

OBJECTIVE

Students compare the fecundity and reproductive strategies of different animals.

TIME REQUIREMENT

50 minutes

BACKGROUND

Fecundity is derived from the word fecund which means 'fruitful'. In biology, fecundity refers to fertility or the rate of reproduction of an individual or population.

The rate at which animals reproduce varies greatly. Some animals have high fecundity, producing thousands of offspring (fish), while others have very low fecundity, producing only one offspring at a time (fur seals). In general, larger animals living in more stable environments have a lower fecundity. Animals living in unstable environments with high predation on offspring are likely to have high fecundity.

In this lab, you will go through different types of animals, review the characteristics of mammals and marine mammals, and discover how many offspring they produce. This lab provides background information for the upcoming rookery activities, to emphasize that northern fur seals have only one pup per year

MATERIALS

- Worksheets 3.2.1, 3.2.3, 3.2.4
- Internet
- Encyclopedias

PROCEDURE

- Have the students work independently or in pairs to complete the following worksheets
- Use Worksheets 3.2.1-3.2.3 as a review before starting Worksheet 3.2.4. As a class or in small groups, research the animals listed or come up with a new list of animals. Discuss the difference in fecundity. How long does the animal live? What type of environment do the animals live in? Who are the predators? How is fecundity related to the animals environment and life history?
- Worksheet 3.2.4: Using the worksheet as an outline, assign individual students or small groups to select animals to research and present their findings to the class.
- References and sources should be properly cited. Discuss the quality of information from the various sources.

DISCUSSION

- Students will learn that all marine mammals have only one offpsring at a time. Some marine mammals, like seals, have one each year, others, like walrus or large whales, have one offspring every 2–3 years.
- Ask students to think of examples of animals that have multiple offspring and animals that only have one offspring at a time.
  - Use different categories of animals (e.g., non-mammals, mammals, land animals, sea animals)
- Students may notice that egg-laying animals (e.g., birds, fish, invertebrates) lay multiple eggs at one time. Discuss how this would be to their advantage. What is the environment like?
- How many pups does a female fur seal have each summer?
  - One
- Why is it important to know how many offspring an animal produces?
  - When a population is being harvested, it is very important to prevent the overharvest of animals that have not reached sexual maturity. If all of the animals are removed before they reproduce, the population will decline rapidly.
  - A female fur seal only produces one pup per year. If her pup dies before it leaves the island, the female cannot produce another pup until the next summer.

EXPLORE AND EXTEND

- Define and research *r* and *k-strategies*. Are northern fur seals *r* or *k-strategists*? Why? Defend your answer.

LAB 3.2 WORKSHEET 3.2.1 Fecundity: Sea Creatures

Student Name: _____ Date: _____

Fill in the number of offspring produced by each animal.

Species Name	# of offspring	Frequency of Reproduction
sea urchin		
sea horse		
lobster		
red king crab		
salmon shark		
Pacific cod		
giant Pacific octopus)		
sea turtle		

LAB 3.2 WORKSHEET 3.2.2 Fecundity: Mammals

Student Name: _____ Date: _____

Fill in the number of offspring produced by each animal.

Animal	# of offspring	Frequency of Reproduction
rabbit		
mouse		
wolf		
fox		
bear		
moose		
musk ox		
bison		

ACTIVITY 3.2 WORKSHEET 3.2.3 Fecundity: Marine Mammals

Student Name: _____ Date: _____

Fill in the number of offspring produced by each animal.

Animal	# of Offspring	Frequency of Reproduction
walrus (pinniped)		
sea lion (eared seal, pinniped)		
harbor seal (true seal, pinniped)		
fur seal (eared seal, pinniped)		
sea otter		
orca (cetacean)		
humpback whale (cetacean)		
dolphin (cetacean)		
beluga whale (cetacean)		
blue whale (cetacean)		

LAB 3.2 **TEACHER KEY 3.2.1** Fecundity: Sea Creatures

Student Name: _____ Date: _____

Fill in the number of offspring produced by each animal.

Species Name	# of offspring	Frequency of Reproduction
sea urchin	1,000,000 eggs	annual
sea horse	25-1,500 eggs	several times a season
lobster	300-75,000 eggs	every two years
red king crab	25,000-75,000 egs	annual
Salmon shark	2-5 pups	1-2 years
Pacific cod	>1,000,000 eggs	annual
giant Pacific octopus	20,000-100,000 eggs	once then dies
sea turtle	50-200 eggs	1-9 clutches of eggs per year

LAB 3.2 **TEACHER KEY 3.2.2** Fecundity: Mammals

Student Name: _____ Date: _____

Fill in the number of offspring produced by each animal.

Species Name	# of offspring	Frequency of Reproduction
rabbit	5-7 kits	every month
mouse	3-14	every 30-60 days
wolf	4-7 pups	annual
fox	1-13 kits	annual
bear	1-2 cubs	annual
moose	1-2 cubs	annual
musk ox	1 calf	annual
bison	1 calf	annual

ACTIVITY 3.2 **TEACHER KEY 3.2.3** Fecundity: Marine Mammals

Student Name: _____ Date: _____

Fill in the number of offspring produced by each animal.

Species Name	# of offspring	Frequency
walrus (pinniped)	1	every 2 years
sea lion (eared seal, pinniped)	1	annual
harbor seal (true seal, pinniped)	1	annual
fur seal (eared seal, pinniped)	1	annual
sea otter	1	annual
orca (cetacean)	1	every 5 years
humpback whale (cetacean)	1	every 2 years
dolphin (cetacean)	1	every 2-3 years
beluga whale (cetacean)	1	every 2-3 years
blue whale (cetacean)	1	every 2-3 years

LAB 3.2 WORKSHEET 3.2.4 Fecundity (Grades 7-8)

Student Name: _____ Date: _____

Choose an animal from the worksheets and answer the following questions.

1. List the common and scientific name of your animal.

2. What type of animal did you research?

3. How long does the animal live?

4. At what age do the males and females start reproducing? Why would they start reproducing at different ages?

5. How many offspring does the animal produce and how often does it reproduce?

6. If it is a mammal, how often and for how long does it nurse its young?

7. Explain why your animal produces the number of offspring as often as it does? Why do you think some animals produce thousands of eggs and other only produce one offspring? What are the advantages and disadvantages of both?

List your sources for the information provided.

LAB 3.2 TEACHER KEY 3.2.4 Fecundity (Grades 7-8)

Student Name: _____ Date: _____

Choose an animal from the Worksheets 3.2.1, 3.2.2, or 3.2.3 and answer the following questions.

1. Common and scientific name of animal.

   Red king crab (*Paralithodes camtschaticus)*

2. What type of animal did you research? (invertebrate, vertebrate, fish, crustacean, mammal, or marine mammal)

   invertebrate, crustacean

3. How long does the animal live?

   20-30 years

4. At what age do the males and females start reproducing? If they begin to reproduce at different ages, explain why you think they would do that.

   5-6 years

5. How many offspring or eggs does the animal produce and how often does it reproduce?

   500,000 embryos, every year

6. If it is a mammal, how often and for how long does it nurse its young?

   Answers will vary.

7. Explain why your animal produces the number of offspring as often as it does. Why do you think some animals produce thousands of eggs and others only produce one offspring? What are the advantages and disadvantages of both strategies?

   Less than 1% of the embryos produced by a female king crab will make it to maturity. For the species to survive, each female must produce thousands of embryos every year.

Extra Credit: Describe the animal's reproductive strategy.

King crabs produce thousand of eggs every year. but don't put much energy into raising them or protecting them from predation. Because of this, only a small number survive.

Information Source:

Alaska Department of Fish and Game, http://www.adfg.alaska.gov/index.cfm?adfg=redkingcrab.main

NOAA/Alaska Fisheries Science Center, http://www.afsc.noaa.gov/Education/oceanlife/crabs/red_crab.htm

NOAA/Alaska Fisheries Science Center, http://www.afsc.noaa.gov/Education/factsheets/10_rkc_fs.pdf

NOAA/Alaska Fisheries Science Center, http://www.afsc.noaa.gov/Kodiak/shellfish/cultivation/crabGrow.htm

LAB 3.2 WORKSHEET 3.2.4 Fecundity (Grades 9-12)

Student Name: _____ Date: _____

Research a marine mammal animal and present the information to your class. Use the questions below as a guideline.

1. List the common and scientific name of your animal.

2. Describe your animal and the environment where it reproduces.

3. What is the animal's life expectancy? Is the life expectancy the same for males and females?

4. At what age do the males and females start reproducing? If they begin to reproduce at different ages, explain why that would be to their advantage.

5. How many offspring does the animal produce and how often does it reproduce?

6. How often and for how long does it nurse its young?

7. Describe the animal's reproductive strategy.

Extra Credit: What are *r* and *K* reproductive strategies? What type of strategy does your animal use?

List of sources used to gather information.

LAB 3.2 TEACHER KEY 3.2.4 Fecundity (Grades 9-12)

Student Name: _____ Date: _____

Research a marine mammal animal and present the information to your class. Use the questions below as a guideline.

1. List the common and scientific name of your animal.

   Northern fur seal, *Callorhinus ursinus*

2. Describe your animal and the environment where it reproduces.

   Vertebrate, mammal, marine mammal

3. What is the animal's life expectancy? Is the life expectancy the same for males and females?

   Females live 20-25 years Males live 12-15 years

   Males don't live as long due to the harsh environment on the rookeries for breeding males. Holding a territory on the rookery means constantly defending the females from other breeding males.

4. At what age do the males and females start reproducing? If they begin to reproduce at different ages, explain why that would be to their advantage.

   Females begin reproducing between the ages of 3-5.

   Males are sexually mature by age 7 but aren't usually big enough or mature enough to reproduce until ages 7-10.

5. How many offspring or eggs does the animal produce and how often does it reproduce?

   1 pup every year

6. How often and for how long does it nurse its young?

   The female fur seal will nurse her pup for 3-4 months.

7. Describe the animal's reproductive strategy.

   Northern fur seals only reproduce once a year. They females devote a lot of time and energy to each offspring. The pups need to be healthy enough to surviver their first winter at sea.

Extra Credit: What are *r* and *K* reproductive strategies? What type of strategy does your animal use?

r-reproductive strategy is found in unpredictable or unstable environments. The ability to reproduce rapidly is advantageous. These animals have a high fecundity (produce hundreds to thousands of offspring) with little investment in each individual. For example, salmon, halibut, or crabs are *r-strategists*.

k-reproductive strategy is found in more stable environments. These animals are usually larger and have longer life spans. Few offspring are produced. Survival for each offspring is high due to high parental investment.

Northern fur seal are *k-strategists*.

Information Source:

Alaska Department of Fish and Game, http://www.adfg.alaska.gov/static/education/wns/northern_fur_seal.pdf

NOAA/Alaska Fisheries Science Center, http://www.afsc.noaa.gov/mml/species/species_nfs.php

University of Montana, http://www.cs.montana.edu/webworks/projects/stevesbook/contents/chapters/chapter002/section004/blue/page003.html

Rookery Timeline

OBJECTIVE

Students will learn about the sequence of events at a fur seal rookery through creation of a timeline.

TIME REQUIREMENT

50 minutes

BACKGROUND

The Create a Rookery Timeline Lab demonstrates the sequence of events over a one-year period at a fur seal rookery. As fur seals of different ages arrive on the rookery, the structure of the rookery changes.

The Lab can be used to introduce concepts of northern fur seal seasonality and rookery structure, such as:

- males establish territories that they defend against other males,
- females gather in the same areas each year to have their pups (site fidelity),
- non-breeding seals gather in haulouts, and
- pups gather into groups called “pup wads” when their mothers are not on the rookery.

The Lab can also introduce the following concepts of life history:

- adult males stay on the rookery to defend their territory,
- adult males don’t eat during the breeding season,
- females alternate periods of time at the rookery to nurse their pups with trips out to sea to feed, and
- females only have one pup per year.

MATERIALS

Large sheet of butcher paper (five to six feet long) or smaller pieces taped together to form a long line.

- Pictures or drawings of northern fur seal male, female, juvenile and pups - can be taped or glued to the timeline at the appropriate locations
- Colored markers or colored pencils

Spreadsheet software

PROCEDURES

Divide the students into pairs or small groups.

Have each group create their own rookery timeline.

- Have students draw a timeline on their paper and divide it into 12 months: January to December (if space is an issue, you can start the timeline at May and go to November).
  - Ask the students to add the following events to the rookery timeline:
    i. Adult males arrive
    ii. Adult females arrive
    iii. Pups are born
    iv. Adult males leave
    v. Pups leave
    vi. Adult females leave
- Using Excel or another spreadsheet software, ask your students to recreate the Teacher Key.

DISCUSSION

Discuss why the rookery changes over the season. Lesson 3 PowerPoint and create a Rookery Timeline Teacher Key can be used as a reference.

- Why do all the seals come to the rookery at the same time of year?

  To mate and raise pups.

- Why do the fur seals leave the rookery before the winter?

  Cold weather/storms; can feed farther away where waters are more productive in winter; pups are weaned so females don’t have to stay around.

- What might this be similar to in your life?

  Compare the rookery cycle to the school year – teachers come back to school first, then students; limited amount of time (August to May); at the end of the school year, students leave school and when they come back in the fall, they are in the next grade.

- Can you think of other examples of seasonal cycles in the year?

EXTEND AND EXPLORE

Add the juvenile males to the timeline. Males don't reach breeding age until 7–9 years (females can start to breed at age 3–5 years). Juvenile males gather on haulouts until they are able to breed, then they move closer to the rookery and challenge territorial males.

LAB 3.3 TEACHER KEY Create a Rookery Timeline

THE FOLLOWING EVENTS SHOULD BE ON THE ROOKERY TIMELINE:

i. **May:** Adult males arrive on the rookery.

ii. **Late June–August:** Adult females begin to arrive on the rookery. Oldest arrive first, youngest arrive last, with most females arriving in July.

iii. **June–July:** The pup of each female is born a few days after she arrives at the rookery.

iv. **July:** Adult females stay on the rookery for one week after the pup is born, to nurse the pup; after a week, the female starts alternating feeding trips at sea with visits ashore to feed the pup.

v. **May:** Juvenile males start arriving on the haulouts in May, with older juveniles returning first and progressively younger males arriving later.

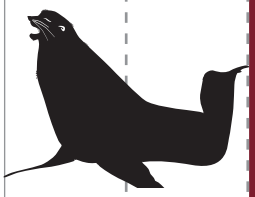
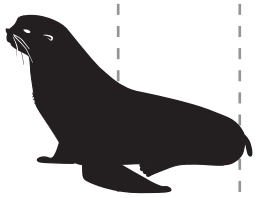
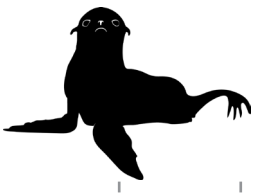
vi. **Late July:** Pup wads (big groups of pups of all ages that play and hang out together) form on the rookery since their mothers are out at sea feeding.

vii. **Mid to Late August:** Adult males begin to leave the rookery; older juvenile males start to move to the edges of the rookery.

viii. **Mid-November:** Pups wean from their mothers (they stop nursing) and leave the rookery after the first winter storms.

ix. **Late-October–early December:** Adult females and juveniles leave the rookery.

Lab 3.3 Northern Fur Seal Rookery Timeline

	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Adult males			Adult males arrive on the rookery in May. Adult males leave the rookery in mid to late Aug.							
Adult females				Females arrive late June to August (older females first, younger ones later) with most arriving in July. Females have pups within a few days of their arrival on rookery, then alternate nursing pup on shore with feeding trips at sea. Females leave the rookery in mid November.						
Juvenile males			Juvenile males start to arrive at haulout sites in May, with older males arriving first, and progressively younger males arriving later. Juvenile males are excluded from the rookery by adult males. Older juveniles start to come into the rookery in late August early Sept. after adult males leave.							
Pups					Pups are born a few days after a female arrives on rookery. As they grow, pups group together into “pup wads.” Pups leave the rookery in November after the first winter storms.					

Paternity and Maternity on the Rookery

OBJECTIVE

Students will match female northern fur seals with their pups using actual DNA information obtained by NOAA scientists.

TIME REQUIRED

50 minutes

BACKGROUND

The Pribilof Island/Eastern Pacific stock of northern fur seals has declined by more than 50% since the 1950s. To lean more about long term population distribution and trends, scientists study the genetic structure of the northern fur seal population (who's related to whom) to see if seals move from one area to another over the long term. Genetic studies also help scientists determine how many pups male and female seals can have over their lifetime. This information is used to model future population trends.

In fur seal rookeries, scientists are able to determine who a pup's mother is through direct observation. Because each female only has one pup and she must nurse that pup for it grow and survive, scientists are able to determine which pup belongs to which female by seeing the female nursing the pup. Fathers are much harder to identify, since they do not interact with the pup at all. In fact, the father of the pup born in one year mated with the pup's mother the previous summer (i.e., mating in 2015 results in a pup being born in 2016). It possible that the pup's father is no longer on the rookery, if he lost his territory to another male.

Scientists use DNA to identify the mother and father of a pup. Each pup's DNA is organized into pairs of chromosomes, with one chromosome of each pair inherited from the father and the other chromosome inherited from the mother. To identify the parents of a pup, scientists compare a specific location on the pup's chromosome (a locus) to the same location on the chromosomes of adult males and females on the rookery.

In this lab, the DNA codes are represented by colors, and students are asked to match pups to their fathers and mothers.

The lab is used to introduce the concepts of:

- Northern fur seal colony structure and mating systems
  - The role of males and females on the rookery
  - Male territoriality

MATERIALS

Basic setup- 2 males, 4 females, 4 pups; 4 allele matches. Any plastic animal may be used for this activity. Plastic seals are available for purchase on the Internet.

- Quart size plastic bag containing:
  - 2 large plastic fur seals, 4 medium fur seals, 4 pups, with Velcro dots on the underside
  - Laminated genetic code sheet below. Cut out the codes for 2 males, 4 females, and 4 pups.
  - Attached the codes to the underside of the plastic animals with Velcro.
- Worksheet 3.4.1 Family Tree
- Answer key
- PowerPoint presentation - NFS_Lesson3_ Lab3.4Paternity.ppt

PROCEDURES

Go through the PowerPoint as a class. Then, divide the class into smalls groups depending on how many bags of animals you have.

PowerPoint (Teachers are encouraged to use the printed copies of the slides provided below when presenting the PowerPoint to their students.)

- Important points:
  - Pup gets one copy of DNA from each parent
  - All loci in the pup have to match with each parent
- Example 1- matching pup to male and female at one locus
  - Look at pup's colors at one locus
  - Match one of the pup's colors at that locus to a males's color at the same locus
  - Once pup has been matched to a male, use pup's other color at that locus to match pup to a female
- Example 2- matching pup to male and female at all four loci
  - Look at pup's colors for the first locus
  - Match pup's color to a male's color at that locus

Paternity and Maternity on the Rookery

- Verify the match between pup and male with all the other loci
- Once pup has been matched to a male, match pup to a female, making sure the other color (the one matched to the male) at all loci match the female

Small Groups

- Give each group of students a plastic bag with the seals and Worksheet 3.4.1. As they match the pups to the males and females, have them record the information on Worksheet 3.4.1.
- After completing the worksheet, set up the seals to discuss colony structure and mating systems. Use the rookery diagrams from Lesson 3 to accurately represent the rookery structure during the peak of pupping season in June and July.

DISCUSSION

- What can you learn from genetic analysis of fur seals?

  Maternity/paternity (relatedness of individuals); population structure and distribution patterns (i.e., if one breeding site originated from another, or if there is cross-breeding or intermingling between sites).

- How do you get DNA from marine mammals?

  From tissue samples (most commonly); can also get it from skin, fur, bone, scat, blood, or saliva.

- Why is it important to know maternity and paternity on the rookery?

  In fur seal rookeries, you can usually figure out who the mom is if you have the time to observe individual pups for several days, because each mom has only one pup and the moms alternate between feeding at sea and spending time ashore nursing the pup. However, the dads are not as easy to identify, since they do not interact with the pup at all; in fact, the mom mates with the dad a year before the pup is born. In addition, if you want to find out information for a lot of animals and compare animals from different breeding sites, you can do so with genetic analysis.

  Once you discover who is related to whom, you can also observe behavior to see if animals behave differently to animals that are closely related.

- The questions we are trying to answer when we are looking at paternity are:
  - How many pups does each male have?

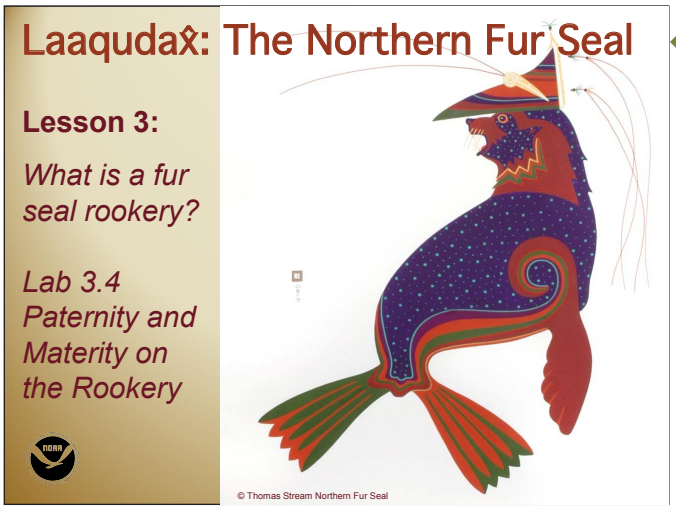
    There could be only a few dads with lots of pups, or there could be a lot of dads with only a few pups each.

  - A related question is what kinds of animals can you think of where a) one male has lots of offspring, or b) one male has few offspring?
  - How many males father pups in several years?
  - Does the territory size or location of a male affect how many pups he is able to father?

EXTEND AND EXPLORE

These genetic analysis techniques can be used for many types of populations and can tell us a lot about whether groups of marine mammals live in family groups.

- Research other marine mammals with available genetic data.



The Lab 3.4 presentation gives an overview of the hands-on activity with some background information.

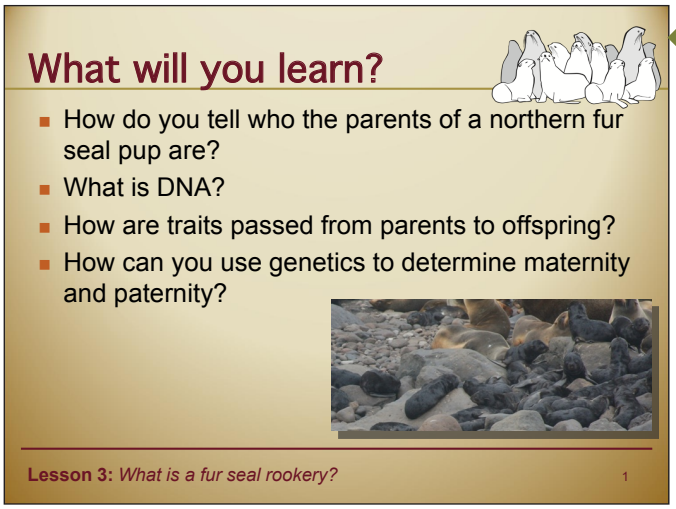
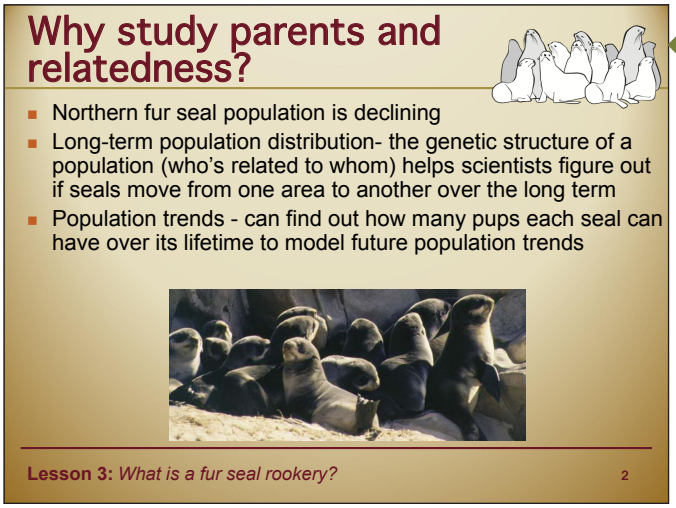


Photo: Lisa-Hiruki Raring, NOAA/AFSC



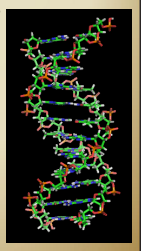
The Pribilof Island/Eastern Pacific stock of northern fur seals was listed as depleted under the Marine Mammal Protection Act in 1988 due to a population decline of more than 50% since the 1950s.

Source: NOAA Fisheries, http://www.fisheries.noaa.gov/pr/species/mammals/seals/northern-fur-seal.html

Photo: Rolf Ream, NOAA/AFSC/MML

What is DNA?

- All living things have DNA
- DNA is a special molecule in every cell that carries instructions for what the cell does
- For example:
  - Which cells should make hair, what color
  - Which cells should grow legs, how long
- DNA contains an incredible amount of information
  - DNA from one of your cells is more than 3 feet long when stretched out!
- Each piece of information is carried on a different section of DNA, called a gene



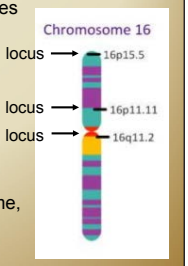
Lesson 3: *What is a fur seal rookery?* 3

DNA (deoxyribonucleic acid) is the material that carries all the information about how a living thing will look and function.

For instance, DNA in humans determines such things as what color the eyes are, and how different organs (like heart, lungs, liver) work. Each piece of information is carried on a different section of the DNA. These sections are called genes.

What is a locus?

- Chromosome
  - Tightly coiled DNA in the nucleus of each cell
  - Each chromosome is made up of one DNA molecule
  - Every animal has a given number of chromosomes
    - Humans have 46 chromosomes (23 pairs)
    - Northern fur seals have 36 chromosomes (18 pairs)
- Gene
  - Each chromosome contains many genes
  - A gene is one section of a chromosome
  - Genes are inherited from a parent
- Locus
  - A specific location of the gene on the chromosome, like a genetic street address



Lesson 3: *What is a fur seal rookery?* 4

Each piece of information is carried on a different section of the DNA. These sections are called genes.

Resources:

Genome Unlocking Life's Code video (https://unlockinglifescode.org/media/animations/659#660)

GeneEd Genetics, Education, Discovery (https://geneed.nlm.nih.gov/topic_subtopic.php?tid=15&sid=17)

NIH National Human Genome Research Institute Talking Glossary of Genetic Terms (https://www.genome.gov/glossary/index.cfm)

Chromosome: https://www.genome.gov/glossary/index.cfm?id=33

Gene: https://www.genome.gov/glossary/index.cfm?id=70

DNA: https://www.genome.gov/glossary/index.cfm?id=48

Locus: https://www.genome.gov/glossary/index.cfm?id=116

Allele: https://www.genome.gov/glossary/index.cfm?id=4

DNA Learning Center (https://www.dnalc.org/)

Image Source: IB Biology 3.1 Slides: Genes, slide 6

Jacob Cedarbaum, Teacher at Nicholas Senn High School

http://www.slideshare.net/jcedarbaum1/ib-biology-31-slides-genes

Original image from http://www.ornl.gov/sci/techresources/Human_Genome/posters/chromosome/chooser.shtml

What is a locus?

3.1.1 A gene is a heritable factor that consists of a length of DNA and influences a specific characteristic.

Chromosomes, Genes and Alleles

Chromosome
made of DNA and protein
⇩
contains
GENES
heritable factors that control specific characteristics

ALLELES are different forms of a specific gene

Gene locus:
specific position of a gene on a chromosome

All individuals of a species carry the same genes at the same loci on the same chromosomes

All individuals of a species carry the same genes at the same loci on the same chromosomes

Lesson 3: *What is a fur seal rookery?* 5

Resources:

Slide Share: IB Biology 3.1 Slides: Genes, slides 3 and 6

Jacob Cedarbaum, Teacher at Nicholas Senn High School

http://www.slideshare.net/jcedarbaum1/ib-biology-31-slides-genes

Teacher Web: Alleles, posted Jan. 17, 2016

(http://www.teacherweb.com/Blog/CA/NogalesHighSchool/mespinoza/7/default.aspx?year=2012&month=1)

Inheritance

- We get half our DNA from our dad, and half from our mom
- This is why children look like their mom and dad
- Also why sisters and brothers can look alike
- We match copies of DNA from pups to their mom and dad
  - Match genetic code at a LOCUS on a gene
  - One copy from mom, one from dad
  - Can use several LOCI to confirm a match

Lesson 3: *What is a fur seal rookery?* 6

DNA is inherited from parents – one copy from the mother, one copy from the father.

In this way, we can use DNA to look for the parents of a northern fur seal pup

We look at specific places on a gene in the DNA, called a locus, and match the genetic code at the locus to the genetic codes at the same locus on the mother's and father's gene in the DNA. We use several of these loci to make sure the match is correct.

How do you get a DNA sample from a northern fur seal?

- Tissue sample (from darting or tagging)
- Scat
- Blood sample
- Saliva
- Swab

Lesson 3: *What is a fur seal rookery?* 7

Scientists can get DNA samples in many different ways –

If the seal is not restrained (remote sampling):

Darting (using specially modified dart guns to get small tissue samples from unrestrained seals)

Feces (picking up scats from the rookery – only if you can identify which animal the scat came from)

If the seal is restrained for tagging:

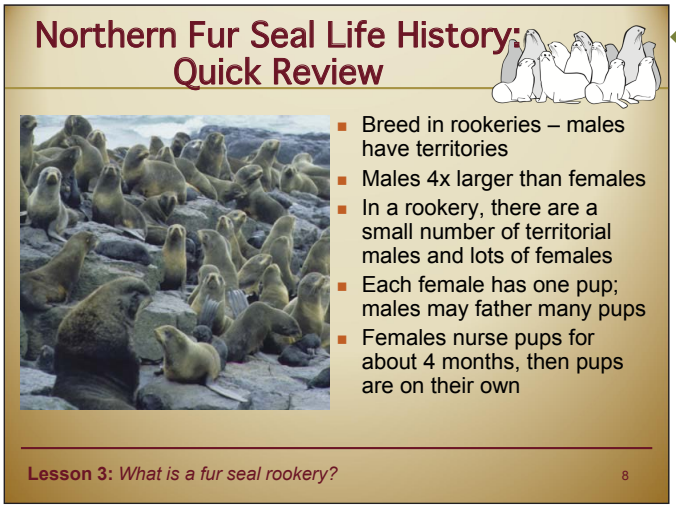
Blood sample – taken from femoral vein in the ankle

Tissue – can get a tissue plug from flipper when the seal is tagged with a plastic tag

Saliva

Swab - can get a swab from the mouth or other areas

Photo: NOAA/AFSC/MML



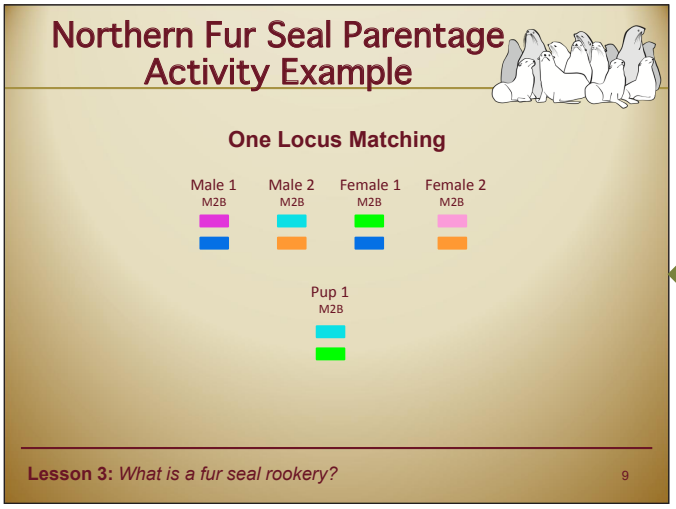
Background on fur seal life history

- Northern fur seals spend much of the year at sea, but return to land to breed (mate and have pups) during the summer. They gather in large groups at specific areas, called rookeries, on islands in Alaska, California, and Russia.
- Most female fur seals return to the same spot year after year to give birth (a behavior called philopatry).
- Philopatry – returning to the location where an individual was born
- Some females return to the same island and rookery but not the site where they were born (a behavior called site fidelity).
- Site fidelity – returning to the same place (can be in relation to the destination of a feeding place, a migration, or a breeding area, among other things)
- Because of this, males gather in areas where female fur seals will arrive each year to breed, and set up territories that they defend against other males.
- The biggest, strongest, most dominant males have the most females in their territories.

Use the picture to talk about the physical differences between males and females to lead into the main questions with this.

Eg. Who can show me which are the males, which are the females and which are the pups, how do you know that?

Sources: Riedman, M. 1990. The Pinnipeds. Gentry, R. 1998. Behavior and ecology of the northern fur seal.
Photo: NOAA/AFSC/MML



During a given year, a female has one pup.
Males can mate with many females.
Only about 10% of male pups become breeding males, whereas most females become breeding females.
Source: Gentry, R. 1990. Behavior and ecology of the northern fur seal.
Photo: NOAA/AFSC/MML

We will walk through a couple of examples of the activity – the simplest example is matching one locus on a gene. The locus names used in this activity (in this example, "M2B") are actual locus names that NOAA geneticists use when analyzing seal DNA. The genetic codes at the locus are represented here by colors. If a color on the pup's locus matches a color at the same locus of one of the parents, that means that the genetic code is the same.

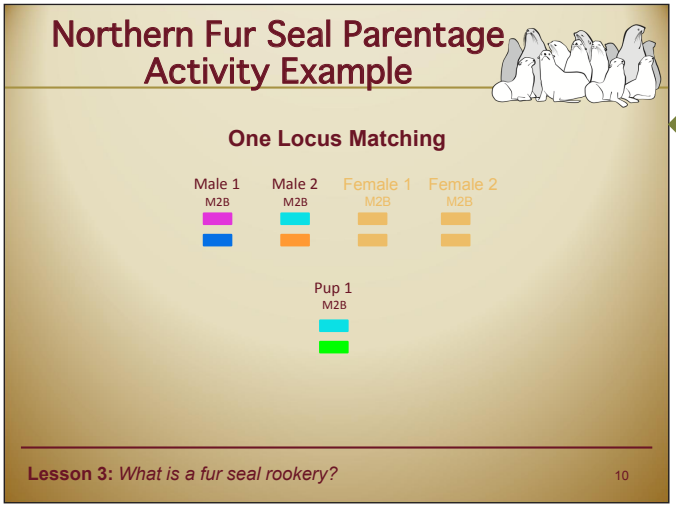
Here, we have an example where you have one pup, and 2 possible fathers (male 1 and 2) and 2 possible mothers (female 1 and female 2).

When looking at the 2 copies of the pup's gene, remember that one copy comes from the father and one from the mother.

Which parent should you look at first? Mom or dad?

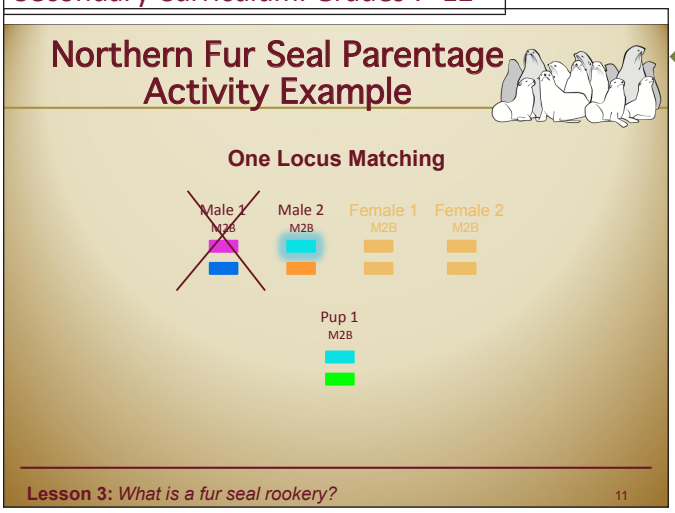
Remember the life history information from slide 6 - few territorial males; many females.

Easier to identify the father (male) because there are fewer possible choices.

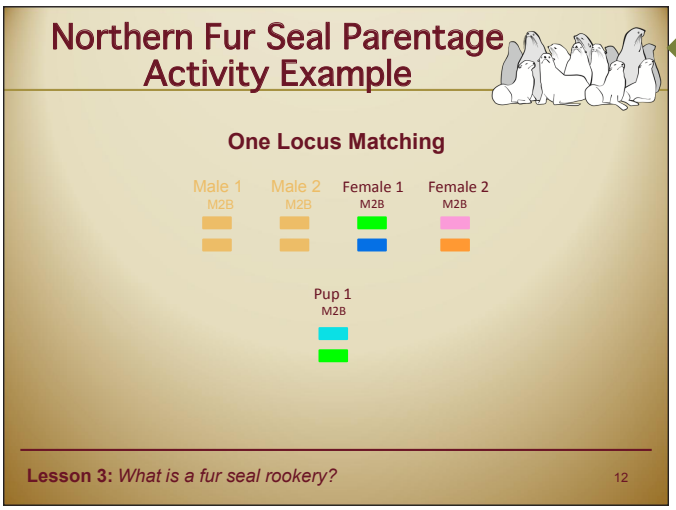


When looking at the 2 copies of the pup's gene, remember that one copy comes from the father and one from the mother.

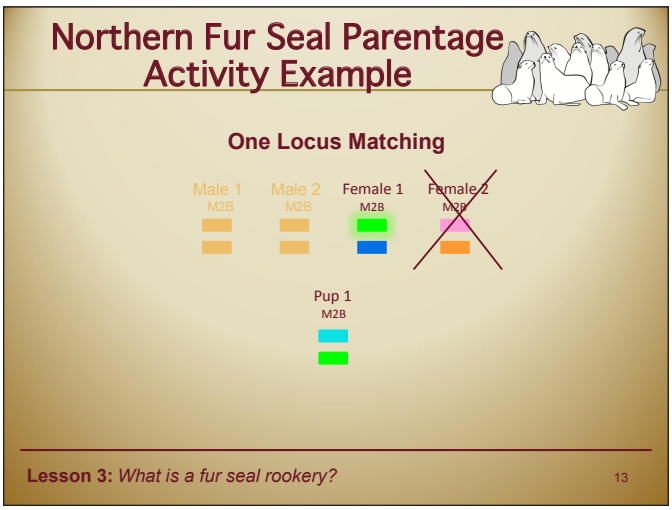
Look for a color on the pup's M2B locus that matches one of the males.



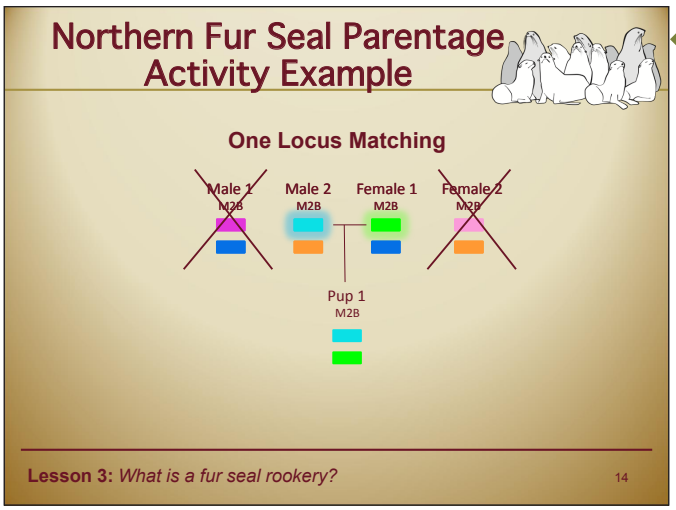
You can see that Male 2 has a light blue color that matches the pup's color, so we can say that Male 2 is the father.



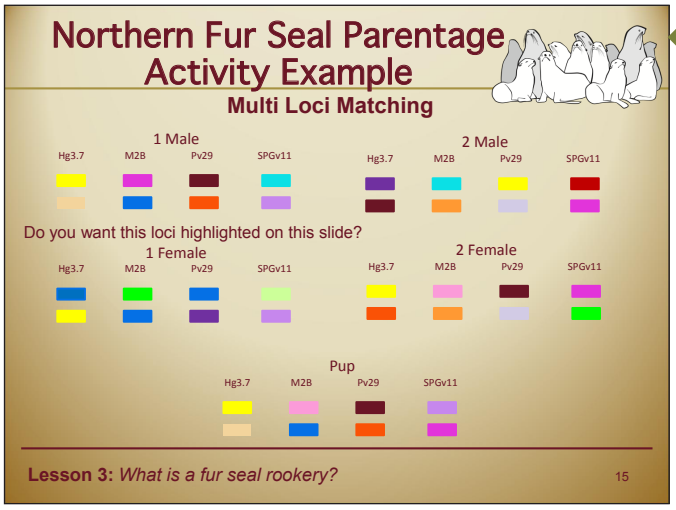
Now we match the remaining color for the pup (green) to one of the females.



Only Female 1 has a green color on the M2B locus, so she is identified as the mother of Pup 1.



From matching one locus (M2B), we have found that Male 2 is the father and Female 1 is the mother of Pup 1.



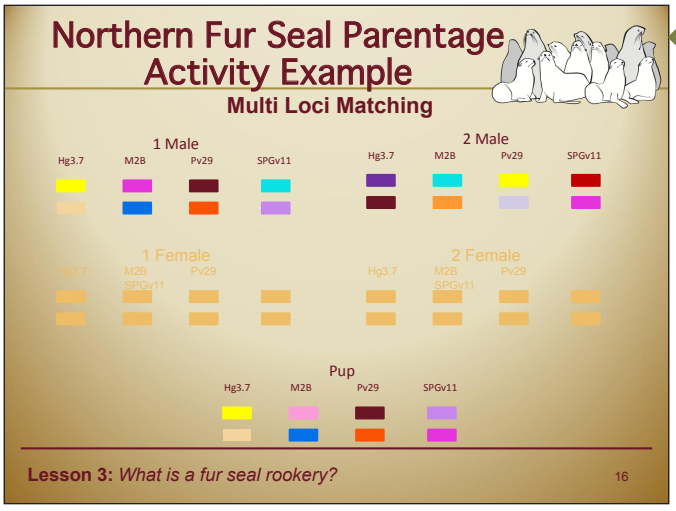
In reality, we need to use many loci to match pups to their parents – an analogy is if we were to use eye color to match kids to their parents. There are a lot of people with the same eye color, so we need to use several traits to match kids to their mother and father.

Here is an example with 4 loci – Hg3.7, M2B, Pv29, SPGv11. Again, loci are specific locations on a gene that can be used to compare between different individual animals.

When starting the match, ask students: which do we match first, males or females?

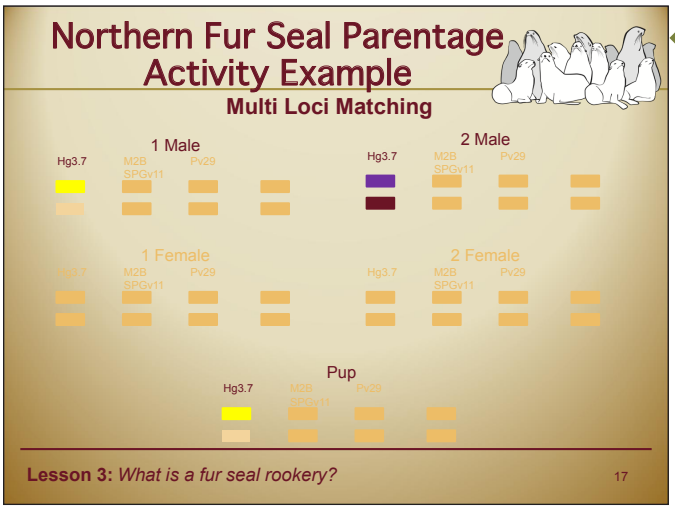
(Answer: males, because there are fewer territorial males to choose from)

Here, the males are across the top, the females are in the second row.



Look at the males to see if there is a match to one of the colors at each locus for the pup.

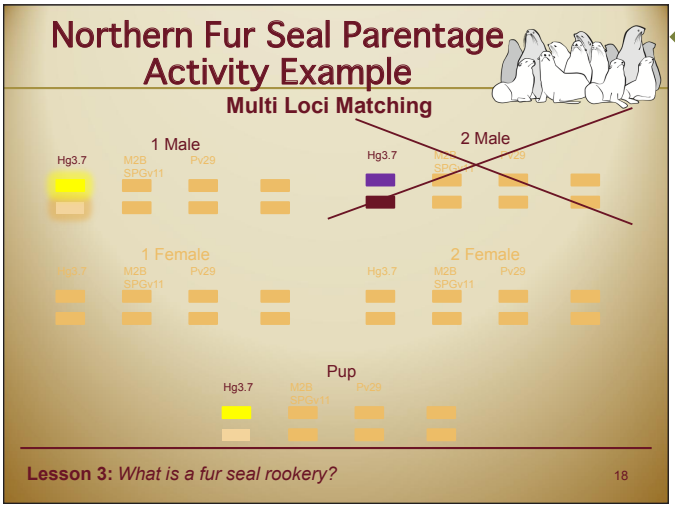
We want to look at each locus individually, so we generally start from the left side (Hg3.7) and match one locus at a time. Remember that you are looking for one color match between the pup and the male at each locus.



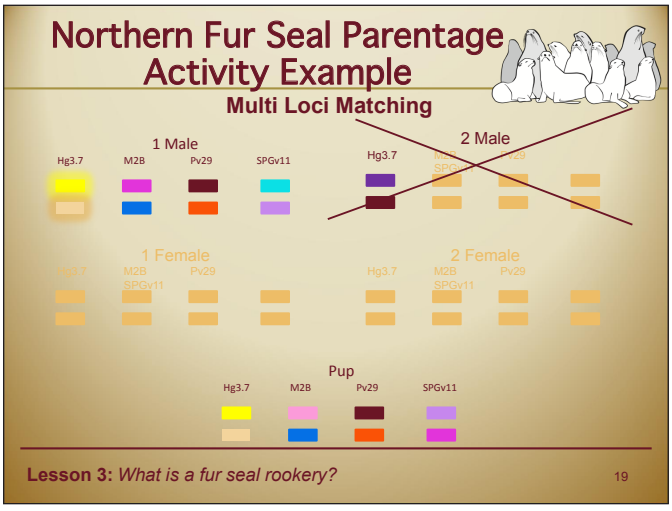
We want to look at each locus individually.

Here we are looking at the first locus, Hg3.7 Remember that you are looking for one color match between the pup and the male at each locus. Which male has a color match to either of the pup's colors at this locus?

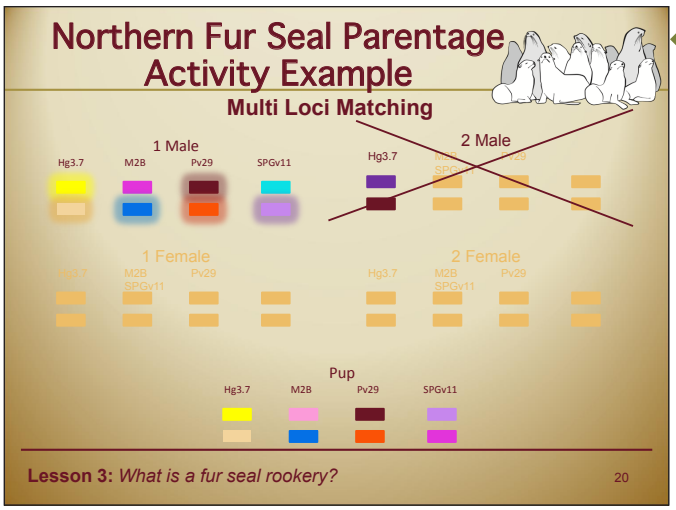
(Answer: Male 1 has a match to both colors at the pup's Hg3.7 locus. Male 2 does not have any matches, so we know that Male 1 is the father.)



Male 1 has a match to both colors at the pup's Hg3.7 locus. Male 2 does not have any matches, so we know that Male 1 is the father.



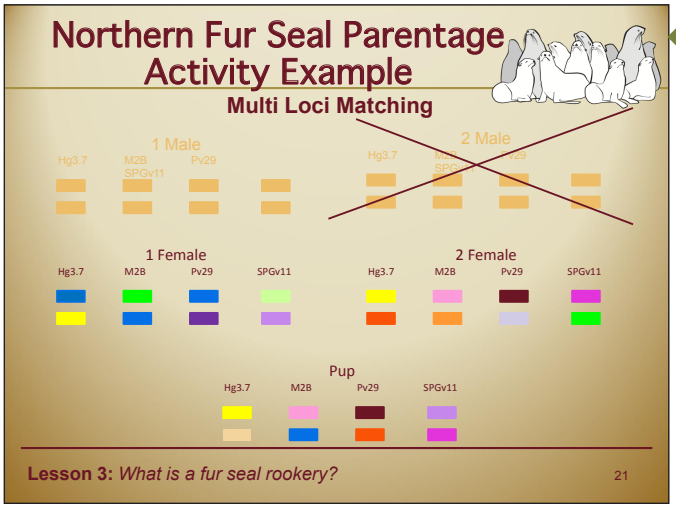
Now we need to double-check (verify) the other loci for Male 1 to make sure that there is a match at each locus. Does Male 1 have at least one color at each of the other loci that matches one of the pup's colors?



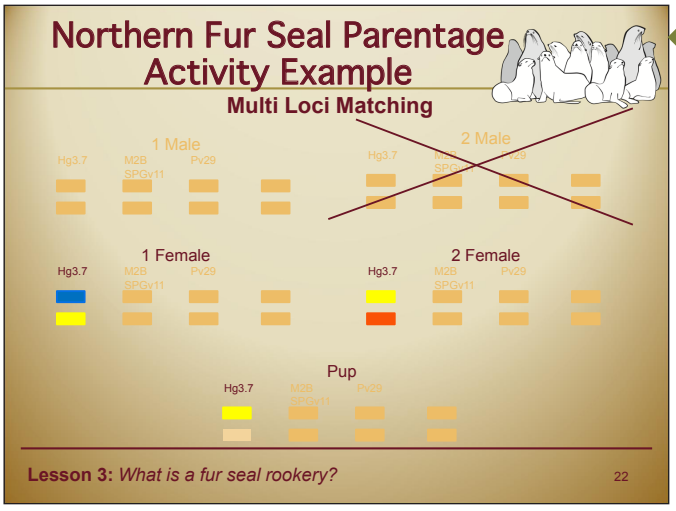
Does Male 1 have at least one color at each of the other loci that matches one of the pup's colors?

Answer: yes: M2B – blue; Pv29 – both brown and orange; SPGv11 – purple

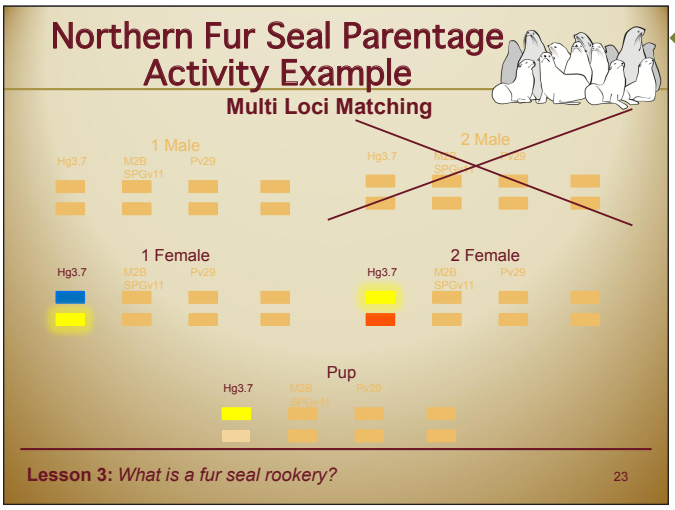
This verifies that Male 1 is the pup's father.



Now we do the same for the females to find the mother.

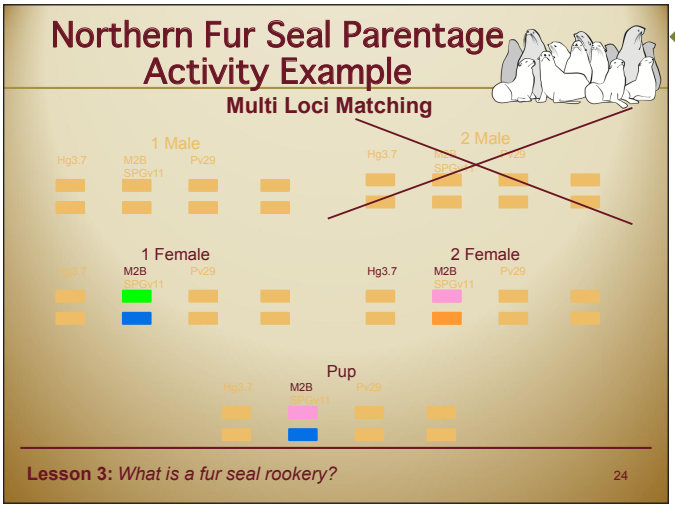


Again, start with Hg3.7 – Do either of the females have one of the same colors as the pup at Hg3.7?

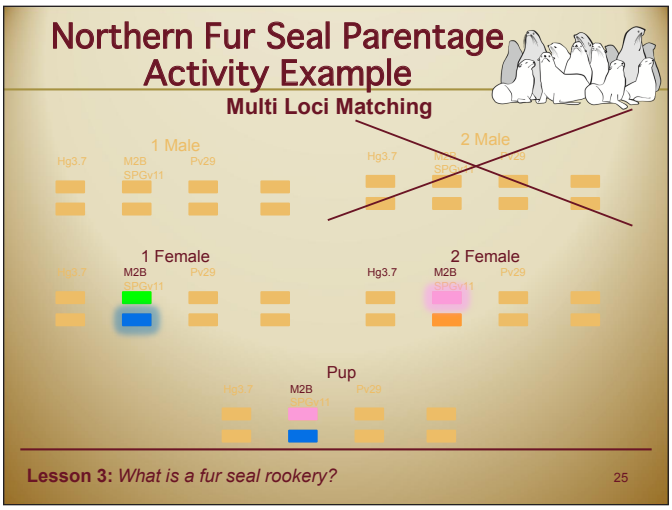


Do either of the females have one of the same colors as the pup at Hg3.7?

Answer: both females have yellow, so we have to go to the next locus to see if we can determine which one is the mother.

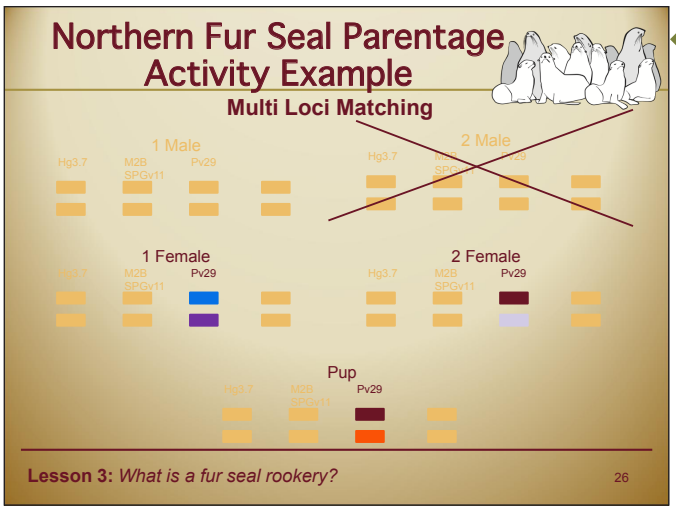


Go to the next locus, M2B -Do either of the females have one of the same colors as the pup at M2B?

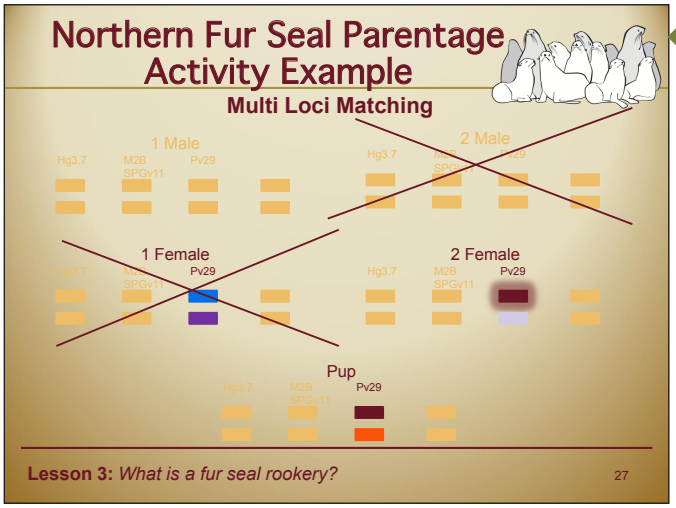


Do either of the females have one of the same colors as the pup at M2B?

Answer: Female 1 has blue, and Female 2 has pink (i.e., both have one color from the pup), so we have to go to the next locus to see if we can determine which one is the mother.

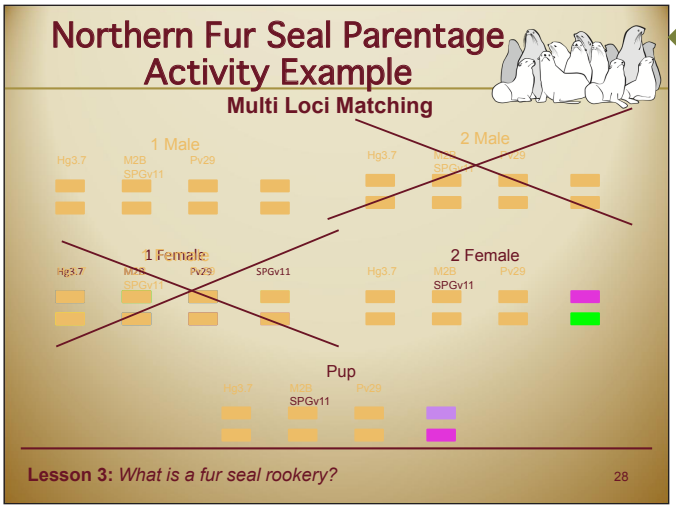


Go to the next locus, Pv29 -Do either of the females have one of the same colors as the pup at Pv29?

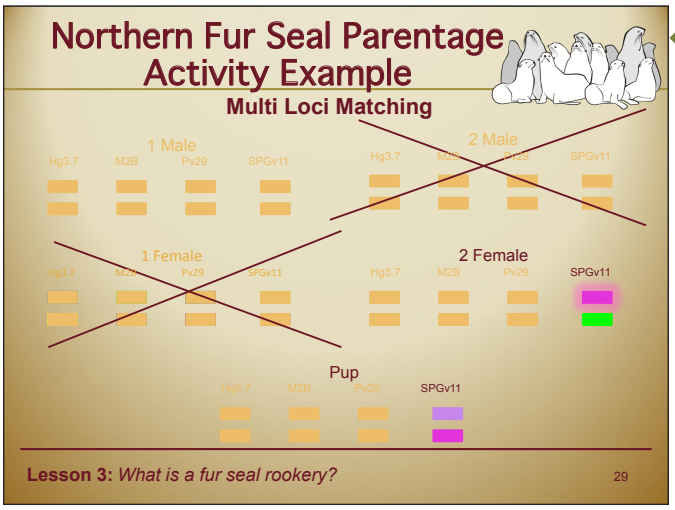


Do either of the females have one of the same colors as the pup at Pv29?

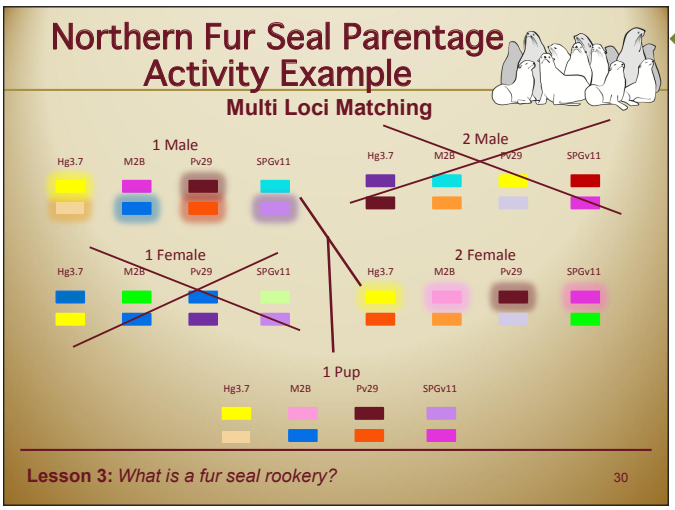
Answer: Female 2 has brown, but Female 1 does not have any colors the same as the pup, so Female 2 is the mother!



Double check the last locus, SPGv11.



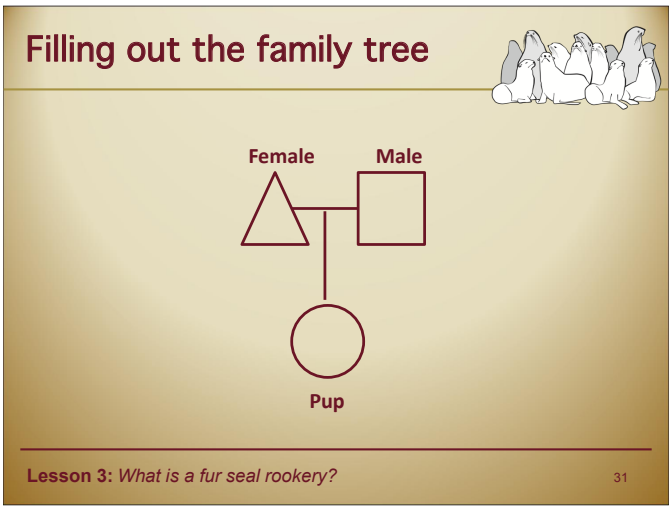
Female 2 has pink, the same as one of the colors from the pup. The match is verified.



From matching one color from the pup to one color from each parent, we were able to determine that Male 1 and Female 2 were the pup's parents.

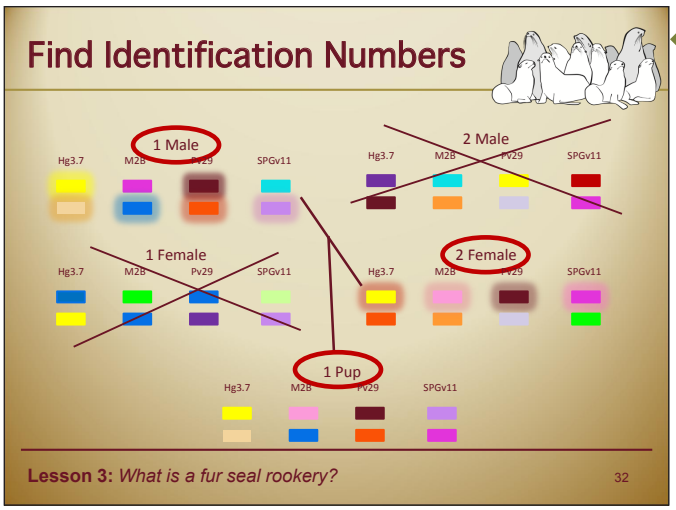
Pup's genetic codes:

- At locus Hg3.7 – yellow from mom, peach from dad
- At locus M2B – pink from mom, blue from dad
- At locus Pv29 – brown from mom, orange from dad
- At locus SPGv11 – purple from dad, magenta from mom

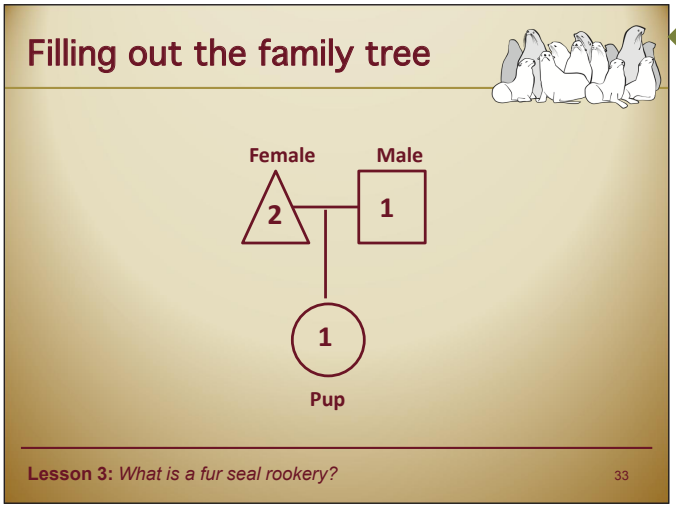


Now we fill out the identification numbers of the parents and pup on the family tree

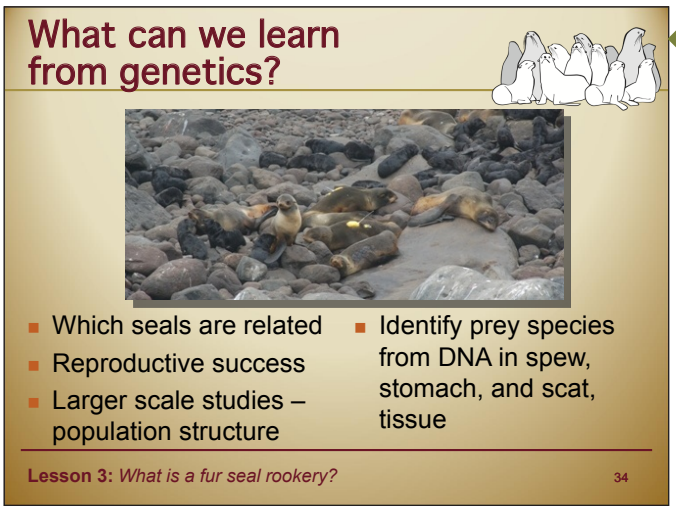
- Triangle – female
- Square – male
- Circle – pup



Find identification numbers from our table (circled in red).



Fill in numbers on family tree.



What can we learn from genetics?

Which seals are related – this is the activity we did today. In reality, computer does matching, but final decision is still done by a scientist who looks over the final computer matches to verify them.

Reproductive success – analyzing paternity by genetics can show scientists how many pups each territorial male fathers, as well as record how many pups a female has over her reproductive life.

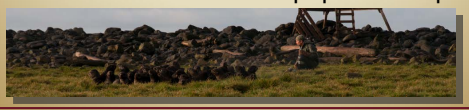
Population structure – scientists can look at genetics from different rookeries to see if there is genetic exchange between rookeries

Prey species identification – scientists can identify prey from tissue in seal scats, spews, or stomach contents.

Photo: Rolf Ream, NOAA/AFSC/MML

Summary

- Scientists can use genetics to find out who the parents of a northern fur seal pup are
- DNA is the material that carries all the information about how a living thing will look and function
- Pups get one copy of their DNA from each parent
- Looking at specific locations on the DNA, scientists can match the DNA from the pup to each parent



Lesson 3: *What is a fur seal rookery?* 35

Photo: Pam Goddard, Thalassa

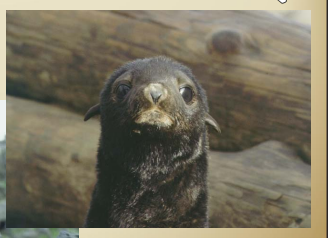
Background slides

- The following slides provide background on northern fur seal life history if this activity is being done as a stand-alone lesson

Lesson 3: *What is a fur seal rookery?* 36

Background…

- **What is a fur seal?**



Lesson 3: *What is a fur seal rookery?* 37

Review from Lesson 1

Pinnipeds are divided into three groups:
True seals (phocid seals) – these are seals like harbor seals and ringed seals
Eared seals (otariid seals) – these are fur seals and sea lions
Walrus (odobenid)

Characteristics of an eared seal:

- external ear flaps
- Large flippers used for propulsion when swimming (eared seal "flies through the water")
- hind flippers rotated under the body so that the fur seal can walk on all four flippers on land

Northern fur seal is an eared seal (otariid seal).

Photos: Rolf Ream, NOAA/AFSC/MML

Fur seal life history

- Breed in rookeries – males have territories; lots of females
- Males 4x larger than females
- Each female has one pup
- Females nurse pups for about 4 months

Lesson 3: *What is a fur seal rookery?* 38

Main points:

During a given year, a female has one pup.

Males can mate with many females.

Only about 10% of male pups become breeding males, whereas most females become breeding females.

Source: Gentry, R. 1990. Behavior and ecology of the northern fur seal.

Photo: NOAA/AFSC/MML

Background on fur seal life history

Northern fur seals spend much of the year at sea, but return to land to breed (mate and have pups) during the summer. They gather in large groups at specific areas, called rookeries, on islands in Alaska, California, and Russia.

Most female fur seals return to the same spot year after year to give birth (a behavior called philopatry).

Philopatry – returning to the location where an individual was born

Some females return to the same island and rookery but not the site where they were born (a behavior called site fidelity).

Site fidelity – returning to the same place (can be in relation to the destination of a feeding place, a migration, or a breeding area, among other things)

Because of this, males gather in areas where female fur seals will arrive each year to breed, and set up territories that they defend against other males.

The biggest, strongest, most dominant males have the most females in their territories.

Use the picture to talk about the physical differences between males and females to lead into the main questions with this.

Eg. Who can show me which are the males, which are the females and which are the pups, how do you know that?

Sources: Riedman, M. 1990. The Pinnipeds.; Gentry, R. 1998. Behavior and ecology of the northern fur seal.

Male fur seals may take up to 7-10 years to become breeding males and may only keep a territory on the rookery for a few years.

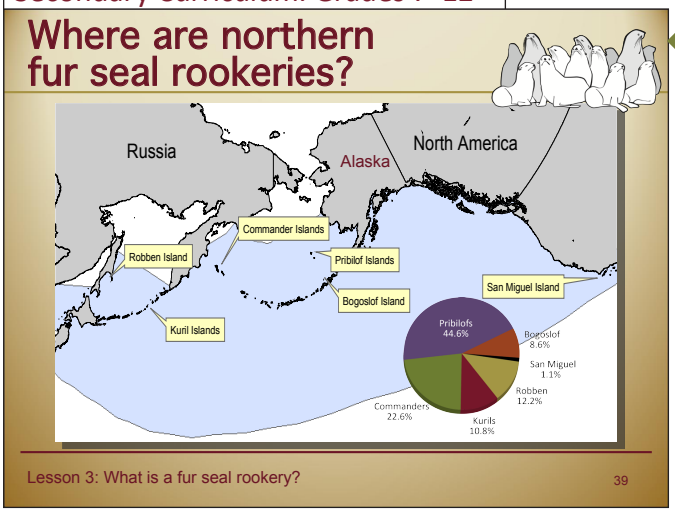
If they become territorial males (adult males who hold a territory on the rookery) they may father many pups per year during the time that they have a territory. Not all males become breeding males; some are idle males (defend a territory but don't have females) and some remain on the haulout areas.

Female fur seals begin to breed at 3-5 years of age and then have one pup per year until they are 18-20 years old. Females choose a location on the rookery that increases their chances of weaning a pup.

Pups are born in July and remain on the rookery until they are weaned, 4 months later.

The pregnancy rate for females is approximately 60% for females age 3 and greater, and 68% for females age 4 and greater (York 1987). Nearly 90% of females in their reproductive prime, 8-13 years old, are pregnant every year with the pregnancy rate gradually decreasing after 13 years of age.

Source: Antonelis G. (1992) Northern fur seal techniques manual. U.S. Dep. Commer, Seattle. NOAA Tech Memo NMFS F/NWC-214, 47 p. (adult males); York (1987) – female reproduction



Unangam names:

Tanax̂-Amix̂ Pribilof Islands

Aĝasaaĝux̂- Bogoslof Island

There are five northern fur seal breeding rookery locations: three in Russia (Commander Islands, Robben Island, Kuril Islands), two in the Bering Sea (Pribilof Islands, Bogoslof Island), and one in California (San Miguel Island). The largest proportion of the northern fur seal population is on the Pribilof Islands. At each location, fur seals breed at specific rookeries (e.g., in the Pribilof Islands, there are 15 rookeries on St. Paul Island and 6 on St. George Island.

Percentage of the worldwide northern fur seal population in different rookery locations (2012):

44.6% Pribilof Islands

22.6% Commander Islands

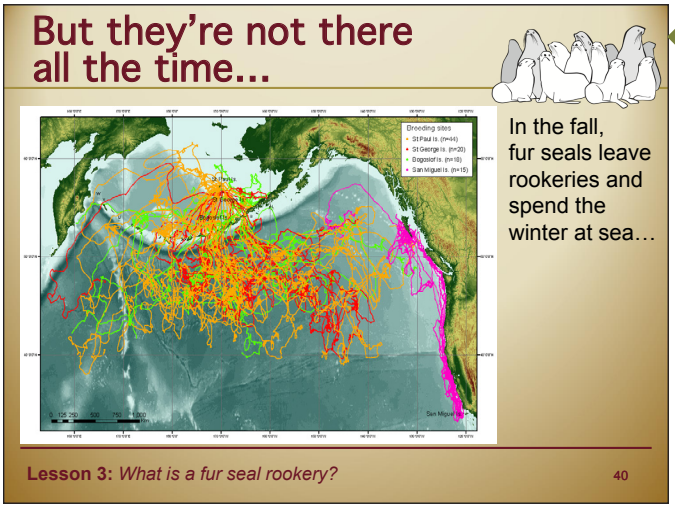
12.2% Robben Island

10.8% Kuril Islands

8.6% Bogoslof Island

1.1% San Miguel Island

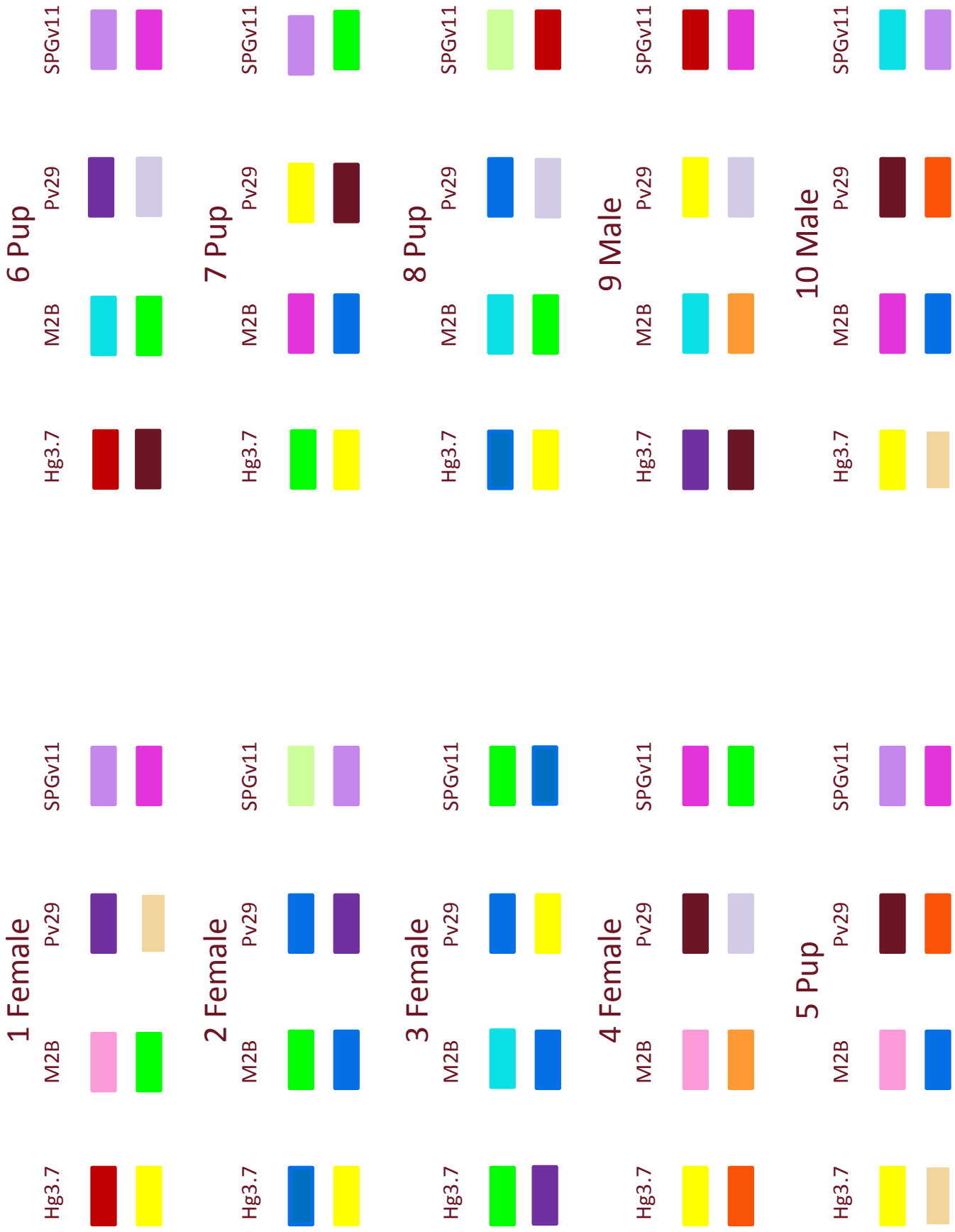
Map from MML/AFSC/NOAA observer PowerPoint

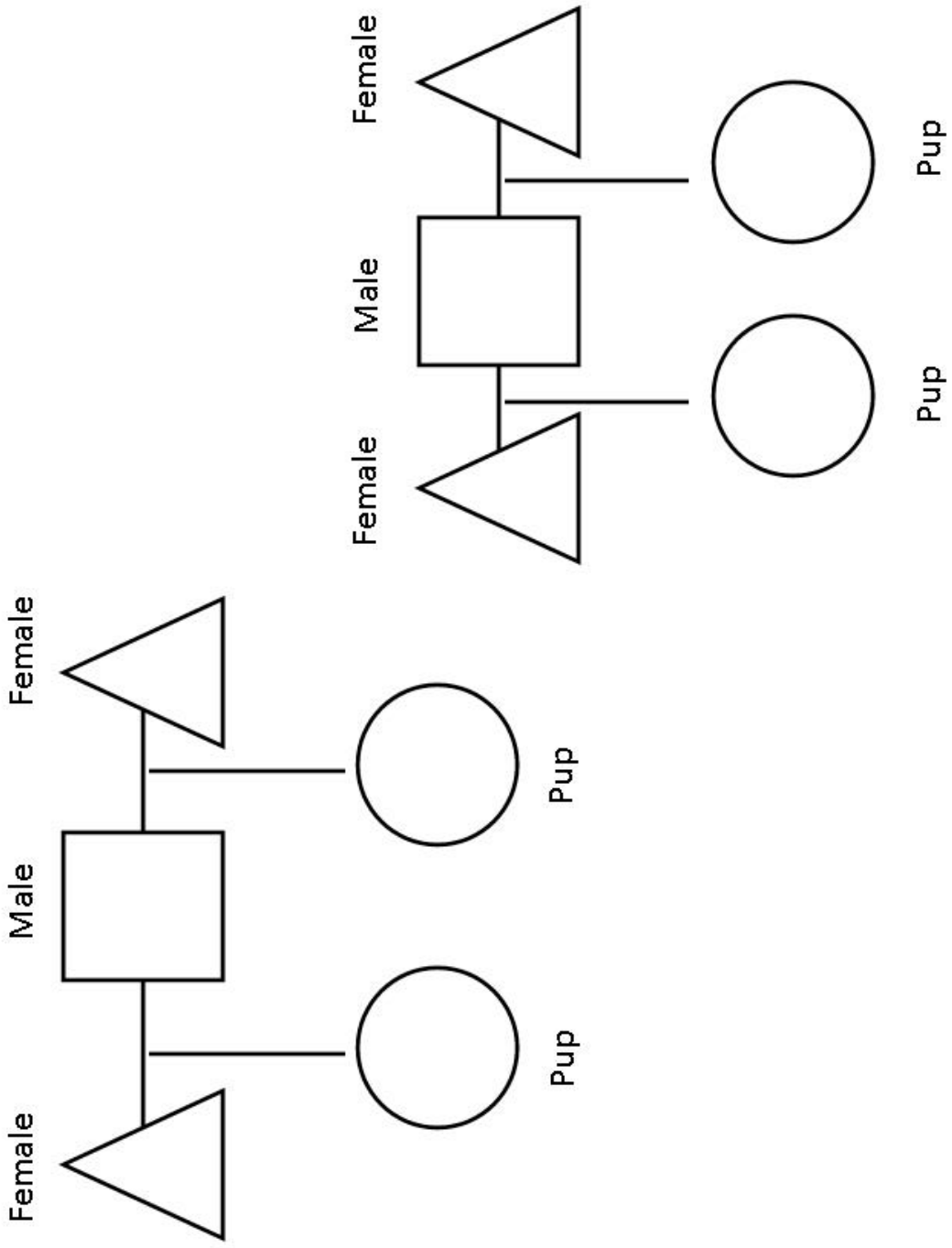


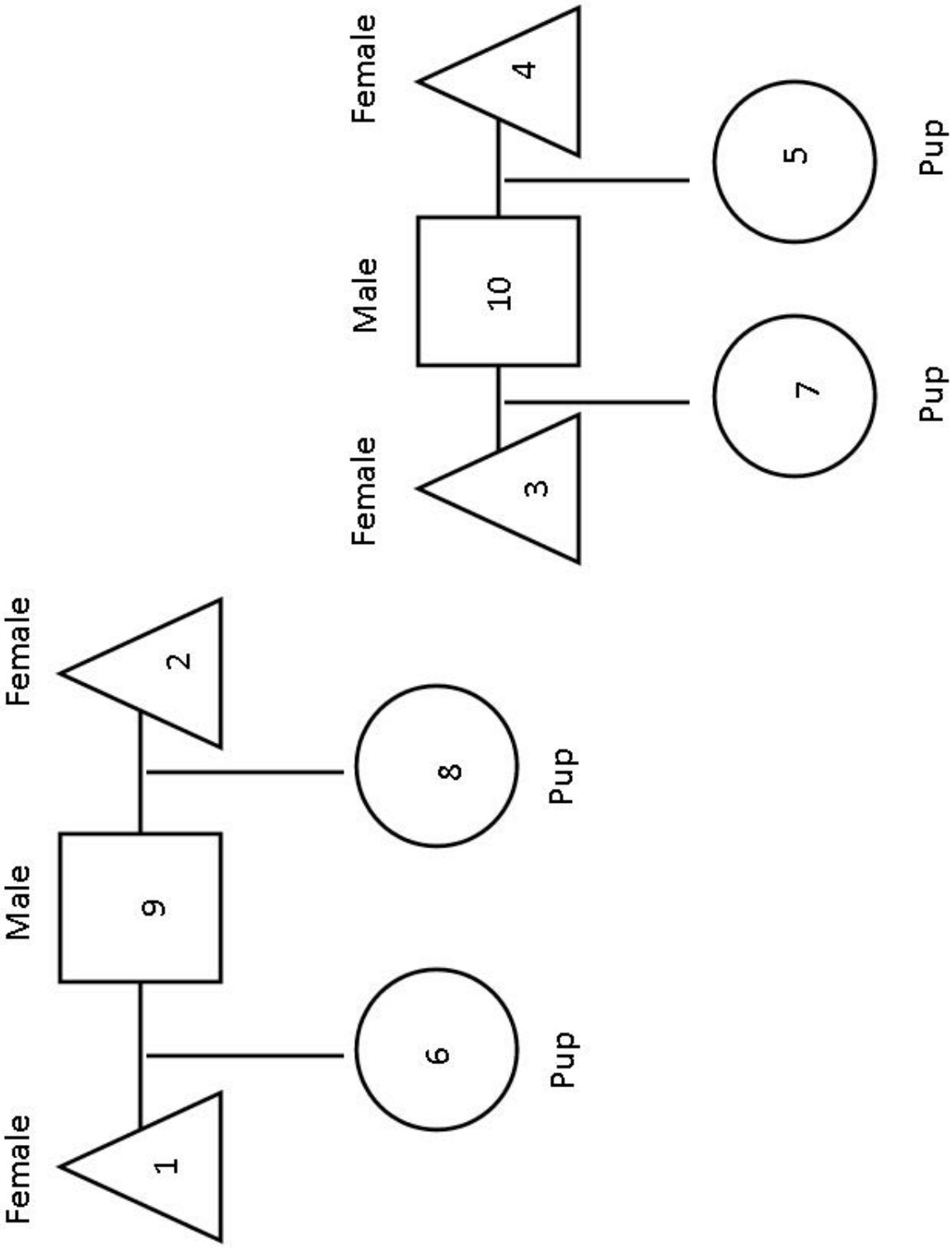
See more details in Lesson 6 - Where do fur seals go in the winter?

Map: MML/AFSC/NOAA

LAB 3.4 Paternity and Maternity on the Rookery




Female
Male
Female
Pup
Pup
Female
Male
Female
Pup
Pup


Female
4
5
Pup
Male
10
7
Pup
Female
3
Female
2
8
Pup
Male
9
6
Pup
Female
1

LESSON THREE | LAB 3.5 ART | Grade Level 7–12

Create a Rookery — Rubber Stamp Making

OBJECTIVE

Students will learn the structure of a rookery through art. Make rubber stamps of the components of a rookery. Create pictures of the rookeries at different times of the year using the stamps.

TIME REQUIREMENT

2–3 class periods

BACKGROUND

The rookery structure changes throughout the season. First males arrive, then females, pups are born, males leave, pups leave, and finally the females leave. Through art, students can visualize the changes on the rookery between June and November. The different behavior of males and females is shown through their distribution on the rookery. See diagrams of rookery structure in Teacher Key.

NOTE

This art project can be adapted for all age levels. Students as young as 5 are able to sketch basic images of seals, grass, rocks, clouds, and water, which can be cut out by older students or adults. The older the students the more complex the final image can be.

MATERIALS

- #2 pencils
- 3 inch x 3 inch Post-its
- Soft-Kut rubber (size of a square post-it note) for each student; can be purchased and cut to size from Blick Art Supplies (dickblick.com)
- Paper plates – for paint
- Sponges – 1 inch by 1 inch cubes for painting
- Acrylic paint
- Stamp pads (washable ink) – various colors
- Linoleum cutters – various size blades, e.g. #1 liner, #2 V-gouge, #3 large line, #4 U-gouge
- Paper to print on – good variety of colors and textures, but copy paper will work. Fabric can also be used instead of paper.
- Wipes – for hands
- Newspaper –to cover painting surfaces
- Table covering paper
- 2 or 3" paint brayer (roller)

PROCEDURES (SEE ILLUSTRATIONS BELOW)

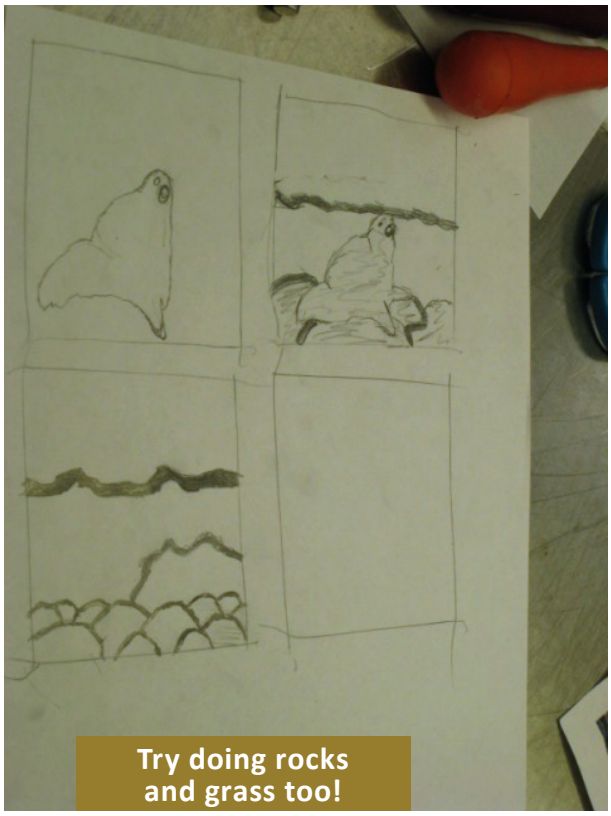
1. Sketch on post-it; have each student pick one component of the rookery for each Soft-Kut rubber block (make sure all components of the rookery are represented, males, females, pups, rocks, waves, grass, clouds…).
2. Put Post-it on soft cut rubber with the image touching the rubber. The student should be looking at the blank side of the Post-it.
3. Transfer image to Soft-Kut rubber by gently rubbing the blank side of the Post-it with your hand or by rolling a pencil over the Post-it.
4. Cut image into rubber using linoleum cutters.
    a. Don’t cut too deep.
    b. Cut what you don’t want to show up.
    c. Trace around objects.
5. Spread small amount of paint on paper plate.
6. Lightly roll paint onto brayer/roller.
7. Once roller is covered with light coating, gently roll paint onto the soft rubber.
8. Invert soft rubber cutout onto paper or fabric.
9. Gently rub back of cutout to transfer paint to paper or fabric.
10. Allow paint to dry.
11. Wash cutout and try with other colors.
12. Create 4 rookery scenes that represent the changes over one breeding season.

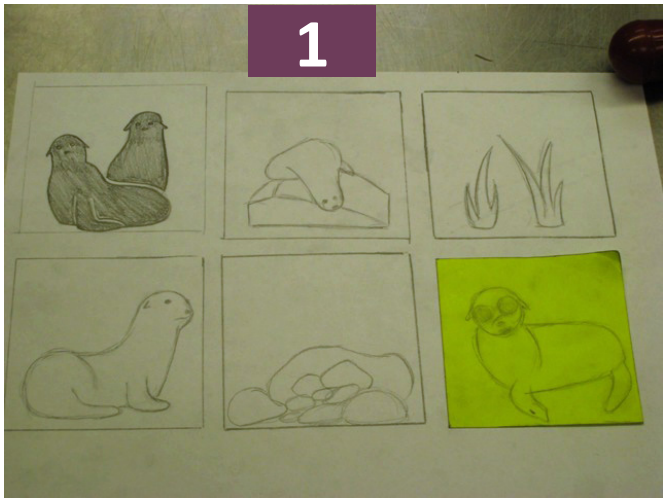
DISCUSSION

- How does the rookery change over the summer?
- Discuss other seasonal cycles, birds, deciduous trees, grey whales.
- Many other animals migrate to Alaska for the summer. Research some of the other animals.

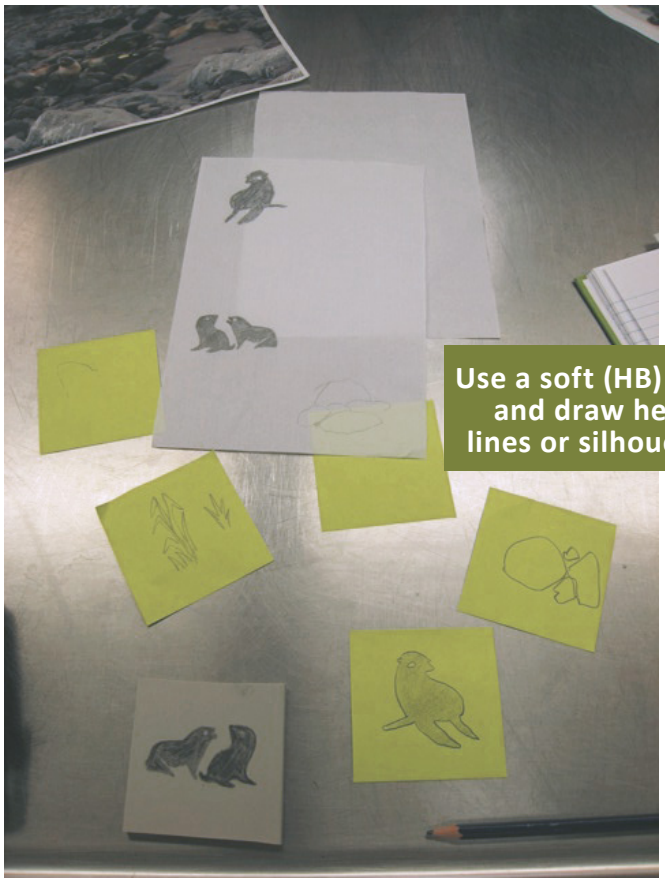
LAB 3.5 ART

Create a Rookery with rubber stamps!

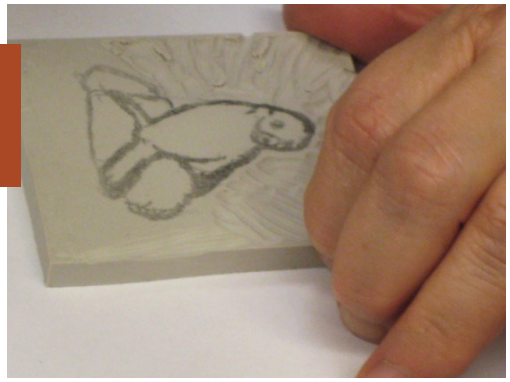




1. Sketch a picture on a post-it note
2. Put post-it face-down on rubber square.
3. Transfer image to rubber square by rubbing the back of the post-it.



Outlines and simple shapes are easiest.



LAB 3.5 ART

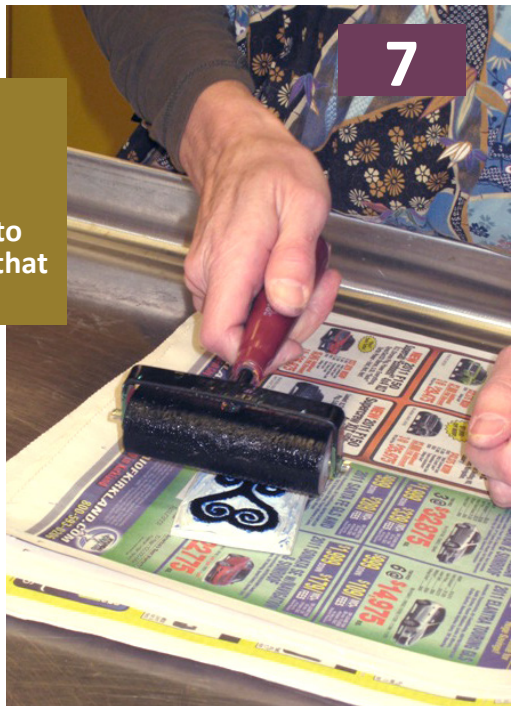
Create a Rookery with rubber stamps!

Cut the area around your design

4. Cut image into rubber, using linoleum cutters.
5. Spread small amount of paint on paper plate.
6. Lightly coat roller with paint.
7. Gently roll paint onto rubber stamp.
8. Place rubber stamp onto paper face down.
9. Rub back of stamp to transfer paint.

Note: paint only on raised image.

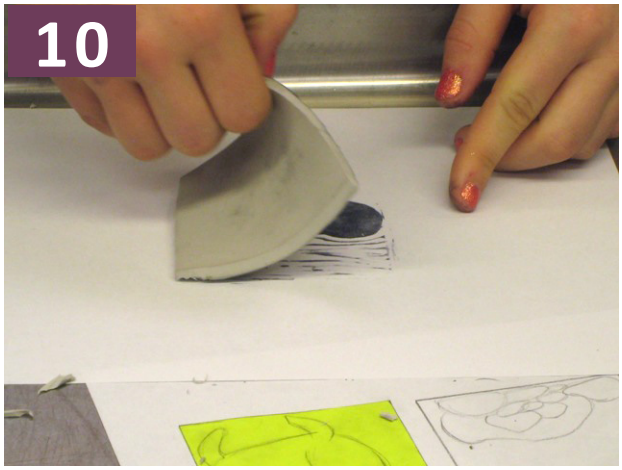
If you push too hard on the roller the paint will transfer to the areas around the image that you want to be paint free.



LAB 3.5 ART

Create a Rookery with rubber stamps!

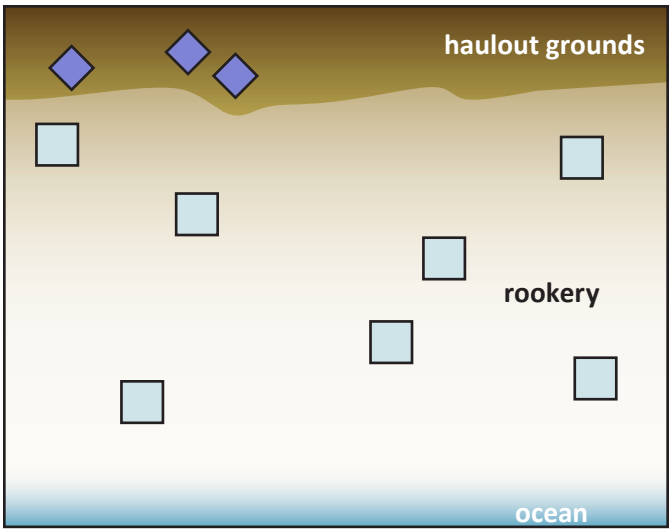
10. Look at your picture! Allow paint to dry.
11. Wash rubber stamp (with wipes or wet paper towel) and try other colors.
12. Combine stamps to make a picture.
13. Try different paper and ink colors!



Try using two colors on the same stamp.

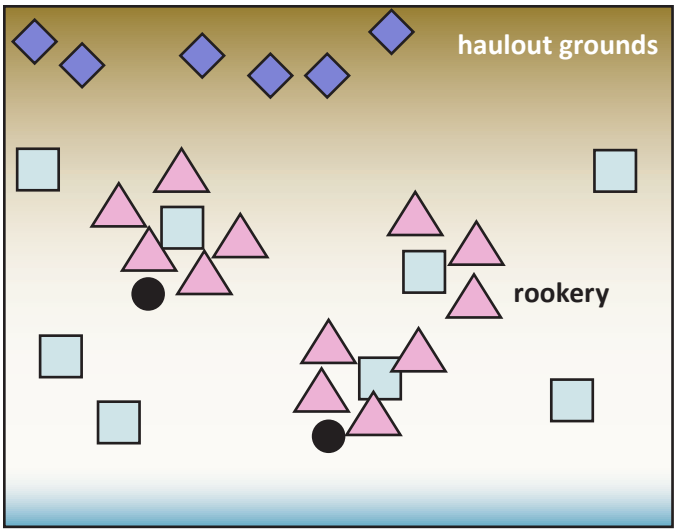
Make a landscape by repeating a scenery stamp.

LAB 3.5 ART TEACHER KEY Create a Rookery



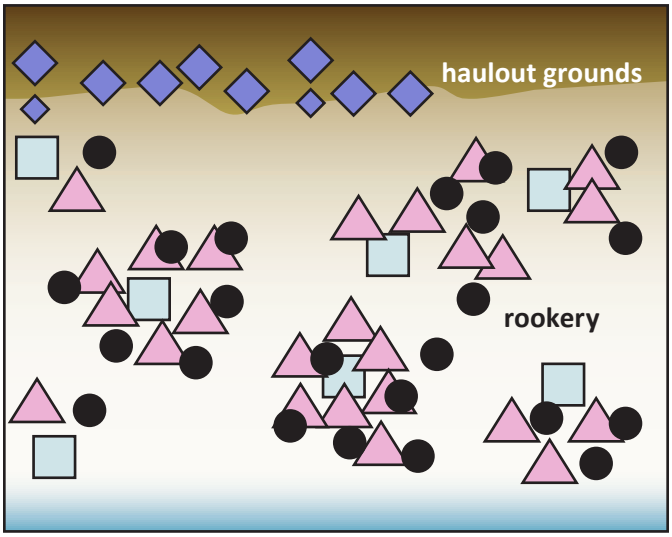
Early to mid-May

- adult males on territories
- males are spaced out (they defend area around them)
- no females on rookery yet
- older juvenile males arrive on haulout grounds



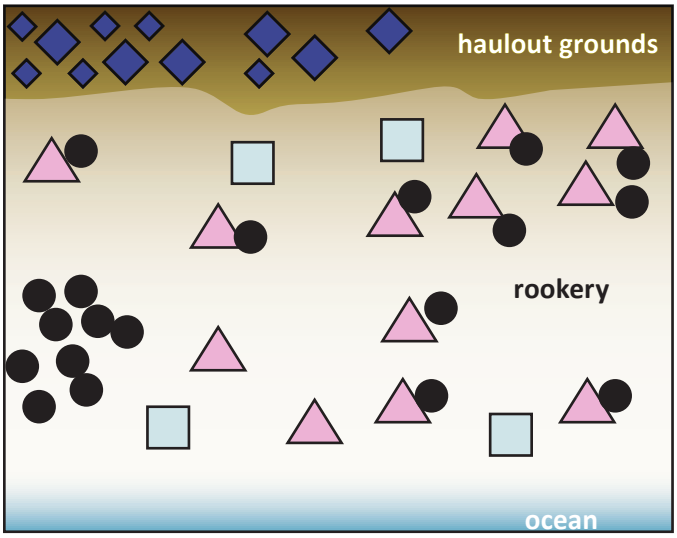
Late-June

- adult females begin to arrive on rookery and have pups within two to three days.
- females gather in territories
- a few males with central territories have most females
- some males only have a few females, over half have none



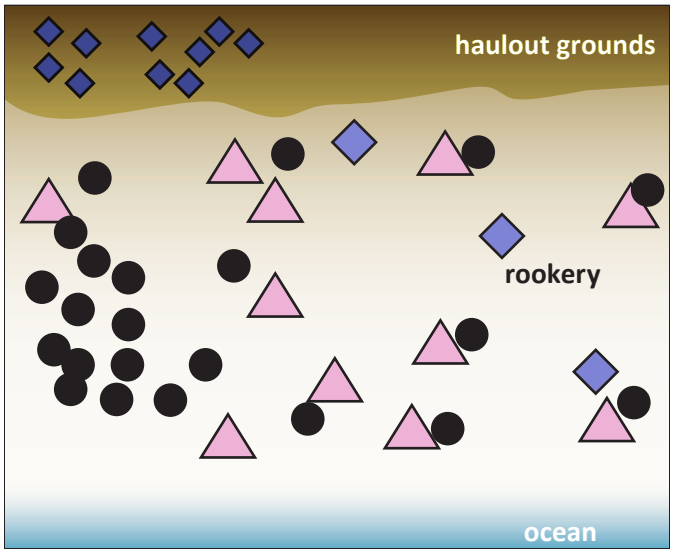
Mid-July

- more adult females arrive on rookery
- females have pups a few days after they arrive on rookery (one pup/female)
- females stay with pups for about a week, then begin to alternate feeding trips at sea with visits ashore to nurse pup
- younger juvenile males arriving on the haulout grounds



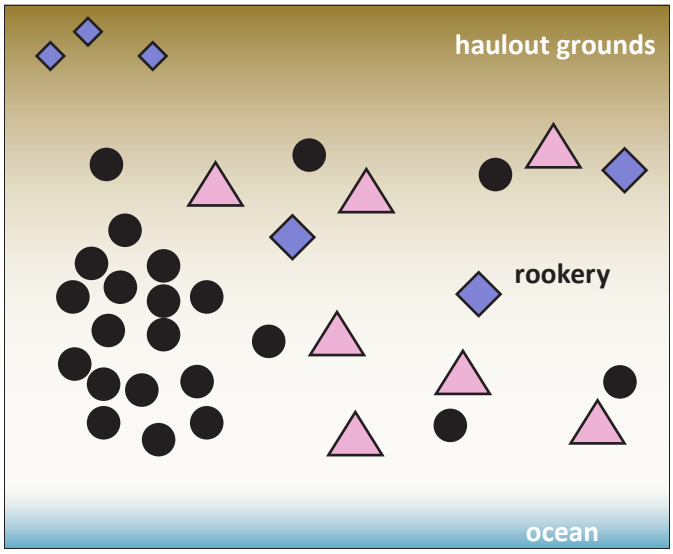
August

- all females are coming and going from rookery; some pups are nursing
- pups whose mothers are feeding at sea gather in "pup wads" (big groups of pups)
- adult males leave rookery in mid to late August
- juvenile males gather in haulout grounds at the edge of the rookery



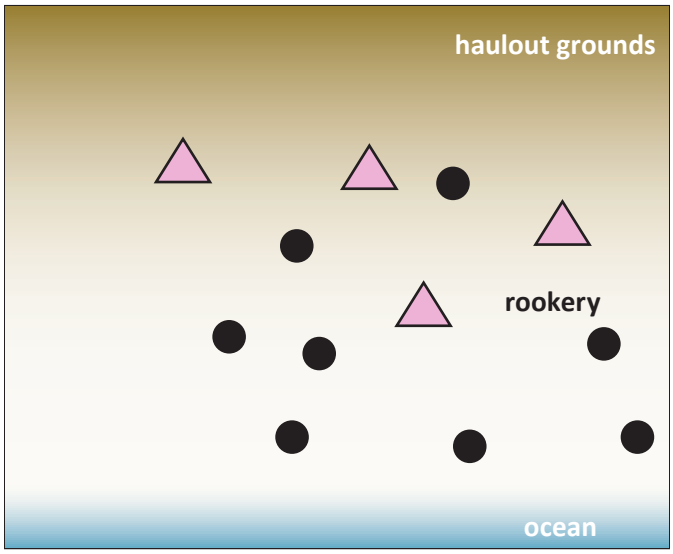
September

- females nursing pups, returning to and leaving the rookery
- pups are in "pup wads"
- younger juveniles are in haulout grounds
- older juvenile males are on the rookery practicing for the next breeding season



Late October

- females without pups begin to leave rookery
- pups are in "pup wads"
- older juvenile males begin to leave the rookery



November–December

- pups are leaving
- females leave rookery after their pup leaves
- juveniles leave rookery

APPENDIX I GLOSSARY

adaptation Any change in the structure or functioning of an organism that makes it better suited to its environment. (Oxford Dictionary of Science)

Aleut Name used by Russian fur traders in the 1700s when referring to people who inhabited the islands now known as the Aleutian Islands.

Antarctic Circle The line of latitude 66.5° south of the equator. Along this line in the southern hemisphere the sun does not set on the day of the summer solstice (usually 21 December) and does not rise on the winter solstice usually 21 June).

archipelago An extensive group of islands.

Arctic Circle The line of latitude 66.5° north of the equator. Along this line in the northern hemisphere the sun does not set on the summer solstice (usually 21 June) and does not rise the winter solstice (usually 21 December).

baleen A fibrous structure made of keratin found in the mouths of filter-feeding whales such as humpback and gray whales. In humans, keratin can be found in fingernails and toenails.

baleen whale A whale with baleen in its mouth instead of teeth. There are 11 species of baleen whales; three examples are blue whale, humpback whale, and gray whale. Also called a mysticete.

blind A shelter used for observing or hunting animals.

blubber A thick layer of fat underneath the skin of marine mammals that provides insulation from the cold and a source of energy when food supplies are low.

breeding philopatry or breeding-site fidelity returning to the same location to breed, year after year.

cetacean A marine mammal of the order Cetacea, which includes whales, dolphins, and porpoises.

chromosome A threadlike strands found in the nucleus of most living cells consisting of a single DNA molecule bonded to proteins and that carries genetic information in the form of genes.

cold-blooded Having a body temperature that is dependent on the surrounding environment. A cold-blooded animal is hot when its environment is hot and cold when its environment is cold.

conservation The act of protecting or preserving natural resources in order to prevent depletion or loss.

countercurrent heat exchange A process that occurs in nature preventing large amounts of heat from being lost to the environment by causing the transfer of heat from warm blood to cool blood reentering the core of the body.

DNA (deoxyribonucleic acid) is the material present in all living organisms that carries all the information about how a living thing will look and function.

eared seal A pinniped of the family Otariidae, which includes sea lions and fur seals. Unique characteristics include an external ear flap and flexible hindflippers that can be rotated forward under the body allowing the animal to walk on all four when on land.

ecosystem A community of living organisms and their environment, and the interactions between the two.

equator The line of latitude that is an equal distance from the North Pole and the South Pole, designated as 0° latitude.

Eskimo A name commonly used in Alaska to refer to Inuit and Yupik people.

eye lens A transparent structure in the eye used to focus light.

feces Bodily waste discharged from animals; also called stool or scat.

fecundity Fecundity is derived from the word fecund which means 'fruitful'. In biology, fecundity refers to fertility or the rate of reproduction of an individual or population.

fissiped Carnivores with toes that are separated from each other. Fissiped is Latin for "split-foot." Weasels (sea otters, mink, badgers), bears (polar, brown, black), dogs and cats are fissipeds.

food chain A food pathway that links different plants and animals within a community or ecosystem. Nutrients and energy are passed from creature to creature through the food chain.

food web A network of food chains in an ecosystem

foraging The act of searching and hunting for food.

gene Genes are made of DNA and are the basic physical unit of heredity.

APPENDIX I GLOSSARY

harbor seal A true seal with spotted coat, commonly found in coastal waters of the northern hemisphere. See true seal definition for characteristics.

haulout Areas on land or ice where pinnipeds (seals, sea lions and walruses) can temporarily leave the water to rest.

hemoglobin The protein in red blood cells that carries oxygen. Similar to myoglobin in muscles.

insulate To prevent the transfer of heat.

Laaqudax̂ Unangam word for northern fur seal.

Laaqudaax̂ Unangam word for northern fur seal pup. Note that the last syllable is longer than the word for northern fur seal.

latitude or line of latitude Imaginary line that runs east to west around the globe parallel to the equator. A latitude line measures the distance north or south of the equator.

locus the location of a gene on a chromosome.

longitude or line of latitude Imaginary line that runs from the North Pole to the South Pole. It measures distances east and west from a base longitude line or prime meridian.

mammal Warm-blooded vertebrate that has hair or fur, gives birth to live offspring, and produces milk to nurse its offspring.

Marine Mammal Protection Act of 1972 An Act to protect marine mammals and their environment, passed by Congress and signed by President Richard Nixon in 1972. Animals protected under this Act include whales, dolphins, seals, sea lions, and walruses.

MMPA: Depletion a population below its optimum sustainable population.

MMAP: Harassment causing a marine mammal to change its behavior in any way.

MMPA: Moratorium a complete ban on taking or importing marine mammal/marine mammal products.

MMPA: Optimum Sustainable Population (OSP) the number of animals that will maintain a healthy population in their ecosystem.

MMPA: Population stock a group of marine mammals of the same species that interbreed.

MMAP: Take the "hunt, harass, capture, or kill" a marine mammal or attempt to do so.

MMPA: Secretary the Secretary of Commerce of the Secretary of the Interior, or both.

midden A mound or deposit containing shells, animal bones and other trash that indicates the presence of humans.

migration The long distance movement of animals on a seasonal basis.

molt To shed old fur and grow new fur.

mortality Death.

myoglobin The protein in muscle that carries oxygen. Similar to hemoglobin in blood.

natal philopatry When an animal returns to the site where it was born, to breed or give birth.

NOAA An abbreviation for the National Oceanic and Atmospheric Administration, a federal government agency in the Department of Commerce, created in 1970. NOAA scientists conduct research on the world's oceans and atmosphere.

northern fur seal A pinniped with ear flaps (an "eared seal"), long front flippers, the ability to walk on all four flippers on land, and with dense underfur. Northern fur seals are found in the North Pacific Ocean, the Bering Sea and the Sea of Okhotsk.

northern fur seal: adult female A female northern fur seal that is old enough to have pups. Usually three years or older.

northern fur seal: adult male A male northern fur seal that is old enough to mate. Usually 7 years or older.

northern fur seal: breeding male An adult male who defends a territory on the rookery containing females. Usually 9 years or older.

northern fur seal: idle male An adult male who may hold a territory on the rookery but does not hold females on the territory.

northern fur seal: juvenile A northern fur seal from December of its birth year until it is old enough to mate.

northern fur seal: pup A northern fur seal from birth to December of its birth year.

odobenid Scientific name for walrus.

otariid (Otariidae) Scientific name for an eared seal such as a northern fur seal or Steller's sea lion.

APPENDIX I GLOSSARY

otolith Otoliths or "earstones" are found in the heads of all fishes except sharks, rays, and lampreys. The otolith of each fish species has a distinctive shape. Scientists use otolith shape to identify the species of fish eaten by seals and sea lions.

pelage Fur, hair, or wool of a mammal.

pelagic Relating to, or living in, the open ocean or seas.

phocid (Phocidae) Scientific name for a true seal such as a harbor seal.

phytoplankton Tiny plants that form the beginning of the food chain for aquatic animals.

pinniped Semi-aquatic marine mammals; pinnipeds leave the water to rest, molt, and reproduce. Pinniped is Latin for "fin-foot." Seals, sea lions and walruses are all pinnipeds.

plankton Tiny plants and animals that live in the water and float with currents. Most plankton can only be seen with a magnifying glass or microscope.

population A group of organisms that live in the same place at the same time.

prey An animal hunted and eaten for food.

Pribilof Islands A group of four volcanic islands in the Bering Sea. The Pribilof Islands are home to the largest population of northern fur seals in the world, as well as large seabird rookeries.

prime meridian A line of longitude defined to be 0°.

pup wad A group of northern fur seal pups on a rookery.

rookery A colony of breeding animals. A rookery can be a nesting place for birds (especially birds that nest in large groups), or breeding grounds for pinnipeds (seals, sea lions and walruses).

satellite tag Scientific instrument used to track the location of an animal in real time. The instrument sends location data through a satellite to a personal computer.

scat Bodily waste discharged from animals; also called stool, feces, or poop.

sea lion A pinniped with external ear flaps, long front flippers, the ability to walk on all four flippers on land, and with no dense underfur. Sea lions and fur seals make up the "eared seal" group of pinnipeds.

seal see definition for true seal

sirenian Manatees and dugongs. Marine mammals found in warm water that only eat seagrass and aquatic vegetation.

site fidelity Returning to the same area each year.

snout The part of an animal's face that projects forward and includes nose, mouth and jaws.

subsistence hunt Harvesting of wildlife by indigenous people for consumption and traditional or cultural requirements.

thermoregulate regulate temperature, especially one's own body temperature

toothed whale A whale with teeth, instead of baleen. Also called odontocete.

topography The physical or natural features of an area.

Tropic of Cancer An imaginary latitude line that lies approximately 23.5° north of the equator. It is the circle of latitude on the earth that marks the most northerly position at which the sun may appear directly overhead.

Tropic of Capricorn An imaginary line that lies approximately 23.5° south of the equator. It marks the most southerly latitude on the earth at which the sun can be directly overhead.

true seal A pinniped of the family Phocidae, which includes harbor seals and spotted seals. Unique characteristics include no external ear flaps and a sleek, streamlined, sausage-shaped body. A true seal cannot walk on all four flippers, but moves on its stomach when on land or ice. Other names include seal, hair seal or phocid seal.

Unangam (adjective) Proper adjective, for example "the Unangam People" or "Unangam culture." http://alaska.si.edu/culture_unangan.asp?continue=1

Unangan (noun) Name the people of the Aleutian and Commander Islands use for themselves. Eastern dialect. http://alaska.si.edu/culture_unangan.asp?continue=1

Unangas Name the people of the Aleutian and Commander Islands use for themselves in the western Aleutian dialect.

vertebra (plural: vertebrae) An individual bone in the backbone or vertebral column. If you run your finger down your backbone, you will feel bumps. Each of these bumps is from one vertebra

APPENDIX I GLOSSARY

vocalizations The sounds that an animal makes fur seals use calls to communicate with other fur seals.
walrus (*Odobenus rosemarus*) A pinniped of the family Odobenidae. Unique characteristics include no external ear flaps, large tusks, thick leathery hide, and hindflippers that rotate forward underneath the body allowing the animal to walk on all fours when on land. Its scientific name translates to "tooth-walking sea horse."
warm-blooded Having a high constant body temperature independent of the surrounding temperature.
zooplankton Animal plankton (tiny animals) that live in the water. Zooplankton are microscopic animals that eat other plankton (both plant and animal plankton).

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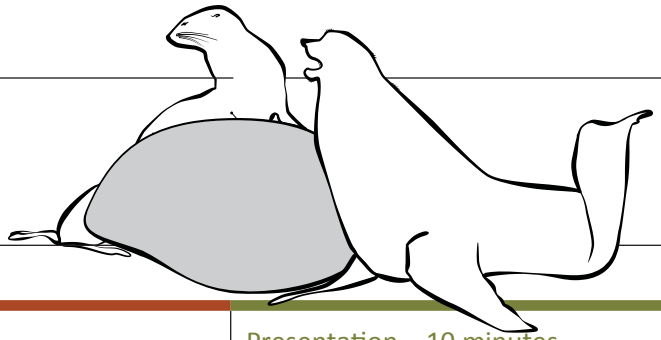
APPENDIX III CURRICULUM OVERVIEW

Lesson	Topic	Components	Grade Level	Time
		Labs vary by grade level allowing educators to select age appropriate activities for their class.		
	Curriculum Pre and Post Assessment		7-12	15 min
1	***What is a fur seal?***	PowerPoint Overview (7 slides) Lab 1.1: Review: Mammals, Marine Mammals, and Pinniped	7-12	30 min
2	***Who are the Unangan?***	PowerPoint Overview (10 slides) Lab 2.1: Where are the Aleutian and Pribilof Islands? (mapping) Lab 2.2: Who are the Unangan? (read and discuss) Lab 2.3: *People of the Seal* (watch and discuss) Lab 2.4: *Aleut Story* (watch and discuss) Lab 2.5: *Aleutian Sparrow*, *The White Seal*, and *Libby* (read and discuss)	7-12 7-12 7-12 7-12 7-12	50 min 50 min 2x50 min 3x50 min 30-50 min
3	***What is a fur seal rookery?***	PowerPoint Overview (13 slides) Lab 3.1: What is a Rookery? (review, assess, worksheet, discussion) Lab 3.2: Fecundity: The Next Generation (hands-on) Lab 3.2: Rookery Timeline (hands-on) Lab 3.4: Paternity and Maternity on the Rookery (hands-on) Lab 3.5: Create a Rookery – Rubber Stamp Making (hands on, art)	7-12 7-12 7-12 9-12 7-12	50 min 50 min 50 min 50 min 2x50 min
4	***What do fur seals eat?***	PowerPoint Overview (8 slides) Lab 4.1: Bering Sea Food Web (hands on) Lab 4.2: Microworlds: What do Marine Mammals Eat? (video) Lab 4.3: Scat Detective (hands on) Lab 4.4: Scat Detective and Frequency of Occurrence (hands on) Lab 4.5: Advanced Scat Detective (graphing and data analysis	7-12 7-12 7-8 9-12 9-12	50 min 30 min 50 min 50 min 50 min
5	***How do fur seals dive?***	PowerPoint Overview (10 slides) Lab 5.1: Blubber vs. Air (hands-on) Lab 5.2: Thermoregulation: Countercurrent Heat Exchange (hands-on) Lab 5.3: Waiting to Inhale! (hands-on) Lab 5.4: Interpreting Fur Seal Dive Data (data analysis)	7-12 9-12 7-12 9-12	30 min 50 min 50 min 50 min
6	***Where do fur seals go in the winter?***	PowerPoint Overview (10 slides) Lab 6.1: Where are Fur Seal Rookeries? (mapping) Lab 6.2: *Fur Seal Migrations* (video) Lab 6.3: Fur Seal Migrations (mapping)	7-12 7-12 7-12	30 min 30 min 50 min
7	***Populations, Harvest, Management***s	PowerPoint Overview (13 slides) Lab 7.1: Estimating a Population (math) Lab 7.2: Mark-Recapture: How Many Pups? (math) Lab 7.3: Analyzing Pup Population Data: 1961-2016 (math) Lab 7.4: Compare Historical Timelines (history, writing, discussion) Lab 7.5: Interpret Historical Images (history, writing, discussion) Lab 7.6: Analyzing Fur Seal Harvest Data: 1817-2016 (math)	7-12 7-12 9-12 7-12 7-12 9-12	50 min 50 min 50 min 50 min 50 min 50 min
8	***Marine Mammal Protection Act***	PowerPoint Overview (22 slides) Lab 8.1 Marine Mammal Protection Act Summary (research, writing, interpretation) Lab 8.2 MMPA: Unintended Consequences of a Law (research, writing, interpretation) Lab 8.3 MMPA Case Study: Gray Whales (research, writing, interpretation) Lab 8.4 MMPA Case Study: Northern Fur Seals (research, writing, interpretation) Lab 8.5 MMPA Comparative Analysis: Makah/Pribilof Islanders (research, writing, interpretation)	9-12 9-12 9-12 9-12 9-12	50 min 50 min 50 min 50 min 50 min

APPENDIX IV LESSON OVERVIEWS

LESSON ONE

What is a fur seal?



Subject Area(s): Life Science	**Grade Levels:** 7-12	Presentation – 10 minutes Labs – variable

Lesson Topics:	Review characteristics of mammals, marine mammals, and pinnipeds.	**Focus Questions**	• What is a mammal? • What is a marine mammal? • What is a pinniped?
Learning Objectives:	Students will: • review the characteristics of mammals, marine mammals, and pinnipeds.	**Key words:**	mammal, pinniped, true seal, eared seal, walrus, phocid, otariid, odobenid, northern fur seal, harbor seal, sea lion, pelage

LABS		ALASKA STANDARDS		
		Science	Minutes	Grades
Lab 1.1	Review Mammals, Marine Mammals, and Pinnipeds (worksheets)	SC2	30	7-12

Targeted Alaska Grade Level Expectations (GLEs)

Science

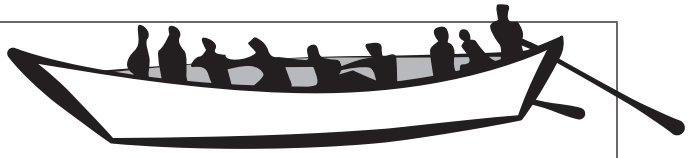
Concepts of Life Science

SC2 Students develop an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms.

APPENDIX IV LESSON OVERVIEWS

LESSON TWO

Who Are The Unangan?



Subject Area(s): Life science, history, cultural	**Grade Levels:** 7-12	Presentation – 15 minutes Labs – variable

Lesson Topics:	Geography, Unangam culture and history, Unangan relationship to northern fur seals	**Focus Questions**	• Where are the Aleutian and Pribilof Islands? • Who are the Unangan? • How have historical events affected Unangam history?
Learning Objectives:	Students will: • investigate the geography of the Aleutian and Pribilof Islands • interpret the Unangam culture through film and literature	**Key words:**	Unangan (noun), Unangam (adjective), Aleutian Islands, Pribilof Islands, culture, history, internment

LABS		ALASKA STANDARDS			
		Science	History	Minutes	Grades
Lab 2.1	Where are the Aleutian Islands and the Pribilof Islands? (mapping)	SF1-3	PPE1	50	7–12
Lab 2.2	Who Are the Unangan? (read and discuss)		IGCP2	50	7–12
Lab 2.3	*People of the Seal* (watch and discuss)		ICGP2,9, CC1-4	2x50	7-12
Lab 2.4	*Aleut Story* (watch and discuss)		ICGP2,5,9, CC1-4	3x50	7-12
Lab 2.5	*Aleutian Sparrow, The White Seal, Libby* (read and discuss)		ICGP2,5,9, CC1-4	30-50	7-12

Targeted Alaska Grade Level Expectations (GLEs)

Cultural, Social, Personal Perspectives, and Science

SF1 Students develop an understanding of the interrelationships among individuals, cultures, societies, science, and technology.

SF2 Students develop an understanding that some individuals, cultures, and societies use other beliefs and methods in addition to scientific methods to describe and understand the world.

SF3 Students develop an understanding of the importance of recording and validating cultural knowledge.

American History-People, Places, Environment (PPE)

The student demonstrates an understanding of the interaction between people and their physical environment by:

PPE 1 comparing and contrasting geographic regions of Alaska.

Individual, Citizenship, Governance, Power (ICGP)

The student demonstrates an understanding of the historical rights and responsibilities of Alaskans by:

ICGP 2 using texts/sources to analyze the impacts of the relationships between Alaska Natives and Russians (i.e., Russian Orthodox Church, early fur traders, Russian American Companies, enslavement, and Creoles).

ICGP 5 explaining the impacts of military actions relative to Native communities (e.g., Naval bombardment of Angoon, Aleut internment, military expeditions.)

ICGP 9 exploring the federal government's influence on settlements in Alaska (e.g., Matanuska Colony, Anchorage, Adak, Tok, Hydaburg) by establishment of post offices, military facilities, schools, courts, and railroads.

Continuity and Change (CC)

The student demonstrates an understanding of the chronology of Alaska history by:

CC 1 using texts/sources to recognize and explain the interrelationships among Alaska, national, and international events and developments (e.g., international interest, trade, commerce).

CC 2 describing how policies and practices of non-natives (e.g., missionaries, miners, Alaska Commercial Company merchants) influenced Alaska Natives.

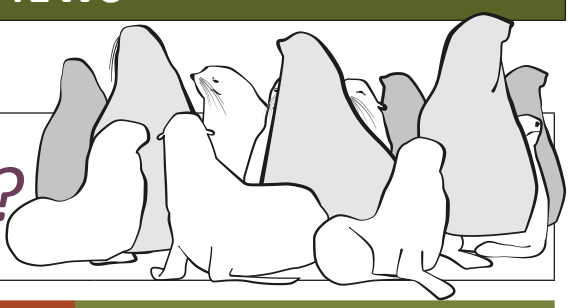
CC 3 describing how the roles and responsibilities in Alaska Native societies have been continuously influenced by changes in technology, economic practices, and social interactions.

CC 4 giving correct and incorrect examples to explain subsistence as a way of life.

APPENDIX IV LESSON OVERVIEWS

LESSON THREE

What is a fur seal rookery?



Subject Area(s): Life science, genetics, reading	**Grade Levels:** 7-12	Presentation – 15 minutes Labs – variable

Lesson Topics:	Fur seal rookery structure, location, and seasonal changes
Learning Objectives:	Students will: • describe the seasonal structure of a fur seal rookery • investigate fecundity • examine genetic relationships • summarize their knowledge with art

Focus Questions	• What is a fur seal rookery? • What information can scientist gather from a rookery? • How does the structure of the fur seal population change on the rookery?
Key words:	rookery, haulout, fecundity, paternity, maternity, seasonal, age class, genetics

LABS		ALASKA STANDARDS		
		Science	Minutes	Grades
Lab 3.1	What is a Rookery? (review, worksheet, discussion)	SC2	30	7–12
Lab 3.2	Fecundity: The Next Generation (worksheet, hands-on)	SC2	50	7-12
Lab 3.3	Rookery Timeline (hands-on)	SC2	50	7–12
Lab 3.4	Paternity and Maternity on the Rookery (worksheet)	SC2	50	9–12
Lab 3.5	Create a Rookery – Rubber Stamp Making (hands-on, art)	SC2	2x50	7-12

Targeted Alaska Grade Level Expectations (GLEs)

Science

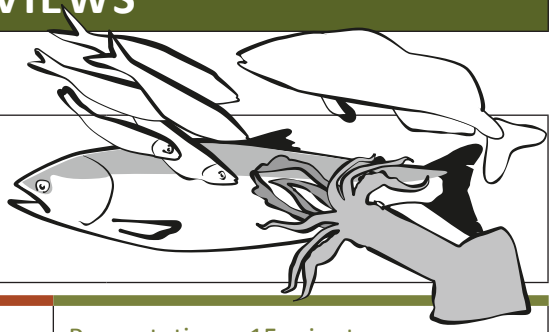
Concepts of Life Science

SC2 Students develop an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms.

APPENDIX IV LESSON OVERVIEWS

LESSON FOUR

What do fur seals eat?



Subject Area(s): Life science	**Grade Levels:** 7-12	Presentation – 15 minutes Labs – variable

Lesson Topics:	Food chain, food web, scat analysis, food habits/diet	**Focus Questions**	• How do scientists study the fur seal's diet? • What is learned from studying food habits? • Why do scientists study food habits?
Learning Objectives:	Student will: • create a Bering Sea food web • analyze scat contents • graph and analyze scat contents	**Key words:**	diet, prey, ecosystem, scat, food habits, forage, food web, frequency of occurrence

LABS		ALASKA STANDARDS					
		Math 7	Math 8	MATH 9-12	Science	Minutes	Grades
Lab 4.1	Bering Sea Food Web (hands on)				SC2,3	30	7-12
Lab 4.2	Microworlds: What do Marine Mammals Eat? (video)				SC2,3	30	7–12
Lab 4.3*	Scat Detective (hands on)	7.SP1-4	8.SP1	S-ID, S-IC	SA1,2, SC 2,3 SE1,2, SG2	50	7-8
Lab 4.4*	Scat Detective and Frequency of Occurrence (hands on)	7.SP1-4	8.SP1	S-ID, S-IC	SA1,2, SC 2,3 SE1,2, SG2	50	9-12
Lab 4.5*	Advanced Scat Detective (graphing and data analysis)	7.SP1-4	8.SP1	S-ID, S-IC	SA1,2, SC 2,3 SE1,2, SG2	50	9–12

Targeted Alaska Grade Level Expectations (GLEs)

Math

MD Measurement and Data

SP Statistics and Probability

Science

Science as Inquiry and Process

SA1 Students develop an understanding of the processes of science used to investigate problems, design and conduct repeatable scientific investigations, and defend scientific arguments.

SA2 Students develop an understanding that the processes of science require integrity, logical reasoning, skepticism, openness, communication, and peer review.

Concepts of Life Science

SC2 Students develop an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms.

SC3 Students develop an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy.

Science and Technology

SE1 Students develop an understanding of how scientific knowledge and technology are used in making decisions about issues, innovations, and responses to problems and everyday events.

SE2 Students develop an understanding that solving problems involves different ways of thinking, perspectives, and curiosity that lead to the exploration of multiple paths that are analyzed using scientific, technological, and social merits.

History and Nature of Science

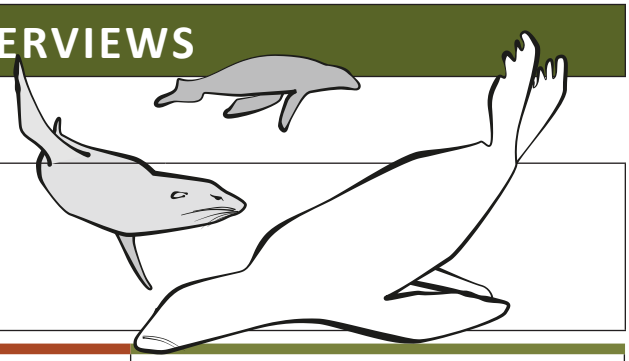
SG2 Students develop an understanding that the advancement of scientific knowledge embraces innovation and requires empirical evidence, repeatable investigations, logical arguments, and critical review in striving for the best possible explanations of the natural world.

*Labs 4.3, 4.4, and 4.5 involve investigating the diets of northern fur seals through scat analysis.
*Lab 4.3 is the most basic and involves plotting the frequency of items found in scats prepared by the instructor.
*Lab 4.4 takes the process one step further by calculating the Frequency of Occurrence of prey items found in scats created by the instructor. The data provided for this lab are very similar to real data collected in the field.
*Lab 4.5 uses a set of actual data collected from the Pribilof Islands for the students to manipulate, graph, and analyze.

APPENDIX IV LESSON OVERVIEWS

LESSON FIVE

How do fur seals dive?



Subject Area(s): Life science	**Grade Levels:** 7-12	Presentation – 15 minutes Labs– variable

Lab Topics:	Fur seal diving and adaptations to cold environments.	**Focus Questions**	• How are pinnipeds adapted to the cold water? • Why do fur seals dive? • What can be learned from studying diving behavior?
Learning Objectives:	Students will: • investigate adaptations of seals to water • collect and summarize data • interpret fur seal dive data	**Key words:**	blubber, body shape, forage, adpatation, counter-current heat exchange, thermoregulation

LABS		ALASKA STANDARDS					
		Math 7	Math 8	Math 9-12	Science	Minutes	Grades
Lab 5.1	How do Marine Mammals Stay Warm? Blubber vs. Air (hands-on)	7.SP.1-4	8.SP.1-4		SA1,2 SC1,2	30	7–12
Lab 5.2	Thermoregulation: Counter Current Heat Exchange (hands-on)	7.SP.1-4	8.SP.1-4		SA1,2 SC1,2 SG2	50	9-12
Lab 5.3	Waiting to Inhale! (hands-on)	7.SP.1-4	8.SP.1-4		SA1,2 SC1,2 SG2	50	7–12
Lab 5.4	Interpreting fur seal dive data (data analysis)	7.SP.1-4	8.SP.1-4	S-IC.	SA1,2 SC1,2 SG2	50	9-12

Targeted Alaska Grade Level Expectations (GLEs)

Math

MD Measurement and Data

SP Statistics and Probability

Statistics: IC.1

Science

Science as Inquiry and Process

SA1; SA2

Concepts of Life Science

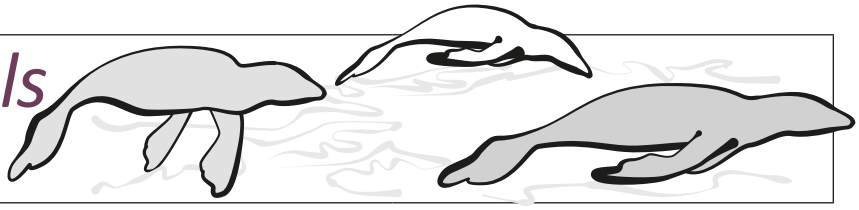
SC2

History and Nature of Science

SG2

LESSON SIX

Where do fur seals go in the winter?



Subject Area(s): Life science, geography, reading	**Grade Levels:** 7-12	Presentation – 15 minutes Labs– variable

Lab Topics:	Fur seal migration, traditional knowledge of migration, and current research.	**Focus Questions**	• Why do fur seals leave the rookery? • Where do they go? • How do we know? • Why do we want to know where they go?
Learning Objectives:	Students will: • describe where northern fur seals go in the winter • plot fur seal migration tracks on a map • describe three methods scientists use to track fur seal migration routes.	**Key words:**	migrate, satellite tags, tracking instruments, latitude, longitude

LABS		ALASKA STANDARDS		
		Science	Minutes	Grades
Lab 6.1	Where are Fur Seal Rookeries? (mapping)	SA3; SC2,3; SF1,2,3	30	7-12
Lab 6.2	*Fur Seal Migrations* (video, discussion)	SA3; SC2; SF1,2,3	30	7–12
Lab 6.3	Fur Seal Migrations (mapping).	SA3; SC2,3; SF1,2,3; SG1,3,4.	50	7–12

Targeted Alaska Grade Level Expectations (GLEs)

Science

Science as Inquiry and Process
SA3

Concepts of Life Science
SC2; SC3

Cultural, Social, Personal Perspectives, and Science
SF1; SF2; SF3

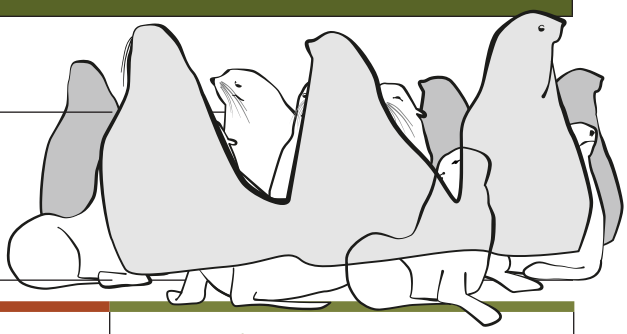
History

History and Nature of Science
SG1; SG3; SG4

APPENDIX IV LESSON OVERVIEWS

LESSON SEVEN

Populations, Harvest, and Management



Subject Area(s): Life science	Grade Levels: 7-12	Presentation – 20 minutes Labs – variable

Lab Topics:	Population estimation, harvest, and management, historical timelines
Learning Objectives:	Students will: • estimate populations • interpret historical events • analyze harvest and population data.

Focus Questions	• How do scientists estimate fur seal populations? • What are the relationships between Pribilof Island historical events, fur seal population, and world history?
Key words:	population estimation, population, harvest, stakeholder, rate of decline

LABS		ALASKA STANDARDS						
		Math 7	Math 8	Math 7-12	Science	History	Minutes	Grades
Lab 7.1	Estimating a Population (math)	7.RP.1-3 7.SP1-2	8.SP.1	S-ID,S-IC A-CED.2	SA3,SE1,2 SF1,SG1-4		50	7-12
Lab 7.2	Mark-Recapture: How many pups? (math)	7.RP.1-3 7.SP1-2	8.SP.1	S-ID,S-IC A-CED.2			50	7-12
Lab 7.3	Analyze Pup Population Data: 1961-2016 (math)	7.RP.1-3 7.SP1-2	8.SP.1	A-CED.2 S-ID,S-IC			50	9-12
Lab 7.4	Compare Historical Timelines (history, writing, discussion)					PPE2,5,7 IGCP2,5,8,8 CC1-4,7	50	7-12
Lab 7.5	Interpret Historical Images (history, writing, discussion)					PPE2,5,7 IGCP2,5,8,8 CC1-4,7	50	7-12
Lab 7.6	Analyze Fur Seal Harvest Data: 1817-2016 (math)	7.RP.1-3 7.SP1-2	8.SP.1	A-CED.2 S-ID,S-IC	SA3,SE1,2 SF1,SG1-4		20	9-12

Targeted Alaska Grade Level Expectations (GLEs)

Math

RP Ratios and Proportional Relationships

SP Statistics and Probability

A-CED Algebra-Creating Equations that Describe

S-IC Statistics-Inferences and Conclusions

S-ID Statistics-Interpreting Data

Science

Science as Inquiry and Process

SA3

Science and Technology

SE1; SE2

Cultural, Social, Personal Perspectives, and Science

SF1

History and Nature of Science

SG1; SG2; SG3; SG4

History

People, Places, and Environment

PPE2,5,7

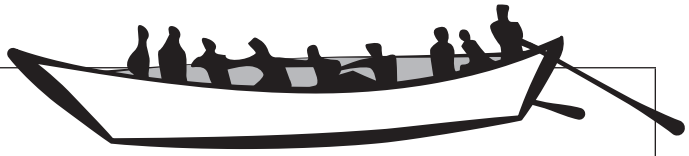
Consumption, Production, Distribution

CC1-4,7

Individual, Citizenshp, Governance, Power

IGCP2,5,8,8

LESSON EIGHT



Marine Mammal Protection Act

Subject Area(s): Life science, history, cultural	**Grade Levels:** 7-12	Presentation – 20 minutes Labs – variable

Lab Topics:	Marine Mammal ProtectionAct. subsistence hunting, treaty rights	**Focus Questions**	• What is the Marine Mammal Protection Act? • What were the unintended consequences of the MMPA? • How were the Makah and the Pribilof Islanders affected by the MMPA?
Learning Objectives:	Students will: • summarize the Marine Mammal Protection Act • compare and contrast the rights of Native American tribes in states other than Alaska and Alaska Natives.	**Key words:**	Marine Mammal Protection Act, permit, waiver, treaty, subsistence

LABS		ALASKA STANDARDS			
		Science	History	Minutes	Grades
Lab 8.1	Marine Mammal Protection Act, Summary (research, writing, interpretation)		CC1-4,7	50	9–12
Lab 8.2	MMPA: Unintended Consequences (research, writing, interpretation)		CC1-4,7	50	9–12
Lab 8.3	MMPA Case Study: Gray Whales (research, writing, interpretation)		CC1-4,7	50	9–12
Lab 8.4	MMPA Case Study Northern Fur Seals (research, writing, interpretation)		CC1-4,7	50	9-12
Lab 8.5	MMPA Comparative Analysis: Makah and Pribilof Islanders (research, writing, interpretation)		CC1-4,7	50	9-12

Targeted Alaska Grade Level Expectations (GLEs)

American History

Individual, Citizenship, Governance, Power Continuity and Change (CC)

The student demonstrates an understanding of the chronology of Alaska history by:

CC 1; **CC 2**; **CC 3**; **CC 4**; **CC 7**

APPENDIX V CURRICULUM PRE/POST ASSESSMENTS

Lesson	Student Name: _____ Date: _____
1	Name four characteristics of a mammal. List up to four mammals.
1	How is a marine mammal different from a mammal? List up to four marine mammals. (Hint: A penguin is not a marine mammal.)
3	What is a rookery? Name two animals that use rookeries.
4	Describe an ocean food web. Where do northern fur seals fit into the ocean food web?
5	What is blubber? Why do some animals need it?
6	Where are northern fur seal rookeries? Where do northern fur seals go when they are at sea?
7	How do scientists estimate the population of northern fur seals?
2	Who are the Unangan?
8	What is the Marine Mammal Protection Act?

APPENDIX V TEACHER KEY: CURRICULUM PRE/POST-ASSESSMENT

Lesson	Student Name: _____ Date: _____
1	Name four characteristics of a mammal. List up to four mammals. hair or fur — gives birth to live young — mouse, dog, cat, mammary glands/nurses young — warm blooded/endothermic — human, seal, whale
1	How is a marine mammal different from a mammal? List up to four marine mammals. (Hint: A penguin is not a marine mammal.) A marine mammal lives in or depend on the ocean. fur seal, harbor seal, walrus, sea lion, elephant seal, orca, blue whale, humpback whale, manatee... (many more)
3	What is a rookery? Name two animals that use rookeries. A rookery is a colony of breeding animals. A specific area where animals gather each year to mate and raise their young. Answers will vary. E.g., northern fur seal, Steller sea lions, Puffins, Kittiwakes, and many other birds
4	Describe an ocean food web. Where do northern fur seals fit into the ocean food web? Sun - Phytoplankton - Zooplankton - Forage Fish - Fish - Marine Mammals - Humans
5	What is blubber? Why do some animals need it? Blubber is a thick layer of fat underneath the skin of marine mammals. Blubber provides insulation from the cold and is a source of energy when food supplies are low.
6	Where are northern fur seal rookeries? Where do northern fur seals go when they are at sea? > 80% of northern fur seals come to land in the Bering Sea (Pribilof Islands, Commander Islands, Bogoslof Island) a small number come to land on San Miguel Island At sea they travel south from the Bering Sea to the coast of the U.S. and then back north to the Bering Sea again.
7	How do scientists estimate the population of northern fur seals? Mark recapture
2	Who are the Unangan? The people who live in the Aleutian, Pribilof, and Commander Islands.
8	What is the Marine Mammal Protection Act? A law that protects marine mammals from being killed or harassed.