

# SEA HABITATS



# SYSTEMS AND SYSTEM MODELS

5th Grade Fieldtrip Guide



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# INSTRUCTOR NOTES



## Standards Alignment

Thank you for your interest in the field trip opportunities offered at Six Flags Discovery Kingdom! We believe nurturing an understanding, empathy, and appreciation of wildlife is imperative, and our field trips and outreach programs are an excellent way to inspire these values.

We'd like to share some information about Six Flags Discovery Kingdom. Six Flags is a place where the welfare of our animals is our overarching priority. Our animals are our family members and they are given an abundance of compassion and love. Many of our animals live at Six Flags because they were unwanted by others, they were rescued and/or they needed to find a new home because they were displaced from their original homes. In addition, many of our animal family members are special needs and/or geriatric that require enhanced and specialized care. Our animals have a full time veterinary staff providing this expert care.

We are a professionally accredited animal refuge. That means we maintain and exceed complex and individualized standards of care and welfare that are mandated by several accrediting bodies. We are also strictly regulated by the State of California and by the federal government, under the USDA and APHIS, and we work in partnership with them to ensure legal and ethical standards are maintained and exceeded.

Seeing animals up-close and providing opportunities to interact or see them in person creates memorable experiences for our guests. Unfortunately, wildlife populations are decreasing rapidly due to human encroachment, illegal poaching, overfishing, and pollution. Our message of saving animals and conservation awareness has never been more important. Six Flags field trips and outreach programs encourage students to become advocates by sharing what they have learned from their experiences with us. They learn practical ways to conserve and protect wildlife so they can inspire others.

### DISCIPLINARY CORE IDEAS

#### LS1.C: Organization for Matter and Energy Flow in Organisms

Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion.

#### LS2.A: Interdependent Relationships in Ecosystems

The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.

#### ESS3.C: Human Impacts on Earth Systems

Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.

### SCIENCE AND ENGINEERING PRACTICES

- Developing & Using Models
- Asking Questions and Developing Models
- Using Mathematical & Computational Thinking
- Obtaining, Evaluating & Communicating Information

### CROSCUTTING CONCEPTS

- Patterns
- Cause & Effect
- Structure & Function

# THE ELASMOBRANCHII HABITATS



## Background Information on Shark Species

### Sandbar Shark Information:

- Size: Usually about 6 feet long and weigh anywhere from 100-200 pounds.
- Color: Sandbars are counter shaded as a form of camouflage. They are usually a gray-brown on the top and white underneath.
- Diet: They are opportunistic feeders that usually eat bony fish, cephalopods, crabs and shrimps. Our Sandbars each get fed 4 pounds of Mackerel, Herring, and squid.
- Range: They are found mainly in the Atlantic Ocean from Cape Cod the Caribbean on the West and from Portugal to Africa on the East.
- Habitat: They are usually found in waters between 60-200 feet deep. During migrations, they have been found in deeper water. They can often be found in bays, estuaries and harbors. They avoid coral reefs and rougher terrain.
- Conservation Status: Endangered on the IUCN Red List.

### Nurse Shark Information

- Size: Nurse Sharks can grow to anywhere between 7-9 feet long and weigh between 150-300 pounds.
- Color: They can be brown, grey, black, white, and a purple maroon color.
- Diet: Their mouths are designed to crush hard shells. They eat small fish, shellfish, shrimp and squid. They also have been observed eating coral and algae. Our Nurse sharks get fed about 2 pounds of Mackerel three times a week.
- Range: They can be found all over the East Pacific Ocean and the West Atlantic Ocean.
- Habitat: They like warm shallow water and can generally be found close to human activity.
- Conservation Status: Vulnerable on the IUCN Red List.
- Fun Fact: Often called the couch potatoes of the sea.

### Australian Zebra Shark Information

- Size: They can grow up to around 6-8 feet long. Male and females are the same size.
- Color: They have a dark spotted pattern on a pale background.
- Diet: They eat mollusks, crustaceans, and small bony fish. Our Zebra Sharks get fed 2 pounds of Mackerel every other day.
- Range: They can be found in tropical waters in the indo-pacific region. They are found from South Africa to Australia.
- Habitat: They are bottom-dwelling animals that can be found in coral reefs, rubble, and sandy areas.
- Conservation Status: Endangered on the IUCN Red List

## Meet Our Sharks

The exhibit is split into three areas which are Deep Reef, Round Tank, and Blue Hole. All three equal 300,000 gallons of human made salt water. It is kept at around 78-80 degrees Fahrenheit.

### Deep Reef

Our Sandbar Sharks- these look like a stereotypical shark and are constantly swimming.

- Josh- biggest Sandbar Shark; wide snout;
- Pepe- smaller of the two, has a smaller snout

Our Australian Zebra Sharks- Tan sharks with spots

- Maggie- prominent dark stripe going down the middle of her back
- Skippy- smaller than Maggie

Our Southern Stingray-

- Frog- smaller; she has a lot of white speckles on her wingtips;

Our Nurse Sharks- these are the largest sharks in the exhibit. Often found lying on the ground.

- Polka- is missing some of her right pectoral fin due to mating; maroon color
- Willow- smallest nurse shark; light tan in color
- Tiny- darkest in color; 2nd largest nurse shark
- Wilbur-biggest nurse shark; has one clasper; dark maroon color
- Rodeo- lightest in color;
- Elvis- has one clasper; left back fin has a white speckle on it

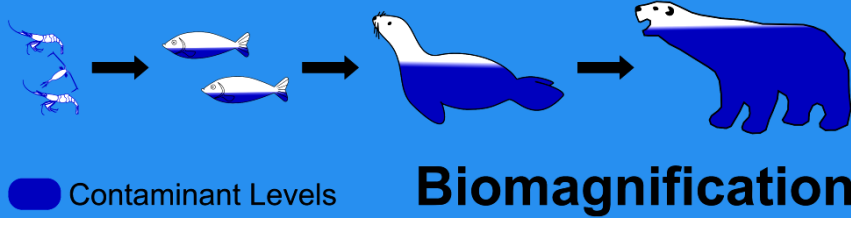
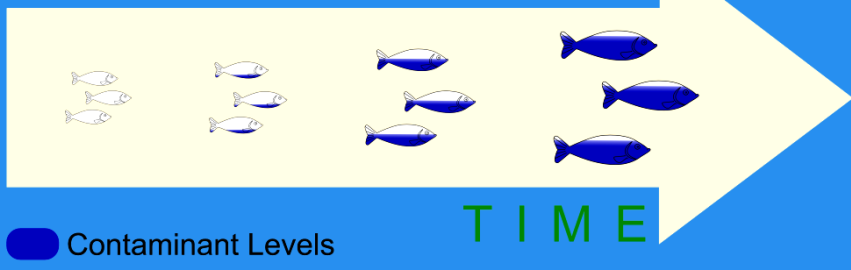
### Round Tank

- Quarantine area- Newly aquired animals are monitored for a period of time in this space. This is to ensure they are healthy and adjusting well before being moved to their final home.

### Blue Hole

- Goose- Laced Moray Eel
- Mary Kay- Triggerfish; changes her color based on her mood
- Bamboo Sharks- Spotty, Fancy and Jean; Jean has no eyes.

# Bioaccumulation



## Before Your Visit...



Look at the diagram above. Use the image in the graphic to create a definition for the words biomagnification and bioaccumulation. (ESS3.C)

Handwriting practice lines consisting of two vertical red lines and several horizontal blue lines.

## After your visit...



Revise your definitions if needed. How do microplastics affect marine ecosystems, and what can you do to help stabilize these complex food webs? (ESS3.C)

Handwriting practice lines consisting of two vertical red lines and several horizontal blue lines.



# SEA LION STADIUM

## Background Information on Pinniped Species

Seals	Sea Lions
Ear holes (no external ear flaps)	External Ear Flaps
Nails on each digit of front and hind flippers	Nails on hind flippers only
Short front flippers; used for steering	Long front flippers for propelling
Uses front flippers and abdominal muscles to crawl on land	Can rotate hind flippers under body to walk on land

- Feed on more than 50 species of fish and cephalopods, but primarily on small schooling fish, squid, and octopuses. At SFDK, diet consists of a variety of restaurant quality sustainable seafood.
- Blubber keeps harbor seals warm, in addition to helping with streamlining and serving as an energy reserve
- Vibrissae, specialized whiskers with nerve endings, are used to sense and feel
- Have large eyes with a light reflecting tissue layer (tapetum lucidum) to maximize sight in low light conditions under water
- Sea Lions can swim up to 25 mph and dive to a maximum of 900 ft. They can hold their breath up to 20 minutes  
Harbor seals can swim up to 12 mph and dive to a maximum of 500 ft, holding their breath up to 30 min.

## Meet Our Pinnipeds California Sea Lions:

### Chief

Birthday: 6/12/2016

Born at Six Flags Discovery Kingdom.

Only male Sea Lion, so he is much larger than the others

### Meesh

Birthday: 6/12/15

Born at Six Flags Discovery Kingdom

Slender and a bit darker than Pebbles and Lulu

Sister to Pebbles and Chief

### Lulu

Birthday: Unknown estimated 6/2013

Rescued from a Unusual Mortality Event; Mother to Minnow

### Pebbles

Birthday: 6/9/2014

Born at Six Flags Discovery Kingdom.

Missing a tooth. Lighter in color than Lulu and Meesh

Sister to Meesh and Chief

### Minnow

Birthday: 6/16/2018

Born at Six Flags Discovery Kingdom.

Smaller than the other Sea Lions; Daughter to Lulu

### Harbor Seals:

#### Lily

Birthday: 4/19/2014

Born at Six Flags Discovery Kingdom

Biggest Harbor Seal, lightest in coloration

#### Pip

Birthday: 3/10/2015

Born at Six Flags Discovery Kingdom

Pip was born without a tail.

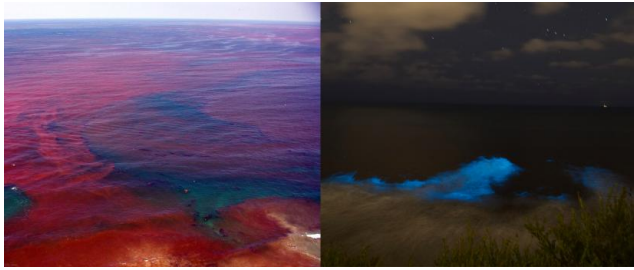
#### Luna

Birthday: 4/25/2016

Born at Six Flags Discovery Kingdom

# Toxic Red Tide Kills 'Uncountable' Numbers of Fish in the Bay Area

A harmful algal bloom in the San Francisco Bay is killing fish, sharks and stingrays. Some are washing ashore.



## Before Your Visit...

This New York Time's article from August of 2022 describes an algal bloom that led to a huge number of deaths in aquatic organisms. Algal blooms are unfortunately becoming more and more common. The images below represent the sequence of events that lead to an algal bloom. However, the sequence is out of order. Cut out the images and arrange them on the diagram on the next page to describe how an algal bloom forms and harms marine ecosystems. (ESS3.C and LS2.A)

Fertilizer run off ( $\text{NO}_3^-$  and  $\text{PO}_4^{3-}$ ) aquatic systems

Dead plants and dead algae become food for bacteria. Bacteria proliferate

All non bacterial life in the aquatic system dies, creating a dead zone

Bacteria decompose dead matter and consume dissolved oxygen. Little photosynthesis and increased bacterial activity cause aquatic anoxia.

Nutrients cause algae growth

Algae growth blocks sunlight

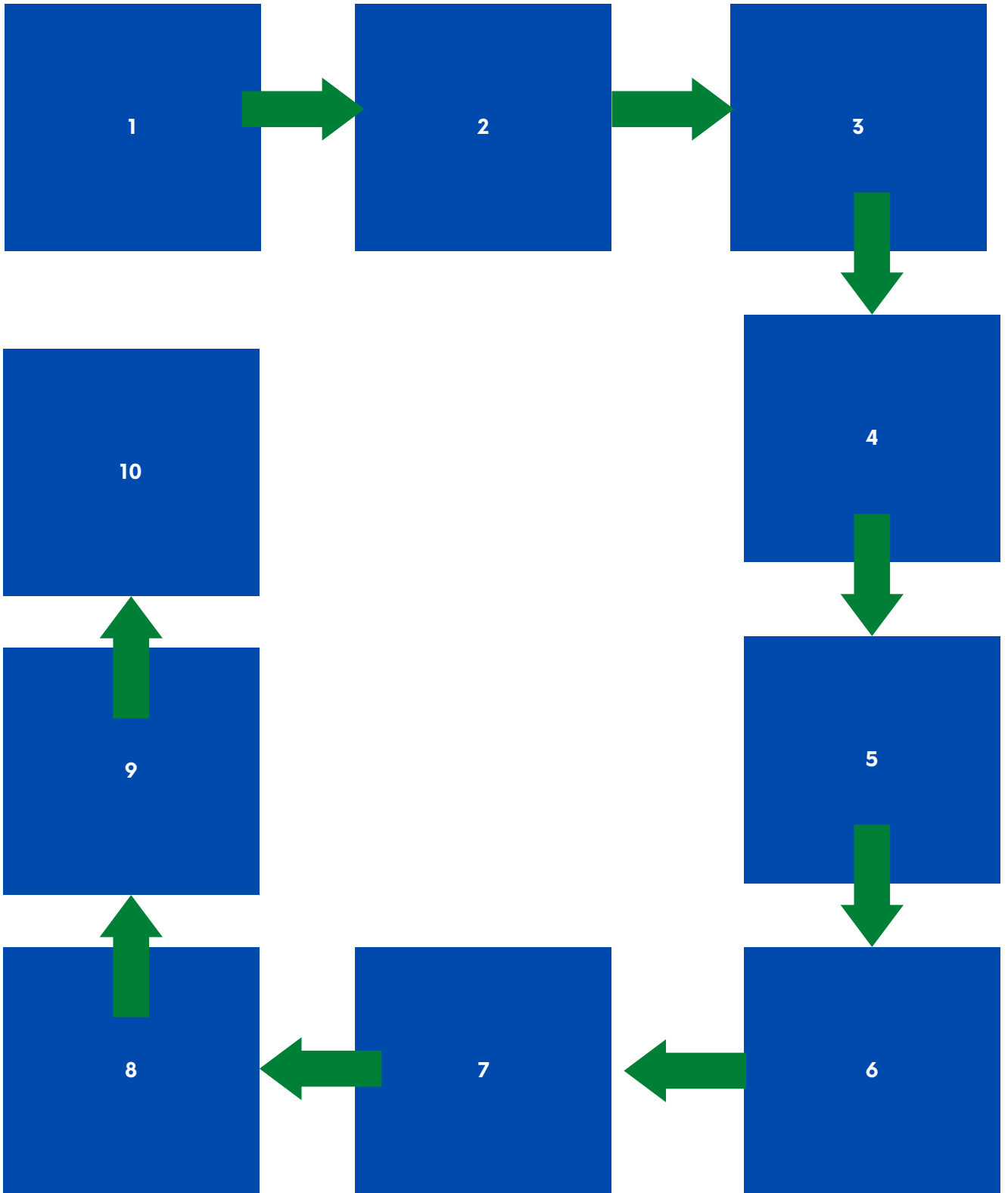
Decomposed matter becomes food for algae, continuing the cycle

Fertilizer is sprayed on crops

Plants cannot get light to photosynthesize and die

As algae growth increases, the excess nutrients are eaten up. Algae also begins to die

## How an Algal Bloom Forms



### After your visit...

In the center of your eutrophication mode, write some ways that we can work together to prevent algal blooms from harming marine life. (ESS3.C and LS2.A)



# THE PENGUIN HABITAT



## Background Information on African Penguins

### Adaptations:

The Penguins we have in the park are warm weather adapted, and native to the southern coast of Africa. The infographic below compares and contrasts the habitat specific adaptations between African and Emperor Penguins.



### AFRICAN PENGUIN

- At approximately 1/5 the size of Emperor penguins, African Penguins are able to lose body heat quickly
- Pink gland above eye is used to regulate body temperature in warm climate, similar to how humans sweat or how dogs pant
- Feet are bare of feathers to dissipate heat quickly
- Dig burrows in sand beaches to nest and shade their young from the heat

### EMPEROR PENGUIN

- Weighing on average 51 lbs, Emperor penguins use their blubber to keep warm
- Emperor Penguins gather tightly together in large groups called huddles to share body heat
- Males incubate new eggs by holding them on their feet and covering them with a warm layer of skin for over two months

### Conservation:

African Penguins are endangered. Unsustainable fishing practices and habitat degradation are major contributors to their decline. Penguins make their nests in guano (bird feces) that accumulates on beaches. In the past, humans have harvested large amounts of guano from breeding sites to use as fertilizer, leaving penguins without shelter from the sun and predators. This can serve as an excellent driving phenomena to introduce K-ESS2-2 and K-ESS3-3.

Supporting Resources: [Savingpenguins.org](http://Savingpenguins.org)

## Meet Our Penguins

Each penguin has a band on a wing for identification with colors and letters that specify the individual. Females have their band on their right wing, and males have their band on their left wing.

Age Range: 9-22 years old (as of 2022)

- Barnacle – Red B
  - Spends lots of time collecting materials for his nest
- Coaster – Tan C
  - Son to Comet and Kamikaze
- Comet – Red C
  - She likes to catch her fish mid air!
- Daffodil – Yellow D
  - Our only penguin who is not related to any others in the colony
- Finn – White F
  - Finn was a movie star! Check her out in 50 First Dates.
- Kamikazee – Black J
  - Devoted husband to Comet
- Lavender – Maroon L
  - Named Lavender because she loves the flowery scent!
- Luna – Silver L
  - Daughter to Comet and Kamikaze
- Olly – Green L
  - Finn's husband; He is an excellent father to new chicks
- Pong – Red P
  - Has served as a surrogate mother for abandoned eggs
- Weeble- Orange W
  - Finn and Olly's daughter; has appeared in commercials
- Stripes – Orange X
  - Weeble's partner
- Vader – Black V
  - Strong personality, can be mischievous



### Before Your Visit...

Observe the photos above. What questions do you have about what you see? (ESS3.C)

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### After your visit...

How have changes to the environment affected the survival of African Penguins? (ESS3.C)

Handwriting practice lines consisting of two vertical red lines and five horizontal cyan lines, providing a space for writing an answer.



# DOLPHIN HARBOR

## Background Information on Bottle Nose Dolphins

- Dolphins are members of the Cetacean order, along with whales
- Cetaceans are mammals, meaning they meet the five criteria to be considered mammals:
  - Give live birth
  - Produce milk
  - Are warm blooded
  - Have hair
  - Breathe air
- At our facility, Dolphins care is complex. Dolphins on site receive routine veterinary care including blood testing, dental care, ophthalmology, and more. Our trainers work in conjunction with veterinary staff to teach our dolphins behaviors that make them more comfortable and able to participate in healthcare routines.
- Beyond their physical health, we must also provide opportunities to keep our dolphins mentally engaged and healthy. We provide enrichment specifically tailored to each animal. Animal care staff are intimately familiar with each animal's likes and dislikes. We are able to provide novel stimuli and exercise opportunities to keep our animals mentally and physically active. You will have the opportunity to observe some of these enrichment strategies during your visit!
- Dolphins are highly intelligent and social animals. They form close bonds with the pod mates and their trainers.
- You can help wild dolphins by shopping for sustainably sourced fish and combating habitat degradation by recycling and limiting purchase of single use plastics.

## Meet Our Dolphins

### Liberty

- Birthday: July 4, 1990
- Born at SFDK to Chelsea
- Very vocal
- Likes ice and impressing his trainers

### Merlin

- Birthday: Unknown, estimated 1986
- One of our star performers
- Father to Mattie and Maverick

### Cupid

- Birthday: Unknown, estimated 2002
- Was rescued after being stranded on a beach in Texas

### Maverick

- Birthday: November 3, 2007
- Has an underbite

### Brisby

- Birthday: May 12, 1994
- Born to Chelsea at SFDK
- Very intelligent and learns new behaviors quickly
- Likes basketballs, Jell-o, and hoops

### Brandy

- Birthday: March 4, 2000
- Very playful and laid back

### Chelsea

- Birthday: Unknown, estimated 1979
- Mother to Liberty and Brisby

### Jasmine

- Birthday: Unknown, estimated 1986
- Dislikes ice

### Mattie

- Birthday: October 4, 2005
- Likes to be near Jasmine and Chelsea

### Avalon

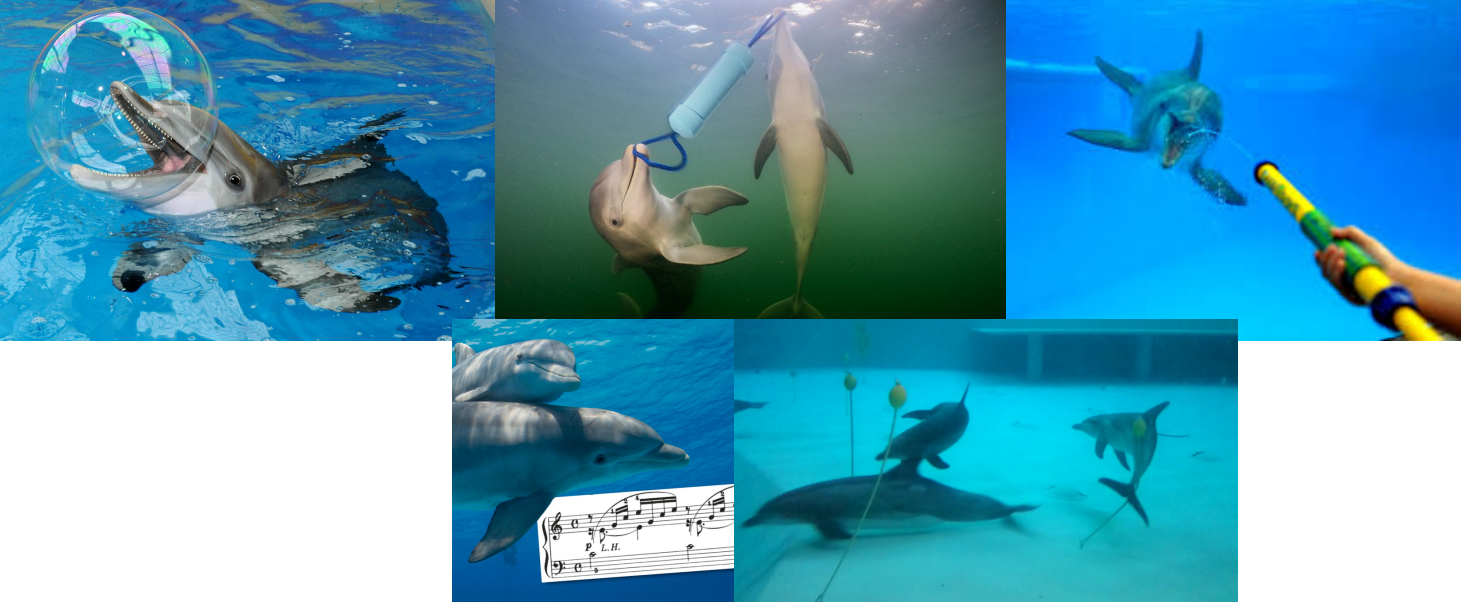
- Birthday: April 23, 1994

### Apollo


- Birthday: February 5, 2015

### Deke

- Birthday: May 7, 2001




### Before Your Visit...

 The images above depict different methods of enrichment for dolphins. There is an entire body of research dedicated to the design and testing of enrichment strategies for animals in human care. Every animal in the park receives some form of enrichment. What do you think enrichment is and why is it so important?

Handwriting practice lines for the 'Before Your Visit...' section, consisting of six horizontal blue lines bounded by vertical red lines on the left and right.

### After your visit...

 Develop a new enrichment idea for our dolphin pod! Sketch or describe your idea below and explain why you think it would be a useful form of enrichment.

Handwriting practice lines for the 'After your visit...' section, consisting of six horizontal blue lines bounded by vertical red lines on the left and right.