

Public Programs

At Sea Theme: Plants of the Sea

Location: At Sea Learning Center

Overview of Activities:

Activities:

- ❖ **Plant rubbing:** Guests can color on paper over different leaves from our native plant garden to make an imprint, showing the intricate details of our native plant species.
- ❖ **Plankton Bingo:** This instructor led activity allows guests to play bingo with different types of plankton.

Videos (1 per TV):

1. **Plankton Under the Instructor Microscope:** Here the instructor will show guests examples and talk about plankton on the microscope --> connected to back TV

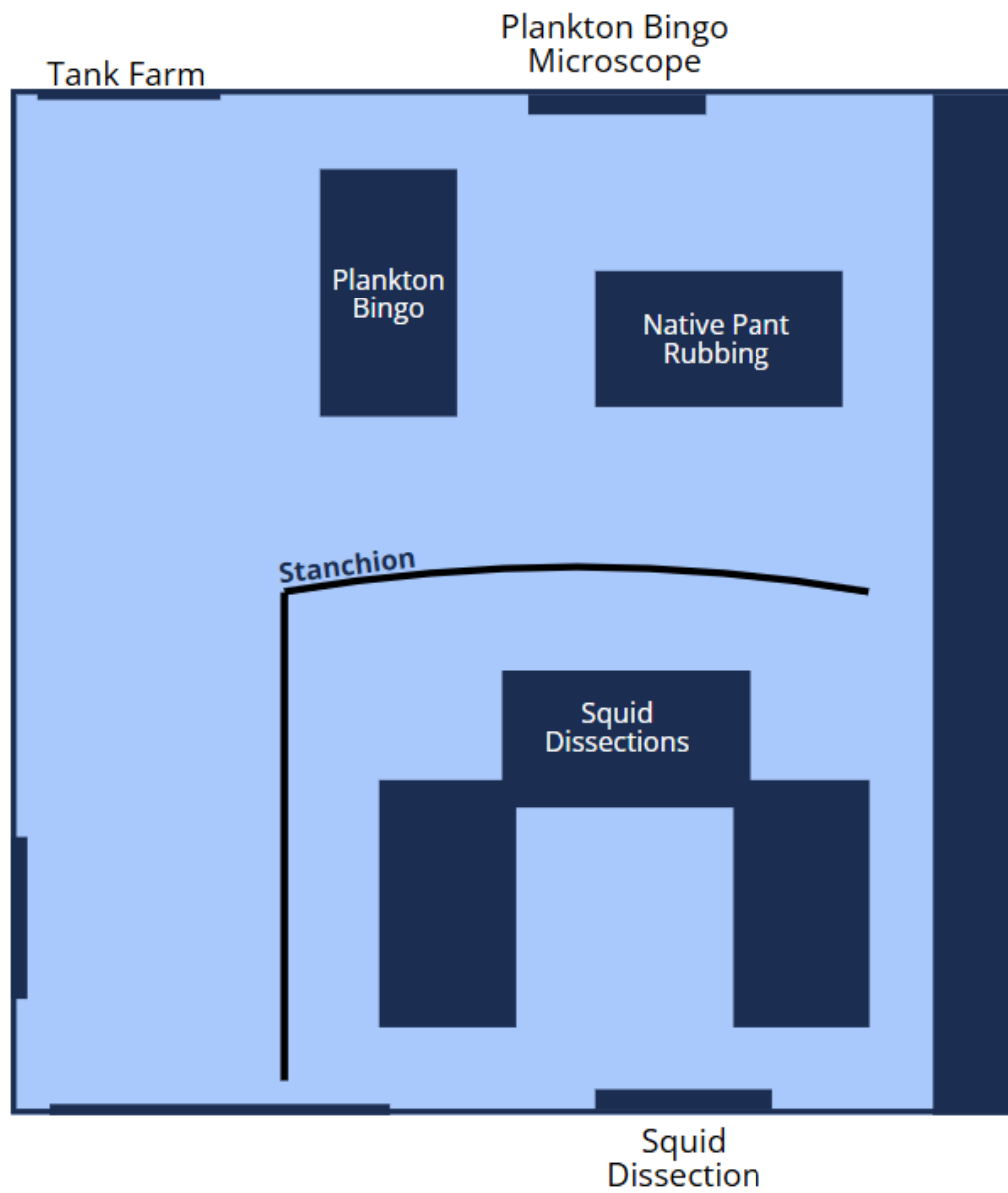
Performance Objectives

The public will be able to...

- ❖ Learn about kelp anatomy and its importance in the local ecosystem.
- ❖ Understand that there are many different types of plankton (both zoo and phyto) and be able to differentiate them.
- ❖ Understand the importance of native plants to a coastal ecosystem such as our Naive Plant Garden.

Setup

- ❖ Move tables to indicated positions below.
- ❖ Turn on back TV corrected to microscope
 - Set instructor microscope with plankton
- ❖ Collect leaves from native plant garden for plant rubbing



Plankton Bingo

Challenge

Guests can learn all about the different types of plankton in our ocean with plankton Bingo.

Materials

- ❖ Microscopes (x6)
- ❖ Plankton Bingo cards (x6)
- ❖ Dry erase markers
- ❖ Plankton ID laminates
- ❖ Plankton under Instructor Microscope on Dissection TV

Advanced Preparation

- ❖ Set out 6 microscopes with plankton sample under each
 - Get plankton from education sample jar in Husbandry kitchen fridge
 - Have only 1 microscope with brine shrimp since they are not on the Bingo card (but still fun to look at)
- ❖ Place laminates and bingo cards on table
- ❖ Place markers on table with rags
- ❖ Turn on Dissection TV
 - TV showing plankton under Instructor Microscope
 - TV connected to Amanda's Laptop through HDMI with AMScope software open (in downloaded files).
 - Microscope camera in lens of education microscope and connected to USB in laptop.

Maintenance

- ❖ Check plankton every 30-60 minutes and replenish water if needed. The heat from the microscopes will evaporate the water and plankton will dry up. You can use seawater from the kelp tank.

Cleanup

- ❖ Put microscopes away
- ❖ Clean out petri dishes
- ❖ Let lead know on plankton levels (do we need the boat to get more?)

Procedure

Engage:

- ❖ Ask guests if they know what plankton is?
- ❖ What's the difference between zoo plankton and phytoplankton?
- ❖ Why do we need plankton?

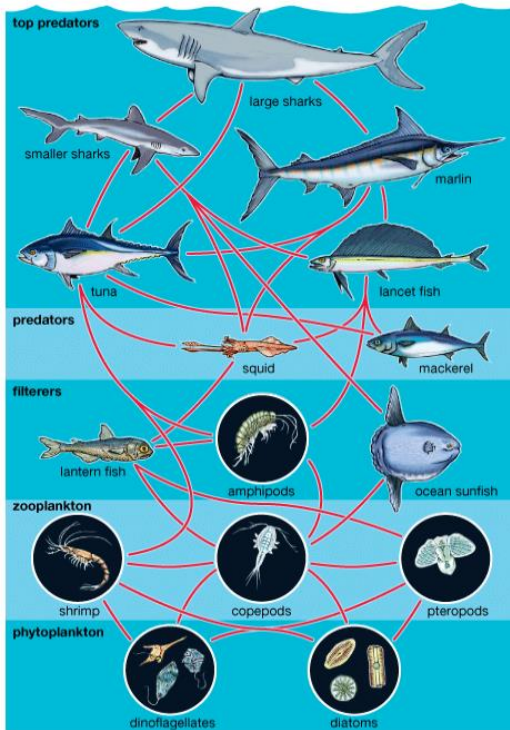
Explore:

- ❖ Show guests how they can look in the microscopes for the different species of plankton on their bingo cards.
- ❖ When they find a plankton, they can mark it off on their bingo card. Guests can feel free to go around to different microscopes that have different samples, but they take their bingo card with them to keep track/play the game.
- ❖ Point out that some of the plankton on the Bingo card are zooplankton and some are phytoplankton. Can they figure out which are which?
- ❖ You can use the microscope connected to the TV to explore different types of plankton and show examples to the public. Think of the plankton station on the boat but more flowy and public oriented.

Explain:

- ❖ What is a plankton?
 - Any marine organism that is too small, weak, or lazy to swim against an ocean current.
 - Ex) diatom, copepod, fish larvae, seahorse, ocean sunfish, etc...

- ❖ There are 2 different types of plankton; zooplankton and phytoplankton.
 - Zooplankton are the animal plankton
 - Phytoplankton are the plant plankton
- ❖ Phytoplankton capture the sun's energy for photosynthesis, making them the base of the marine food web, or the **producer**.
 - Phytoplankton are consumed by zooplankton and filter feeding organisms.
- ❖ Zooplankton consume phytoplankton, making them the **primary consumer** in the marine food web. Zooplankton are then consumed by other zooplankton or by small fish/other organisms.
- ❖ This energy from the sun that is harnessed by the phytoplankton is then transferred up the food web.



- ❖ Explain the importance of phytoplankton and why we should care about these microscopic organisms.
 - They are the foundation of the aquatic food web.
 - They absorb CO₂ and create oxygen (via photosynthesis)
 - They generate about half the oxygen in the Earth's atmosphere
 - They also absorb about 37 billion metric tons of CO₂, which is about 40% of all CO₂ produced.

Activity Resources

- ❖ <https://oceanservice.noaa.gov/facts/ocean-oxygen.html>
 - This article talks about the importance of phytoplankton in generating oxygen.
- ❖ <https://earthobservatory.nasa.gov/features/Phytoplankton#:~:text=Phytoplankton%20are%20the%20foundation%20of,are%20eaten%20by%20bigger%20ones.>
 - This source is all about phytoplankton's role in the marine food web

Native Plant Rubbing

Challenge

Guests can color over the leaf of a native plant from our native plant garden and create an imprint of that species.

Materials

- ❖ Crayons
- ❖ ½ sheets of paper (colored)
- ❖ Leaves from native plant garden
- ❖ Instructional signs
- ❖ Native Plant info booth

Advanced Preparation

- ❖ Place crayons and colored ½ sheets of paper on table
 - Cut colored sheets of paper in half if not enough
- ❖ Collect leaves from native plant garden (basket of leaves)
 - Place basket on the table
- ❖ Make an example/put out a pre-made example

Maintenance

- ❖ Put loose leaves back in basket
- ❖ Throw out damaged leaves
- ❖ Tidy tables (throw away used coloring sheets)

Cleanup

- ❖ Put coloring supplies away
- ❖ Throw out leaves after the weekend

Procedure

Engage:

- ❖ Ask guests if they know of any native plants?
- ❖ Have they seen any super blooms?
 - What causes a super bloom?

Explore:

- ❖ Show guests they can look at the details of the plant by doing a plant rubbing
 - Show them an example

Explain:

- ❖ Plant rubbings help us be able to document different plants, recording their details while not having to press the plant
- ❖ There are many different species of native plants in California

- ❖ Ocean Institute's Native Plant Garden represents chaparral habitat
 - Coastal plants in drier areas
- ❖ Native Plant Examples...
 - California Sage Brush
 - **Description:** Highly aromatic shrub. Branches from the base and grows out from there, becoming rounded. The stems of the plant are slender, flexible, and can be hairless or fuzzy. Leaves are thread-like, hairy, and light green to gray in color; the margins of the leaves curl under.
 - **Ecology:** One of the foundation plants of the coastal sage scrub community and the preferred plant of the California gnatcatcher, a threatened species. Extremely drought tolerant.
 - **Human uses:** Native Americans used California sagebrush as a soothing medicine for poison oak, ant bites and measles, and as a tea for general illness. They also rubbed the leaves on themselves to disguise their scent during hunting.
 - Coyote Brush
 - **Description:** Bushy evergreen shrub 1-12 feet tall. Has very small round leaves and abundant small white flowers. Blooms in early winter. Is dioecious (meaning that there are male and female plants, the flowers of each look different – female flowers appear fuzzy and tube shaped and male flowers are round with stamens and may be slightly yellow with pollen).
 - **Ecology:** Critical nectar source for pollinators such as native species of bees, wasps, butterflies, and flies
 - as it blooms in winter when most other plants are dormant. Many animals use this thick and woody plant for shelter. Important pioneer species for coastal sage scrub (one of the first plants to establish the plant community). Has a number of drought resistant adaptations including small leaves (reduced evaporation) and thick woody stems.
 - **Human uses:** Native people used it as building material for tools such as arrow shafts. The fluffy female flowers were used as stuffing for cloth items like toys. Heated leaves were used to reduce pain and swelling.
 - Black Sage
 - **Description:** 3.3–6.6 ft tall evergreen shrub. Has pale lavender flowers in a cluster. Covered in small hairs. Has long oblong leaves. Highly aromatic (sage scent). Dormant in dry season (summer-fall) – appears dry and dark brown.
 - **Ecology:** Important nectar source for a large variety of pollinators including bees, butterflies, flies, and hummingbirds. Scent is very dominant in sage scrub community. Dormant stage allows for survival in drought. Strong scent attracts pollinators.

- **Human uses:** Native American medicinal uses (tea for flu, arthritis, stomach inflammation, sore throat), seasoning for cooking, great for erosion control, honey from black sage is highly valued.
- Mule Fat
 - **Description:** Flowering bushy shrub that can grow very tall, sometimes appears like a tree. Has lots of small fuzzy white, pink, or reddish flowers. Leaves are long, pointed, and sometimes toothed. Leaves also have three lengthwise veins (helpful for ID!). Foliage can feel sticky.
 - **Ecology:** Attractive to pollinators, especially butterflies.
 - **Human uses:** The name mule fat comes from when gold miners and cowboys would allow their mules to graze on these plants. It was very irritating to the mules' stomachs and would cause significant bloating making them appear fat. Native Americans had many uses for mule fat, including using the leaves as eyewash and to stop baldness.
- Toyon
 - **Description:** Evergreen shrub. It grows into a large evergreen shrub to small tree, reaching 12-18 ft. tall and more. Dense foliage is comprised of dark green leathery leaves with serrated margins. Clusters of creamy-white flowers occur from late spring into summer that mature into colorful orange to red berries from fall through winter.
 - **Ecology:** Ripe berries are valued by many bird species. Drought-adapted and mostly fire-resistant.
 - **Human uses:** Native people used a pulp of the leaves as a wash for sores and used the wood extensively for tools and weapons.
- California Buckwheat
 - **Description:** Densely branched shrub 2-3 ft tall. It has white or pale pink flower clusters that dry into an orange-brown color in fall (dried flowers drop seeds). Leaves are small, narrow, and rolled, similar to rosemary leaves.
 - **Ecology:** Important nectar source for bees and food source (seeds) for birds. Rolled leaves reduce evaporation and aid in its survival during drought.
 - **Human uses:** Buckwheat was an important medicinal plant for Native Americans. Kumeyaay boiled flowers or leaves into a tea to be used as an eyewash, a mouthwash and a remedy for headaches, stomach aches and bladder infections. The honey that bees produce from nectar of this plant is delicious.
- California Poppy
 - **Description:** Annual plants with feathery gray-green foliage. The four-petaled flowers, borne on stems 8 to 12 inches long, are usually pale yellow, orange, or cream.
 - **Ecology:** Very important to local pollinators. They provide pollen (not nectar) to birds, butterflies, bees and other pollinators. Monarch butterflies

can be seen resting and sipping the dew that accumulates in the cup, which is just the right size on which to land, and the right color to attract.

- **Human uses:** It is the state flower of California. People use the parts that grow above the ground for medicine. California poppy is used for trouble sleeping (insomnia), aches, anxiety, bed-wetting in children, and diseases of the bladder and liver. It is also used to promote relaxation.

➤ Coastal Prickly Pear

- **Description:** Oval-shaped flat pads up to 8 ½ inches long, covered in clusters of yellowish spines. Grows in dense clumps. The flowers are yellow or red and bloom in the spring. The edible fruit is purplish red, reaching up to 2 inches long.
- **Ecology:** Very important to wildlife. Fruit and pads are food (and hydration) for birds, mammals, reptiles, and insects. Flowers are a nectar source for a variety of pollinators. Rodents and reptiles live in burrows underneath for protection. It holds large amounts of water aiding its survival in drought. Spines serve as protection from grazing animals.
- **Human uses:** Fruit, flowers, and pads are edible. May be helpful in diabetes treatment development. Native Americans used its juices to treat open wounds.

➤ Coastal Goldenbush

- **Description:** Branching perennial shrub 40-80 inches tall. Several straight main stems branch from woody base. Leaves are clustered along the stem, are about 2 inches long, and range in shape from long ovals to rectangular shapes. The edges of leaves can be smooth or toothed. Flowers grow in abundant bright yellow clusters at the end of each branch. Largest blooms occur April – December but you can often find some flowers year-round.
- **Ecology:** Because this plant is able to flower year-round, it is a vital nectar source for pollinators when all other plants are not in bloom. It also serves as a hunting ground for spiders and predatory insects (think spider restaurant!).
- **Human uses:** Native people used dry stalks to make brooms. Effective for restoration projects and erosion control.

➤ Arrow Willow

- **Description:** Large, sprawling, multi-trunked shrub or small tree, usually less than 30 feet (10 m) high. It is winter deciduous, but often retains some leaves throughout the year. Arroyo willows are riparian, needing a consistent source of fresh water. Flowers are dense, cylindrical clusters of tiny flowers known as catkins. Is dioecious (male and female individuals).
- **Ecology:** Insect pollinated. Can survive short droughts but requires a reliable source of fresh water.
- **Human uses:** Kumeyaay tribe used the arroyo to build their homes and baskets, as insect repellent, and as a pain and fever reducer.

- Bush Sunflower
 - **Description:** Rounded perennial shrub. Widely spaced green oval leaves pointed at the tip. Flowers are bright yellow and daisy-like.
 - **Ecology:** Attracts bees, butterflies, moths, and small birds.
 - **Human uses:** Kumeyaay tribe used this plant to treat toothaches and chest pains.
- Lemonade Berry
 - **Description:** 3.3–26.2 ft tall sprawling evergreen shrub or small tree. Leaves are flat and leathery, one to two inches long, and sometimes serrated. It has clusters of small pink or white flowers in February – May. Berries grow in clusters and are red, sticky, hairy, and shaped like pomegranate seeds.
 - **Ecology:** Important for pollinators, especially bees. Fruits are eaten by various birds. Fruit is attractive to animals who will spread seeds through their waste (and provide fertilizer for the seeds).
 - **Human uses:** Berries can be used to make a lemonade flavored drink. Leaves can be used to make brown dye, and oil from berries can be used to make scented candles. Tea from the woody parts were used to treat coughs.

