

Science @Home

CALIFORNIA COAST

Surf's up! Get to know the best coast with a week's worth of sunny, sandy science activities for beach bums ages 8-11.

The California coast is a biodiversity hotspot, home to thousands of animal and plant species that live nowhere else on Earth. Explore the Golden State's beaches, kelp forests, and tidepools with hands-on crafts, guided videos, interactive programs, coloring pages and more.

Please note: While Science @ Home activities are designed to be conducted by kids, some little ones might need adult help with reading instructions and preparing crafts.

Day 1: Shoreline

60 minutes

- » Sand Investigation (activity) (en español)
- » Snowy Plovers (video)
- » Snowy Plover Scrape (craft) (en español)

Day 2: Tide Pools

60 minutes

- » California Coast Tidepools (video)
- » Scientific Sketching (activity) (en español)
- » Sea Star Anatomy (video) (activity)

Day 3: Kelp Forests

30-60 minutes

- » Kelp Forests and Coastal Foods Webs (video)
- » Gigamacro Green Sea Urchin (activity)
- » Academy Collections Deep Dive: Sea Otters (video)
- » Floating Forests Zooniverse (activity)

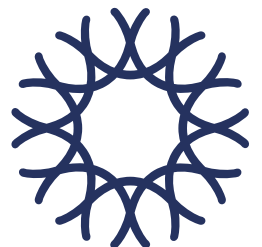
Day 4: Caring for the Coast

60-90 minutes

- » Cal Coast Scene (coloring) (en español)
- » Shifting Sheephead (craft)
- » Nudibranchs and Climate Change (video)
- » Oil Spill Clean Up (activity)

Kid & Caregiver Extension Activities

- » Thriving California (resource)
- » Animating Life (video)
- » Snapshot Cal Coast (activity)
- » Scientist Spotlight: Terry Gosliner (video)
- » Our Ocean Backyard (video)





Sand Investigation

What is sand made of? Where does sand come from? Geologists make observations to study the physical characteristics of sand sediments in order to understand how they form. Be a sand scientist and use your observations and tools like geologists to learn how sand forms!

Materials

Pencil
Photos of beach sand samples (pages 3-7)
Photos of California beaches (page 8-12)
Paper to record observations



Directions

1. **Look** at each of the beach sand samples starting on pages 3-7. **Think about** the following questions and **write down** your observations.
 - a. *What colors do you see in the sand? What might cause the difference in color?* The color of the grains can give us clues about what types of minerals make up the sand.
 - b. *Are all the grains of sand the same size?* Sand grains come in different sizes. Smaller grains are typically older, have traveled farther and been worn down, or are made of softer materials than larger grains. How does sand get like this?
 - c. *What shapes are the grains of sand?* Are any of the grains rounded or angular? What might this tell us about how long ago the sand was formed?
2. **Look** at the pictures of California's beaches starting on page 8 and **compare** them to the pictures of sand we looked at earlier. The beaches along the California coast are composed of many different types of sand that have formed in different ways.
 - a. Do you recognize any of these beaches? Have you been to any of them?

- b. What does the sand look like? Does it remind you of the earlier photos?
 - c. How do you think the sand got there?
3. Next time you go to a beach, take a closer look at the sand and see what you can learn!

The science of sand

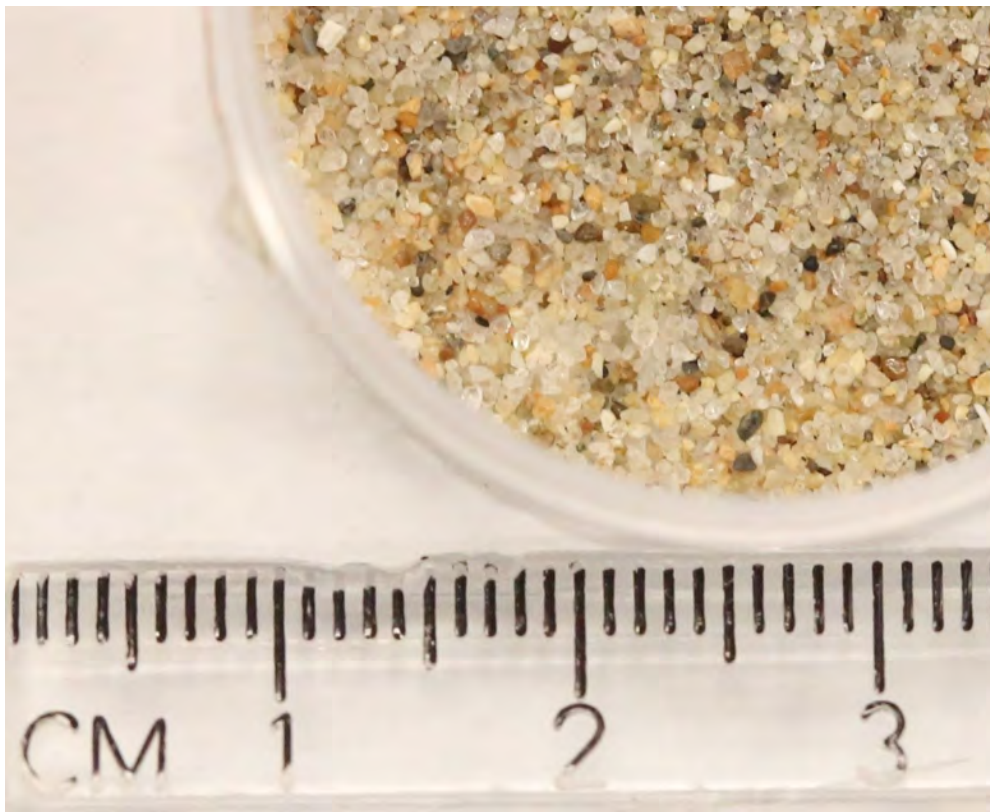
Geologists use different tools to study the color, size, and shape of sand to learn how it was created and how it got there.

Beach sand is formed in many different ways.

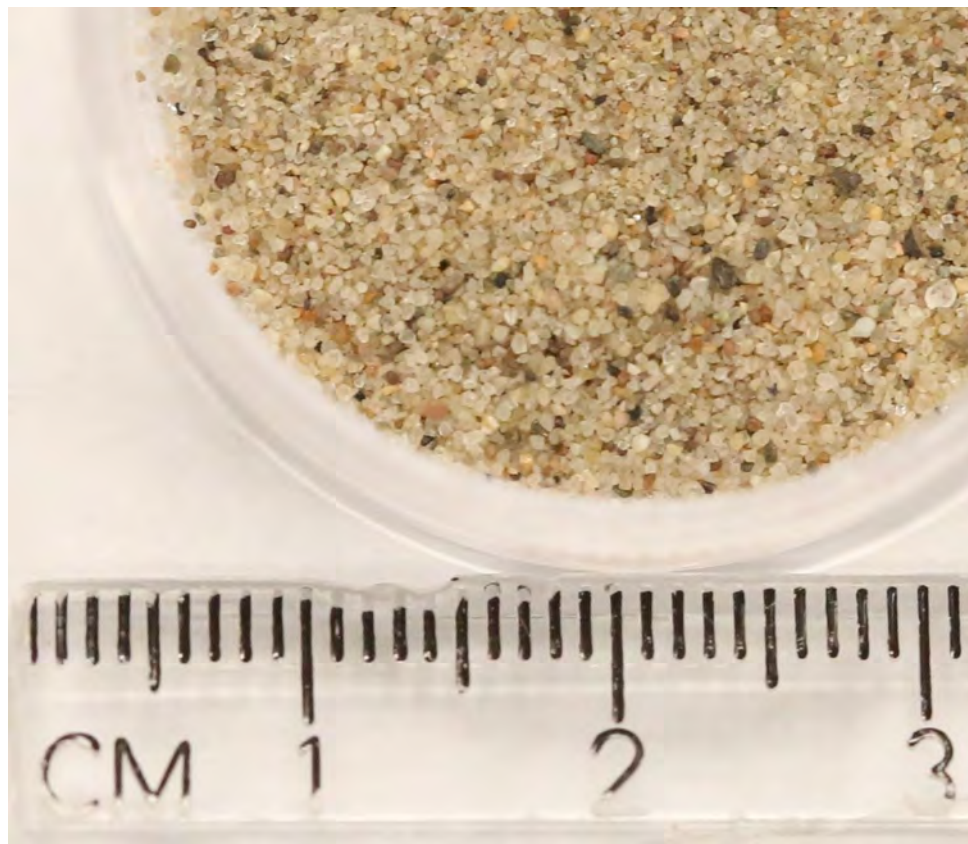
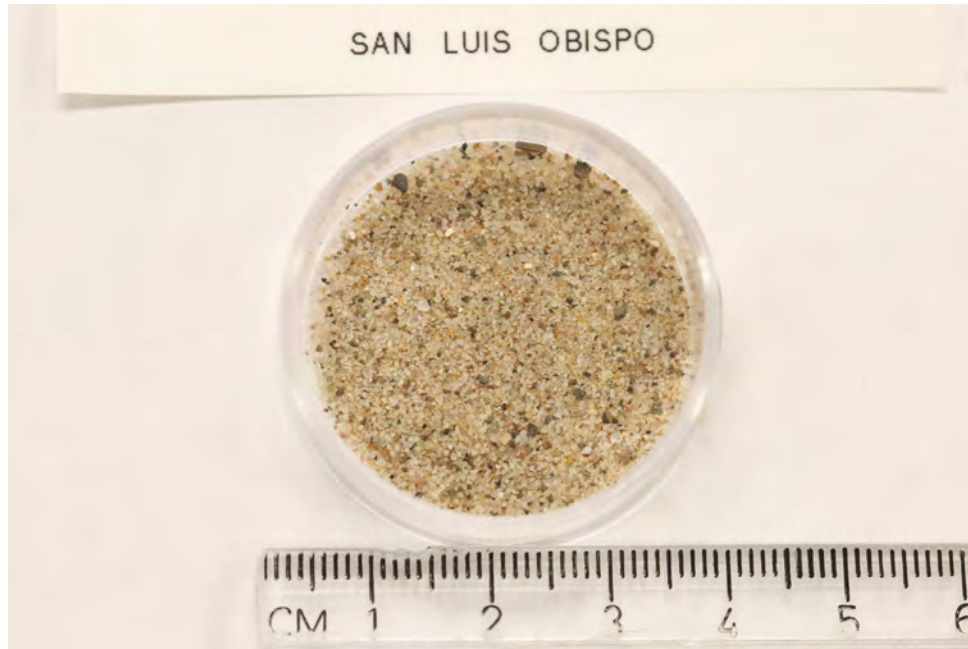
1. In many tropical places, sand grains form when the shells of small marine animals are broken down by waves.
2. Some sand grains along tropical beaches are created by the poop — that’s right, poop! — of coral-munching parrot fish swimming along the reefs.
3. Some sand grains are created when waves erode beach cliffs and rocky bluffs.
4. Volcanic eruptions also produce sand grains, like the ones found at some black and green sand beaches.
5. In California, many beaches are formed by sand grains that are brought to the ocean shores by rivers that deposit their sediments into the sea. For example, much of the sand along Ocean Beach eroded from the Sierra Nevada Mountains and reached the beach via the San Joaquin and Sacramento rivers, which empty through the delta out into San Francisco Bay.

Looking at the color of sediment grains is helpful in understanding what type of minerals make up the sand.

1. Minerals like amphibole, hornblende, and magnetite tend to produce dark grains.
2. Minerals like chert, feldspar, and hematite (iron ore) tend to produce red, orange, or even yellow grains.
3. Many of the clear sand grains we see are broken down fragments of quartz.
4. The mineral garnet, when weathered, often produces rare purple sand grains.



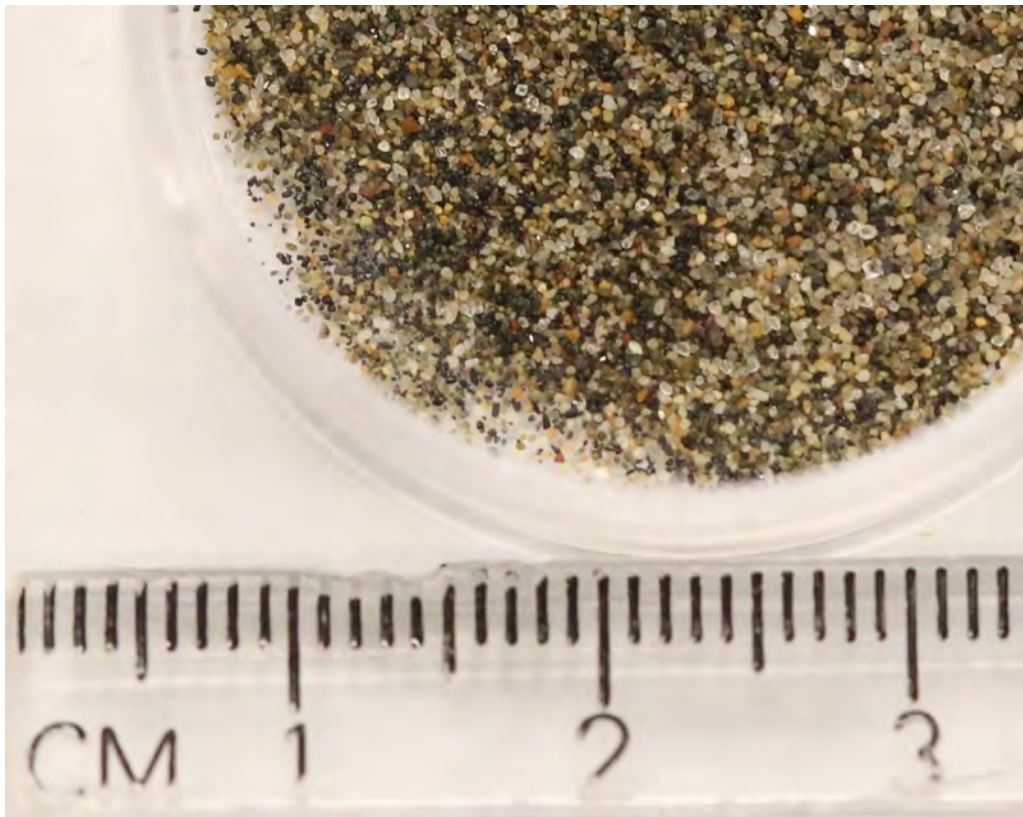
Santa Cruz, California



San Luis Obispo, California



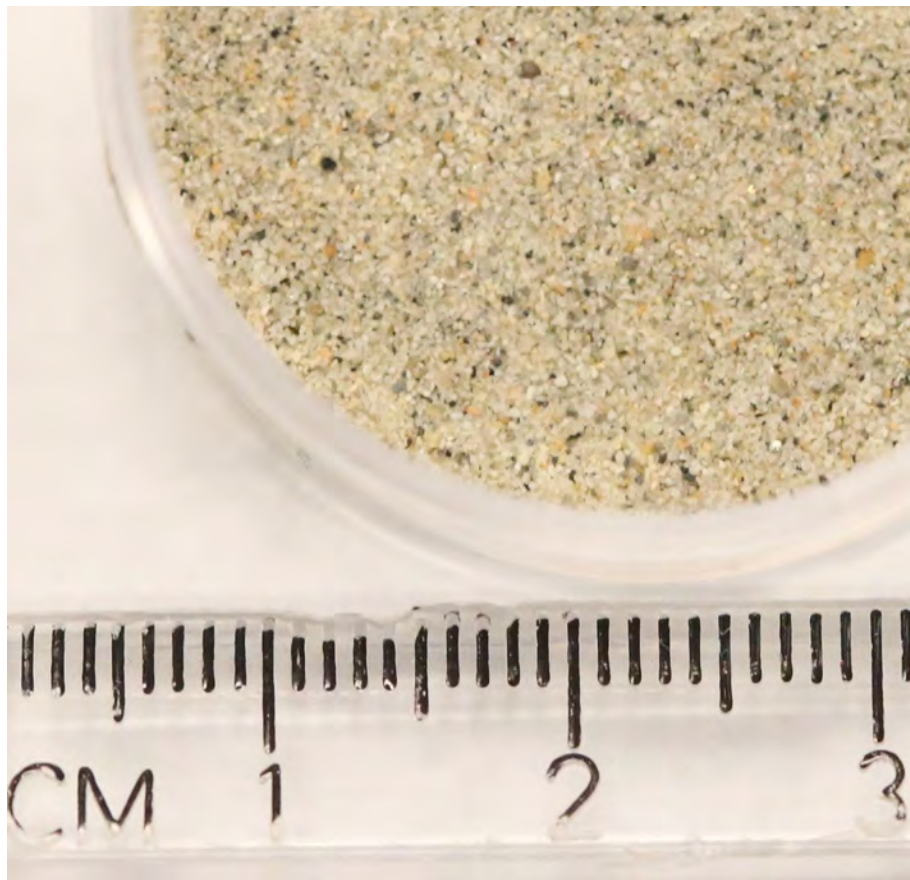
Rodeo Beach, California



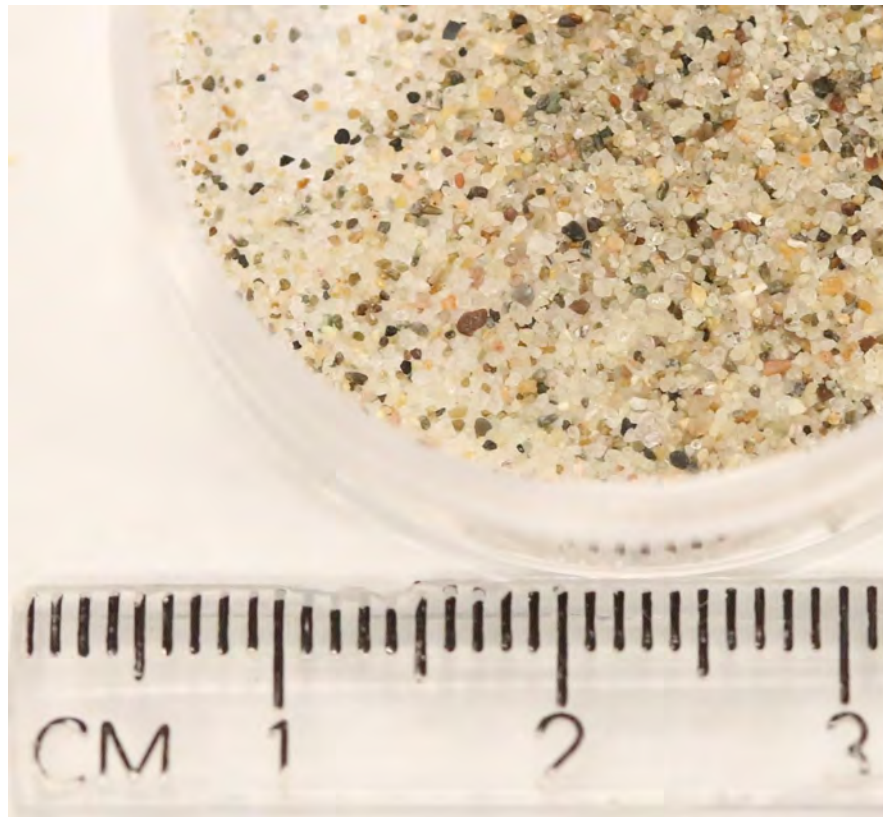
Ocean Beach, California



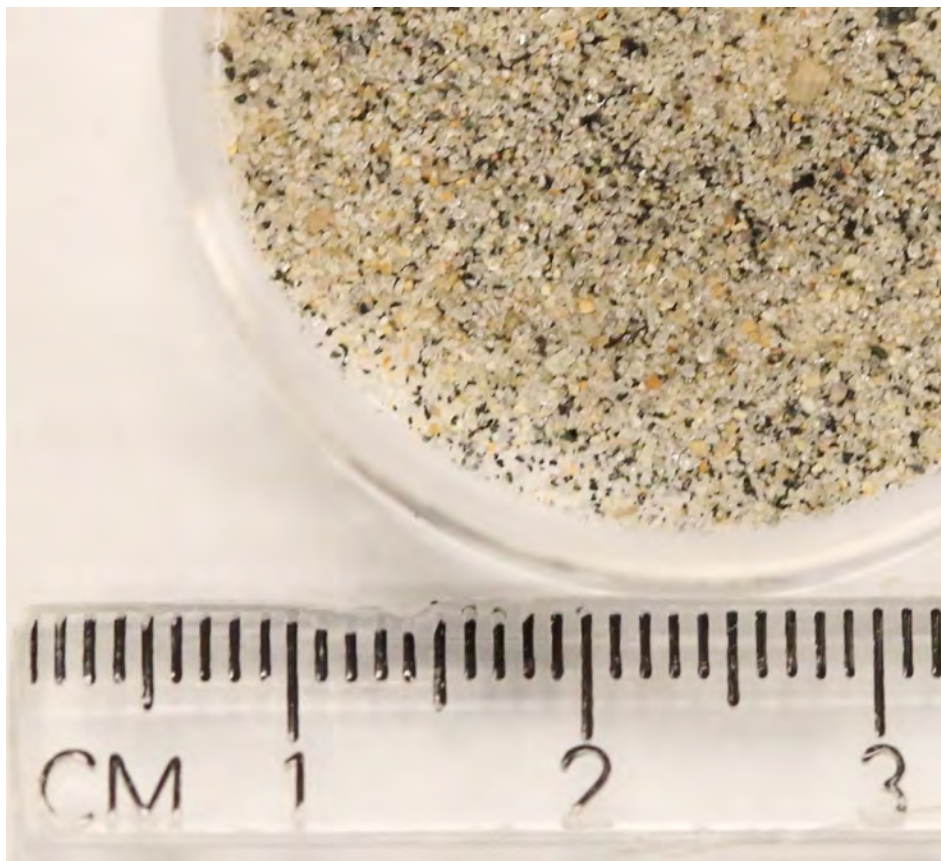
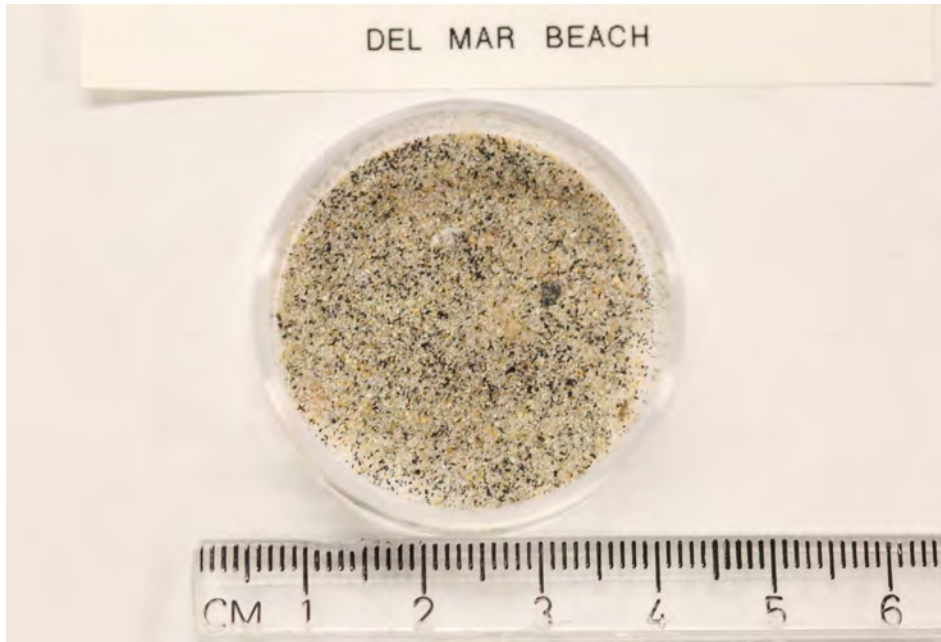
Monterey, California



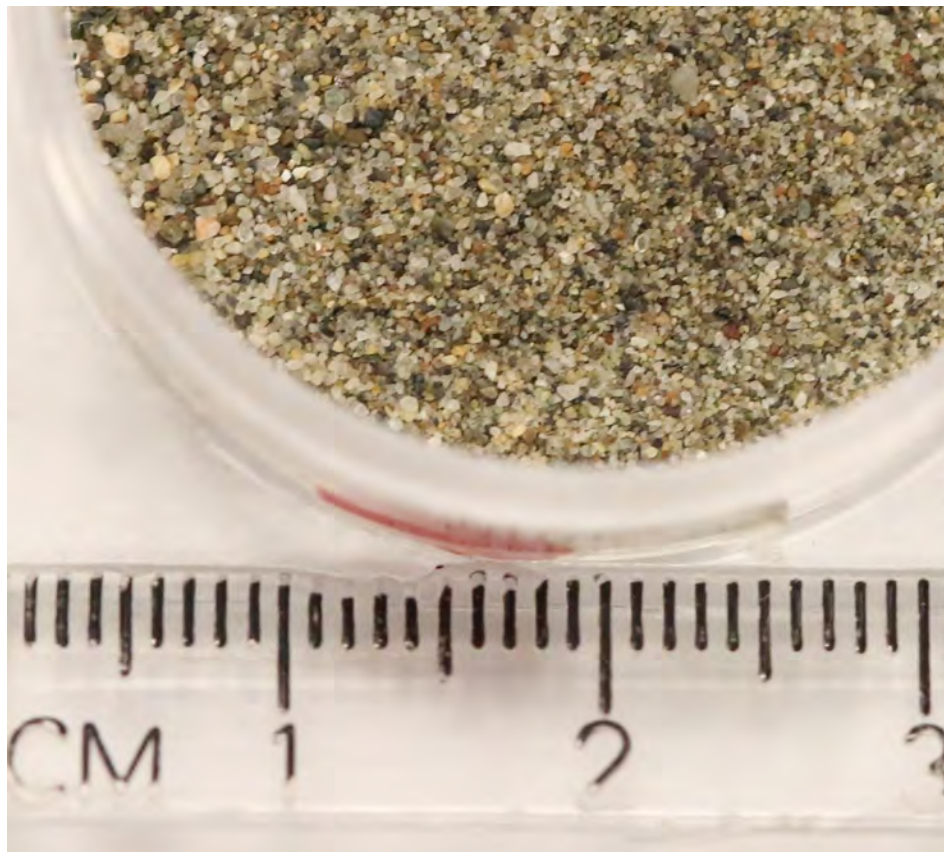
Long Beach, California



Fort Bragg, California



Del Mar, CA



Bodega Bay, CA



Santa Cruz, CA



San Luis Obsipo, CA



Rodeo Beach, CA



Ocean Beach, CA



Monterey, CA



Long Beach, CA



Fort Bragg, CA



Del Mar, CA



Bodega Bay, CA



Investigación de Arena

¿Qué es arena? ¿De dónde viene la arena? Geólogos(es) hacen observaciones para estudiar las características de los sedimentos de arena en orden para estudiar cómo se forman. ¡Sé un científico(e) de la arena y usa tus observaciones y herramientas como geólogos(es) para aprender cómo se forma la arena!

Materiales

Papel para grabar observaciones
Lapiz
Fotos de ejemplos de arena de playa (páginas 3-7)
Fotos de playas de California (páginas 8-12)



Direcciones

1. **Mira** las fotos de las playas de California empezando en la página 8 y **comparalas** con las fotos de la arena que vimos más temprano. Las playas a lo largo de la costa de California están compuestas de varios diferentes tipos de arena que se ha formado de diferentes maneras.
 - a. ¿Reconoces alguna de estas playas? ¿Has estado en alguno de ellos?
 - b. ¿A qué se parece la arena? ¿Te acuerdas de las fotos anteriores?
 - c. ¿Qué piensas sobre cómo llegó la arena allí?
2. La próxima vez que vayas a la playa, acércate a la arena y mira que puedes aprender!

La ciencia de arena

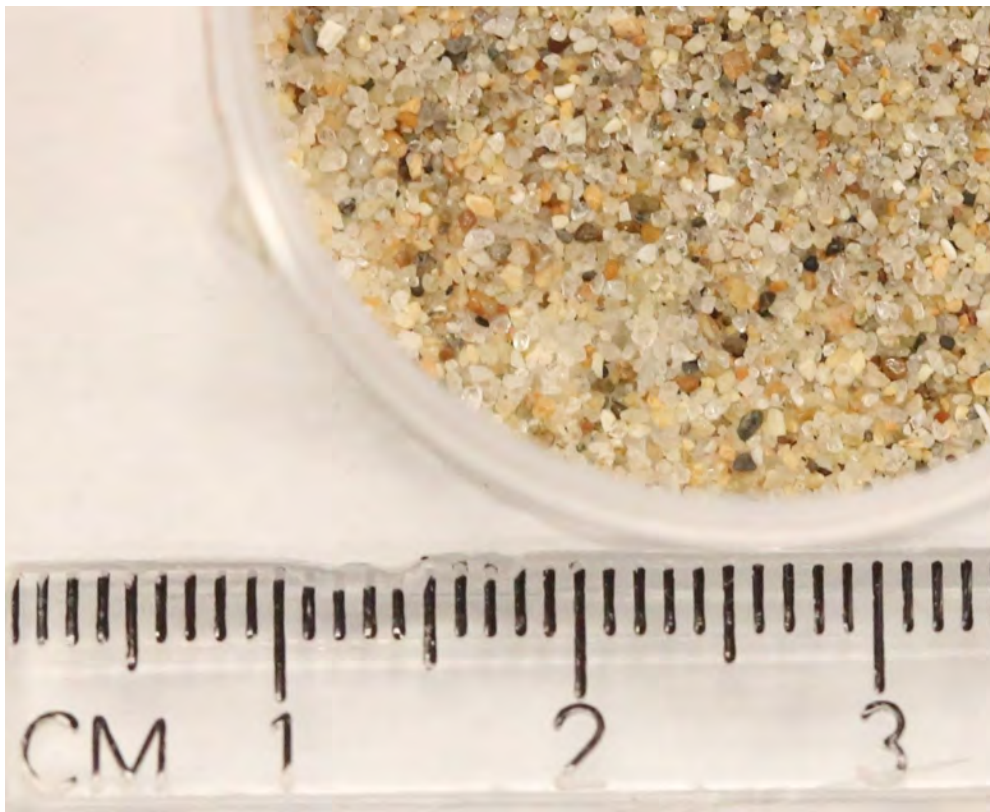
Geólogos usan diferentes instrumentos para estudiar el color, tamaño, y forma de la arena para aprender cómo se formó y cómo llegó allí.

La arena de la playa se forma de diferentes maneras.

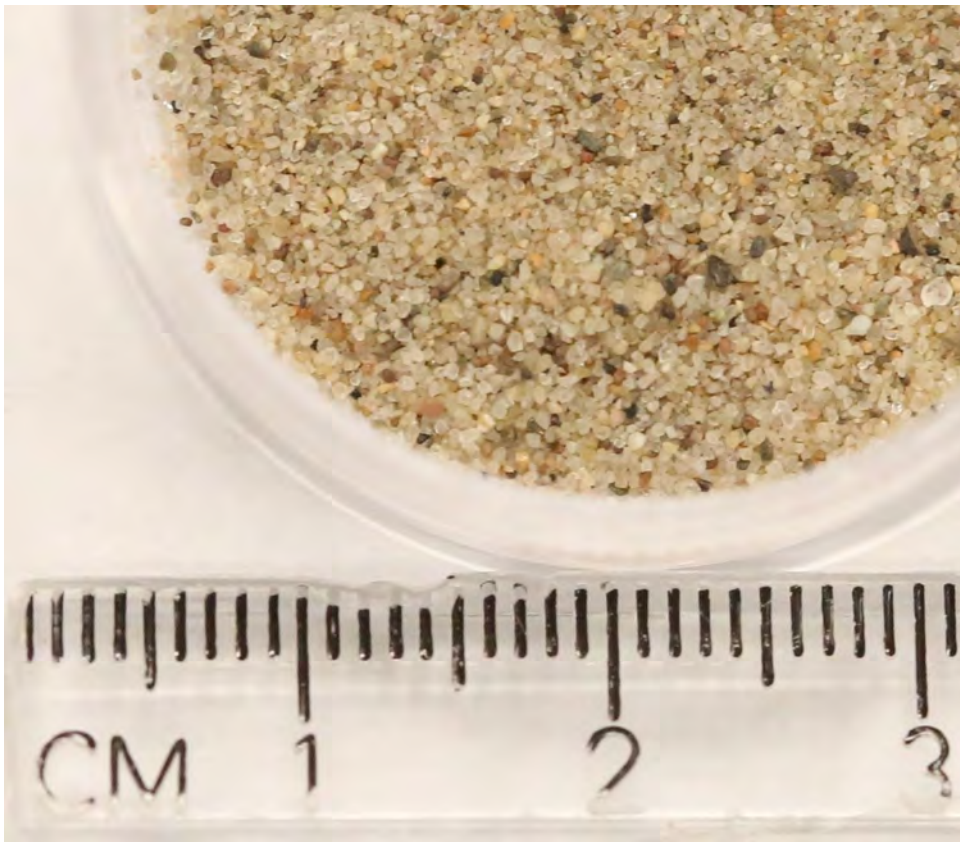
1. En lugares tropicales los granos de arena se forman cuando las olas del mar quiebran conchas de animales marinos pequeños.
2. Algunos granos de arena que se encuentran a lo largo de las playas tropicales están hechos de la caca- ¡así es la caca!-de los peces loros que se comen corales cuando están nadando alrededor de arrecifes.
3. Algunos granos de arena son hechos cuando las olas erosionan los acantilados de playa y acantilados rocosos.
4. Erupciones volcánicas también producen granos de arena, como los que se encuentran en algunas de las playas de arena negra y verde.
5. En California, muchas playas son formadas de los granos de arena que son traídos a la orilla del océano por ríos que depositan sus sedimentos en el mar. Por ejemplo, mucha de la arena alrededor de Ocean Beach fue erosionada de las Montañas de la Sierra Nevada y llegó a la playa vía los ríos de San Joaquín y Sacramento, que dejan vacíos el delta que se encuentra en la bahía de San Francisco.

Viendo el color de los granos de sedimento ayuda entender de qué tipo de minerales componen la arena.

6. Minerales como anfíbol, hornblenda, y magnetita tiende a producir granos oscuros.
7. Minerales como esquisto, feldespato, y hematita (una mena de hierro) tiende a producir granos que son rojos, anaranjados, o incluso amarillo.
8. Muchos de los granos de arena que son claros que vemos son pedazos quebrados de cuarzo.
9. El mineral granate, cuando es desgastado, tiende a producir granos de arena morada que son raros.



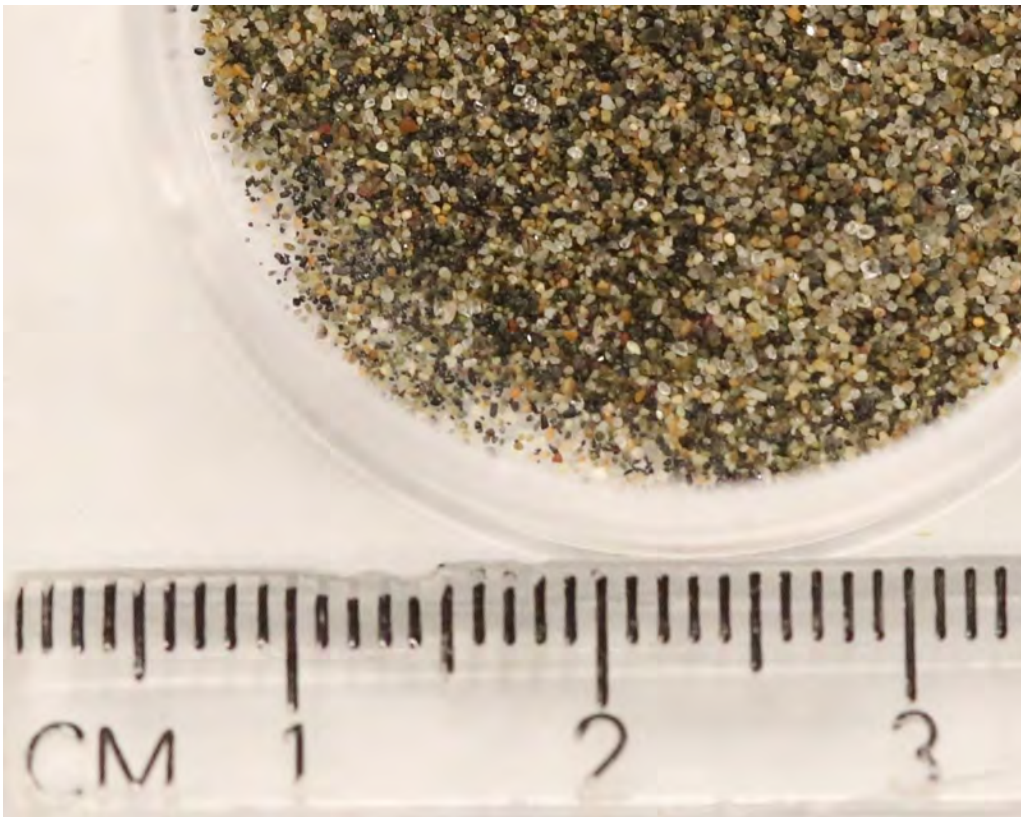
Santa Cruz, California



San Luis Obispo, California



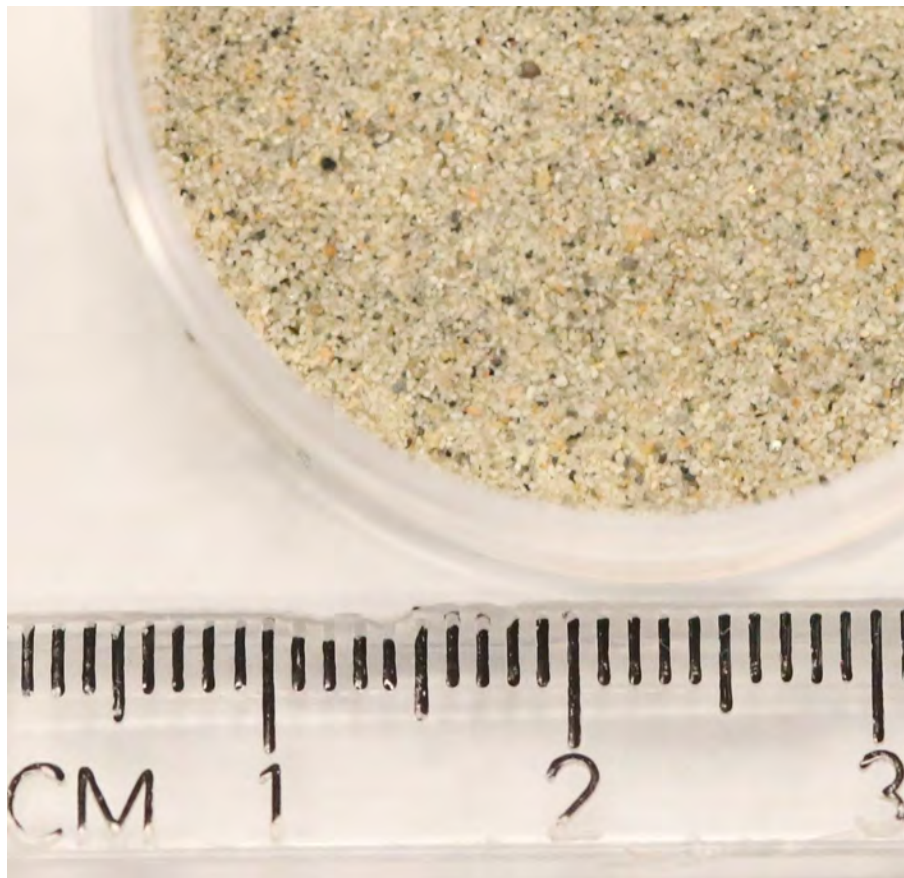
Rodeo Beach, California



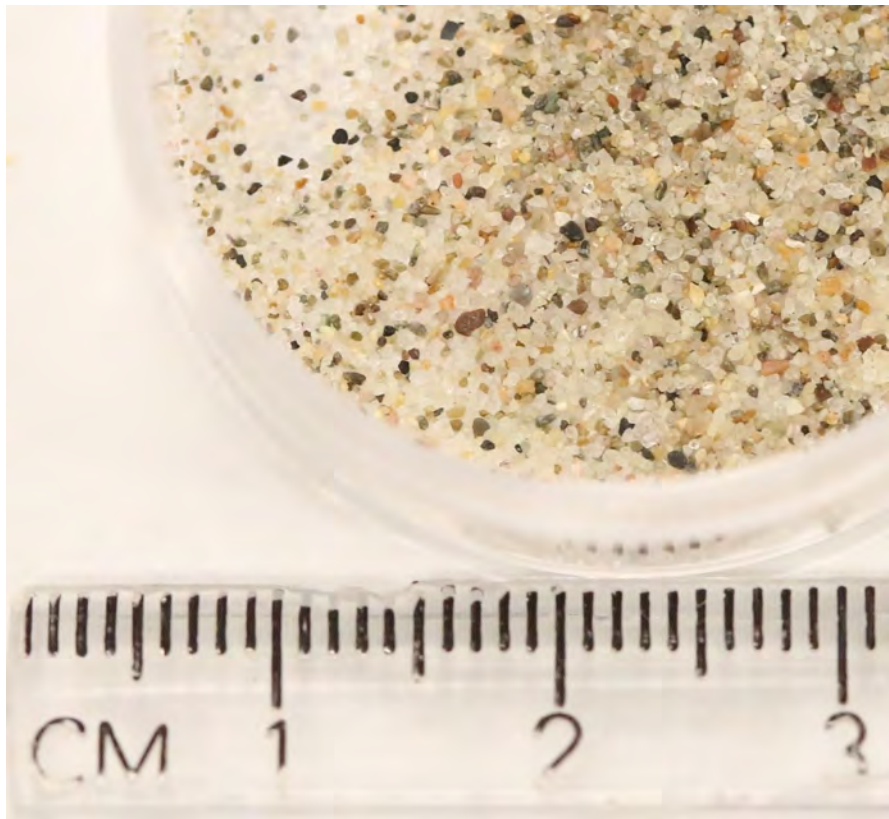
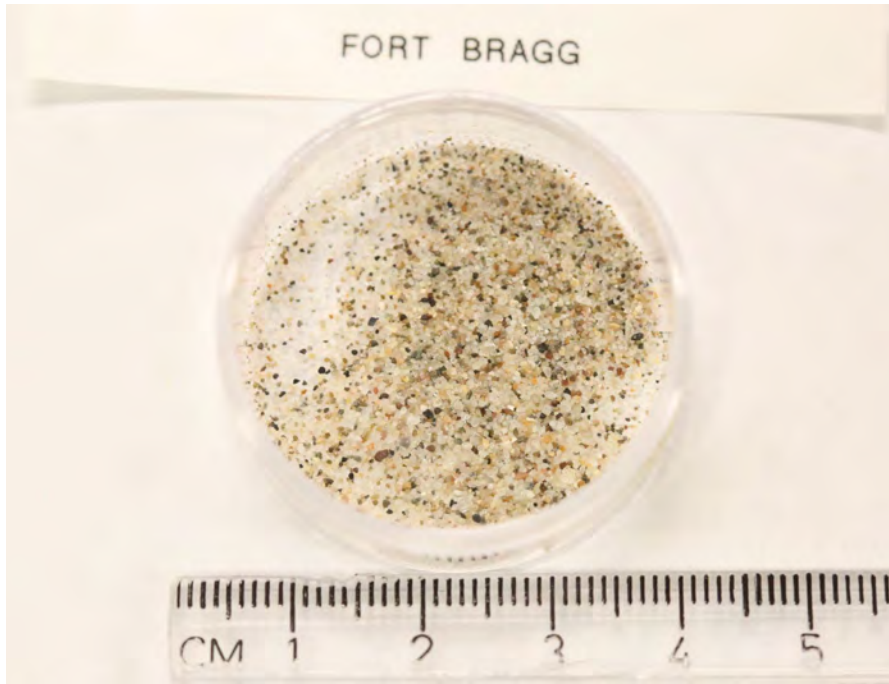
Ocean Beach, California



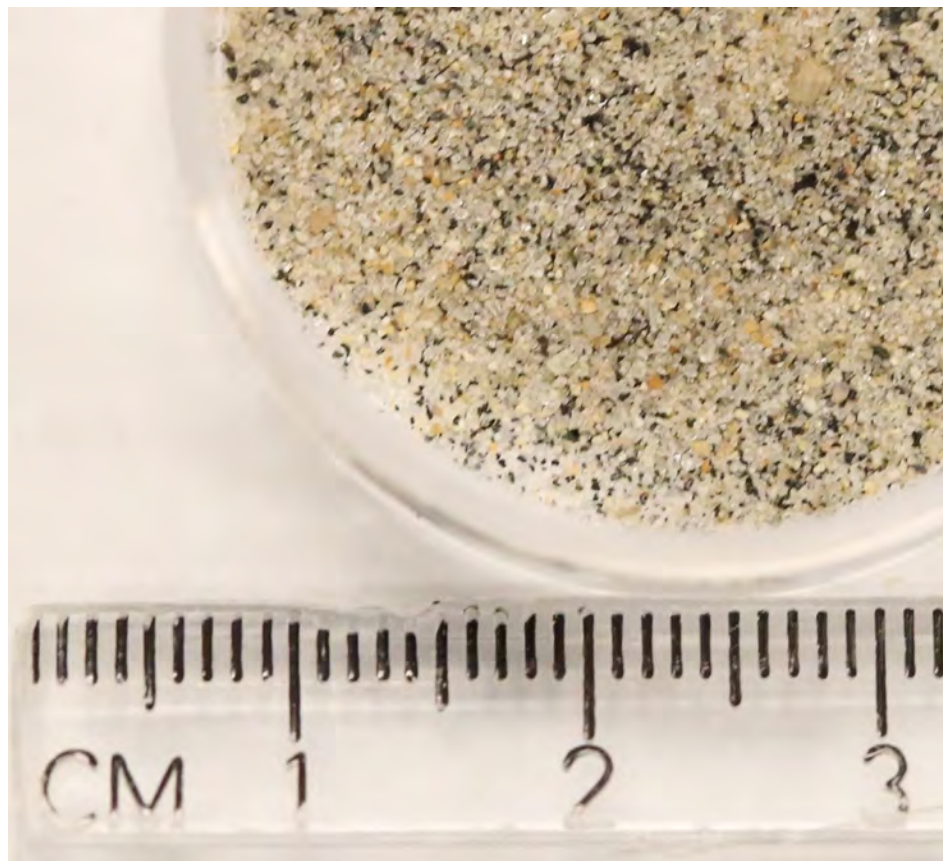
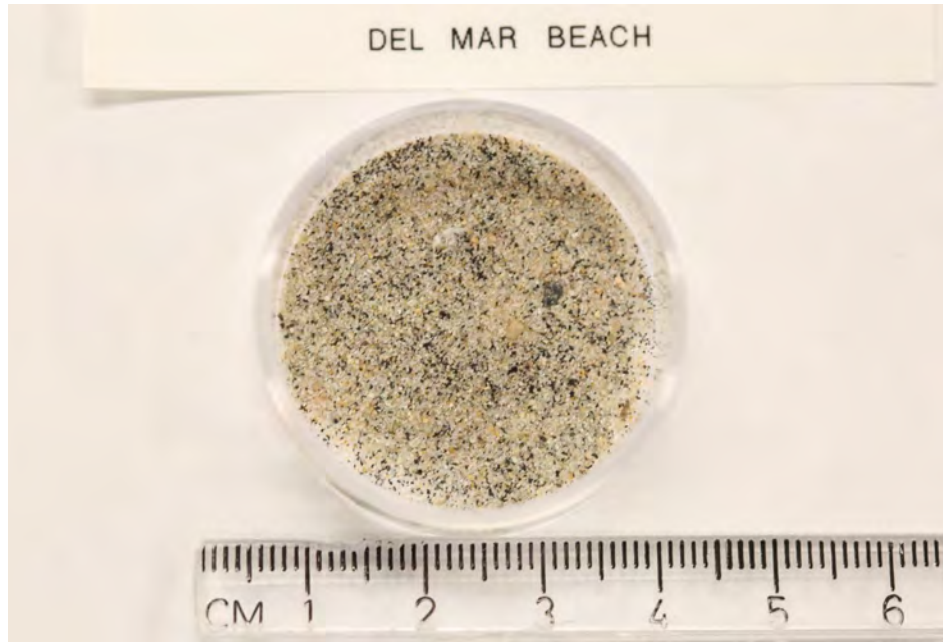
Monterey, California



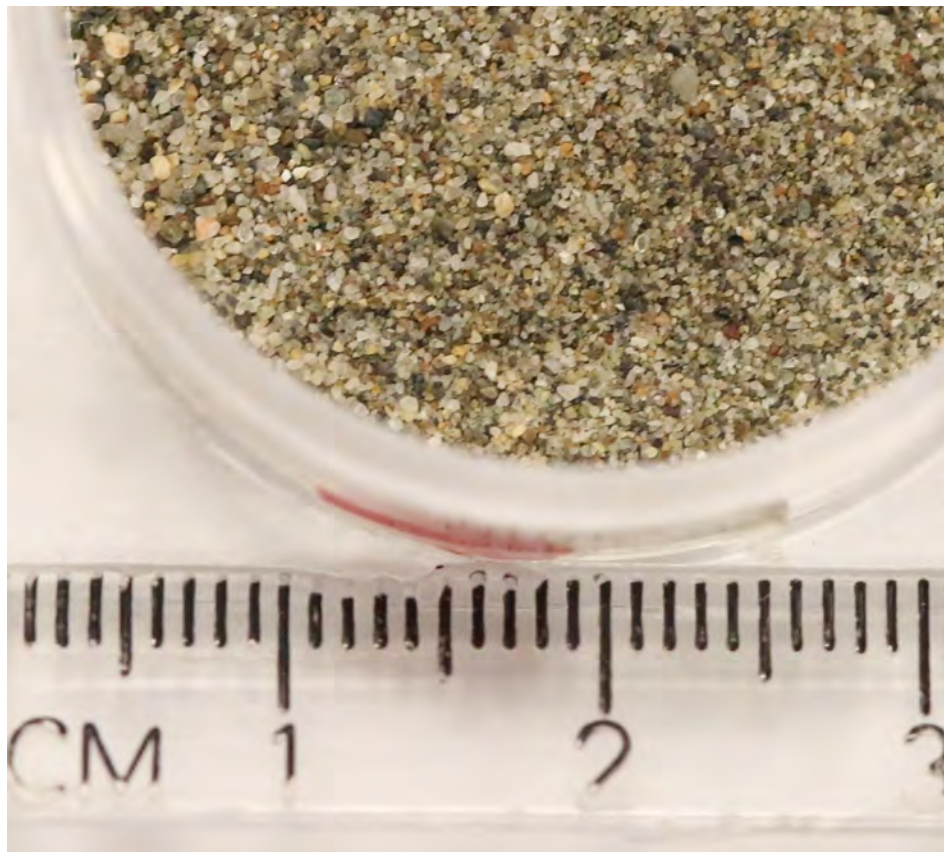
Long Beach, California



Fort Bragg, California



Del Mar, CA



Bodega Bay, CA



Santa Cruz, CA



San Luis Obsipo, CA



Rodeo Beach, CA



Ocean Beach, CA



Monterey, CA



Long Beach, CA



Fort Bragg, CA



Del Mar, CA



Bodega Bay, CA



Snowy Plover Scrape

Western Snowy Plovers are small birds that live close to the water on the shorelines from Oregon down through Baja California. Instead of big nests, they lay their eggs in “scrapes,” indents in the sand with some beach debris like dried kelp, shells, driftwood, pebbles, or even bits of plastic to help camouflage 2-3 eggs. Build your own snowy plover scrape—hatchlings and all!

Materials

3 cotton balls
Black or dark brown marker
Pipe cleaner
Scissors
Piece of paper
Glue
Sand
Pebbles, grass, sticks, or other natural materials
Colored pencils, crayons, or markers

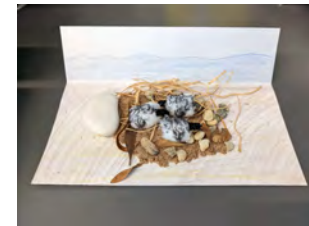
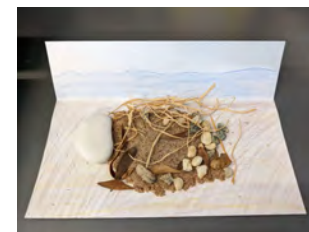
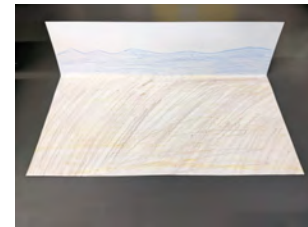


Directions

1. **Color** the top half of a cotton ball with a black marker. The cotton fluff will create a spotty pattern as you color.
2. **Color** a triangle on each side of the cotton ball to make wings for the plover.
3. **Repeat** steps 1 and 2 with the other two cotton balls.
4. **Cut** 3 1-inch pieces of pipe cleaner and bend each into a V-shape to make beaks. **Glue** one open part of the V to one end of a cotton ball and repeat for each cotton ball. Plovers typically lay 2-3 eggs at a time.



5. **Fold** one side of a piece of paper “hot dog” style about a third of the way and prop it up.
6. **Color** the paper to look like the beach with a sandy shore on the bottom part and blue waves on the part that is folded up. What other details can you add to your beach?
7. **Spread glue** across the middle of the bottom part of the paper, covering about half of it.
8. **Pour** sand slowly and carefully over the glue and spread the sand gently across the paper with your fingers.
9. **Wait** 1 minute and then carefully **pour** the extra sand off of the paper and back into a container or outside.
10. **Place** pebbles, twigs, leaves, bark, or other natural materials to make the plover’s scrape. Even though plovers lay their eggs out in the open (instead of hiding them in a tree or in dense bushes), they do camouflage their scrapes to look like the beach around them. How might this help protect their eggs?
11. **Place** the 3 cottonball hatchlings in the scrape.



After 28 days of mom and dad taking turns sitting on the eggs, the little birds will hatch! Dad will stay with the chicks for about another month, teaching them how to fly and hunt for their food, which includes small crustaceans, insects, and worms.



Raspaduras de Chorlitejo Blanco

Los Chorlitejos Blancos del Oeste son aves pequeñas que viven cerca del agua en las costas de Oregon hasta Baja California. En vez de nidos grandes, ponen sus huevos en “raspaduras”, hendiduras que se encuentran en la arena y los llenan con escombros de la playa, como queipo seco, conchas, madera, piedritas, y incluso pedacitos de plástico para proveer camuflaje a los 2-3 huevos. Construye tu propia raspadura de Chorlitejo Blanco, con polluelos y todo!

Materiales

- 3 bolas de algodón
- Marcador negro o marrón oscuro
- Limpiapiipas
- Tijeras
- Hoja de papel
- Pegamento
- Arena
- Piedritas, zacate, palos, o otro materiales naturales
- Lapizes de color, crayones, o marcadores

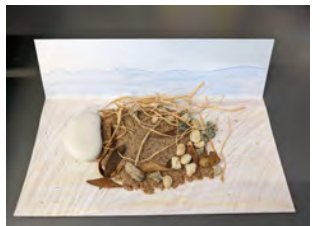
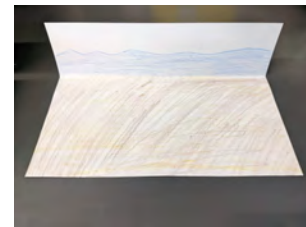


Instrucciones

1. **Colorea** la mitad superior de la bola de algodón con un marcador negro. Las fibras del algodón van a crear un diseño manchado cuando lo colorea.
2. **Colorea** un triángulo en cada lado de la bola de algodón para hacer las alas del Chorlitejo.



3. **Repite los pasos 1 y 2** con las otras dos bolas de algodón.
4. **Corten 3 limpiapiipas** de medida de 1 pulgada y doblen cada una en forma de "V" para hacer los picos. Pega un lado de la parte abierta de la "V" a un lado de la bola de algodón y repite con cada bola de algodón. Los Chorlitejos típicamente ponen 2-3 huevos.
5. **Doblen** un lado de la hoja de papel en el estilo de "perro calientes" aproximadamente un tercio del camino y después apóyalo
6. **Colorea** el papel para que parezca como una playa, con la parte inferior haciendo la playa de arena y la parte superior es la olas azules. ¿Qué otros detalles puedes agregar a tu playa?
7. **Extiende** el pegamento en medio de la parte inferior de la hoja del papel, cubriendo la mitad de la hoja.
8. **Echen** despacio y cuidadosamente la arena sobre el pegamento y extiéndelo despaciosamente sobre el papel usando sus dedos.
9. **Espere** 1 minuto y cuidadosamente boten la arena que sobró en el papel en un contenedor o afuera.
10. **Pongan** piedritas, pedazitos de palos, hojas, cortezas, o otros materiales naturales para hacer la raspadura del chorlitejo. Aunque los chorlitejos ponen huevos al aire libre (en vez de esconderlos en árboles o arbustos densos) usan camuflaje para que las raspaduras se parezcan como la playa que se encuentra.
11. **Pongan** los 3 polluelos de algodón en la raspadura.



Después de 28 días la madre y el padre toman turnos sentándose en los huevos y luego los pajaritos nacerán! El papá se queda con los polluelos aproximadamente para un mes más, enseñándoles cómo volar y cazar su presa, que incluye crustáceos pequeños, insectos, y gusanos.



Scientific Sketching

Sketching is a skill everyone can practice! Scientists make sketches to notice details and changes, record observations, and make connections—not necessarily to make art. Try these fun techniques to hone your observation skills and make your own scientific sketches. You may surprise yourself with what you can create.

Materials

Paper

Pencil (or pen)

Object to sketch (this can be a household item like a salt shaker, or even your non-dominant hand)

Sea star page printout (page 4)

Optional: internet access

Optional: ruler

Optional: timer

Directions

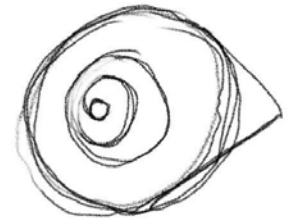
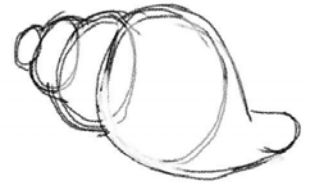
1. **Blind Contour Drawing:** Household Object
 - a. This warm up will help you focus on drawing what you see, instead of what you think is there. There are only two rules: don't lift your pencil from the paper, and don't look at your drawing until you're finished!
 - b. **Choose** a household object that you'd like to draw.
Try to choose something that is smaller than a piece of paper.
 - c. **Look at your object and draw**, keeping the pencil tip on the paper.
Try to capture the outline of the object and the most important details. Your drawing will probably look strange or funny, but this exercise helps connect your eyes to your drawing hand.
 - d. **Optional:** Set a timer for 5 minutes while you draw.



Blind contour of
a cup

2. Shape Drawing: Tide Pool Creature

- a. **With an adult's permission to go online, choose** one of these 3D models of tide pool creatures, and find an angle that you like: [Ochre Star](#), [sea snail](#), [Pink Abalone](#), [Gaper clam](#), [Red sea urchin](#). (Or select another household object).
- b. Before you start sketching, try to **blur** your vision a little, and identify some shapes in the object. For example, a triangle at the tip of a sea star's arm, or an oval for a swirl of a shell.
- c. **Sketch** your object using the simple shapes you see. You can look at your paper, but remember to look at your object before adding to your drawing.



3. Observing Variation: Sea star printout

- a. **Print** out page 4. Challenge a friend or family member to join you for this activity.
- b. **Secretly choose** one specimen. All the images are of the same species, the Ochre Star, but individuals might look a little different. This could be because of their genes, or their environment. For example, an orange sea star might pass on its orange color to its offspring. Or, a sea star that has access to more food might grow bigger.
- c. **Sketch** your specimen. Try starting with simple shapes, then adding in details. Can you show the texture? Is there something unique about your specimen?
- d. **Challenge:** When you are satisfied with your sketch, trade papers with a friend or family member, and see if you can identify their chosen specimen.
- e. **How did it go?** What changes could you make to your sketch to make identifying your specimen easier?
- f. **Optional:** Make any changes to your sketch and try the challenge again.

4. Extension: Your choice

- a. Now that you have some practice, choose another 3D model to sketch, or bring your sketching materials to a tide pool or a place with living things (plants or animals or mushrooms) near where you live.
- b. **Choose** a specimen to sketch using the techniques you've practiced. Start with shapes



and outlines, then fill in details. If you'd like, sketch a close-up of your favorite detail on your specimen, like a flower on a plant, or a pattern on a shell.

- c. **Label** the details you notice. Which features could help you identify this specimen?
- d. **Measure** your specimen with a ruler, or compare its size to your hand or your pencil. How big are its different features? For example, maybe the smallest swirl of a shell is the size of your eraser.
- e. **Title** your illustration, and be sure to add your signature.

Created a scientific illustration that you're proud of? Send us a photo of your creation at scienceathome@calacademy.org

1



2



3



4



Image credits: (1) "[Ocre Star](#)" by Ed Bierman [CC-BY 2.0](#) (2) "[Pisaster ochraceus \(purple sea star or ochre sea star\)](#)" by Jerry Kirkhart [CC-BY 2.0](#) (3) "[Sea Star at low tide](#)" by Peter Kaminski [CC-BY 2.0](#) (4) "[May2005_o80.jpg](#)" by Jonathan Kellenberg [CC-BY 2.0](#)



Ilustración Científica

¡Dibujando es una habilidad que todos pueden practicar! Científicos dibujan para notar detalles y cambios, grabar observaciones, y hacer conexiones – no necesariamente para hacer arte. Traten estas técnicas divertidas para mejorar su habilidad de hacer observaciones y hacer sus propias ilustraciones científicas. Puedes sorprenderte con lo que puedes crear.

Materiales

Papel

Lapiz (o pluma)

Objeto para dibujar (este puede ser un artículo de hogar como un salero o hasta puede ser tu mano menos dominante)

Página de Estrella de Mar (página 4)

Opcional: acceso al Internet

Opcional: regla

Opcional: Un reloj automático

Instrucciones

1. **Dibujo de Contorno Ciego:** Artículo de hogar!
 - a. Este calentamiento te ayudará a concentrarte en dibujar lo que ves, en lugar de lo que crees que está allí. Solo hay dos reglas: ¡no levantes el lápiz del papel y no mires tu dibujo hasta que hayas terminado!
 - b. **Escoge el artículo** de hogar que te gustaría dibujar. Trata de escoger algo que sea más pequeño que una hoja de papel.



*Blind contour of
a cup*

- c. **Mira tu objeto y dibuja**, manteniendo la punta del lápiz encima del papel. Trata de capturar el contorno del objeto y los detalles más importantes. Tu dibujo probablemente se va a ver extraño o gracioso, pero este ejercicio ayuda a conectar tus ojos a tu mano que usas para dibujar.
- d. **Opcional:** Pon tu reloj automático para 5 minutos mientras dibujas.

2. **Dibujo de forma:** Animal de la Marea

- a. **Con el permiso de un adulto para ir en línea, elige** uno de los modelos de animales de la marea en 3D y encuentra un ángulo que te gusta: Estrella Ocre, Caracol Marino, Abulon Rosado, Almeja de Boca Abierta, Erizo de Mar Rojo (O escogas otro artículo de hogar).
- b. Antes de que empieces a dibujar, trata de **desenfocar** tu visión un poquito e identifica unas de las formas en el objeto. Por ejemplo un triángulo en la punta del brazo de las estrellas del mar, o un oval para el remolino de la concha.
- c. **Dibuja** tu objeto usando formas simples que puedas ver. Puedes ver tu hoja de papel, pero acuérdate de ver tu objeto antes de agregar a tu dibujo.

3. **Observando Variaciones:** Página con la Estrella del Mar

- a. **Imprima** página 4. Desafía a un amigo(a) o miembro familiar a acompañarte en esta actividad.
- b. **Escoge secretamente** una especie. Todas las imágenes son de la misma especie, la Estrella Ocre, pero individuales se pueden parecer un poco diferentes. Esto puede ser por su genes, o su medio ambiente. Por ejemplo, una estrella de mar anaranjada puede dar su color anaranjado a su cría. O, una estrella de mar que tiene acceso a más comida puede crecer más grande.
- c. **Dibuja** tu especie. Trata de empezar con formas simples, después agregando detalles. ¿Puedes mostrar textura? ¿Hay algo único que tiene tu especie?
- d. **Desafío:** Cuando estás satisfecho con tu dibujo, cambia papeles con tu amigo(a) o miembro de familia, y ve si puedes identificar la especie que escogieron.
- e. **¿Cómo te fue?** ¿Qué cambios puedes hacer a tu dibujo que haga más fácil identificar tu especie?
- f. **Opcional:** Haz cualquier cambios a tu dibujo y trata el desafío de nuevo.

4. **Extensión:** Tu selección

- a. Ya que has tenido práctica, elige otro modelo de 3D para dibujar o traigas tus materiales de dibujo a una marea o lugar con cosas vivientes (plantas o animales, o hongos) que está cerca de donde vives.
- b. **Escoge** una especie para dibujar usando las técnicas que has practicado. Empieza con formas y contornos, y después llena los detalles. Si prefieres, dibuja cercano tu detalle favorito de la especie, como una flor en una planta o el diseño en la concha.
- c. **Nombrea** los detalles que notas. ¿Cuáles características te ayudan a identificar esta especie?
- d. **Mide** tu especie con una regla, o compáralo con el tamaño de tu mano o tu lápiz. ¿Qué tan grandes son los detalles diferentes? Por ejemplo, quizás el remolino más pequeño de las conchas es del mismo tamaño que tu borrador.
- e. **Dale un título** a tu ilustración y recuerda firmarlo.

Has creado una ilustración científica que te de orgullo? Mandenos una foto de tu creación a scienceathome@calacademy.org

1



2



3



4





Sea Star Anatomy Puzzle

How does a sea star hold on to a rock as the tide comes in? And how can it open clam shells without using tools? Take a tour of the insides of these tough intertidal invertebrates and assemble your own model to find out.

Materials

Scissors

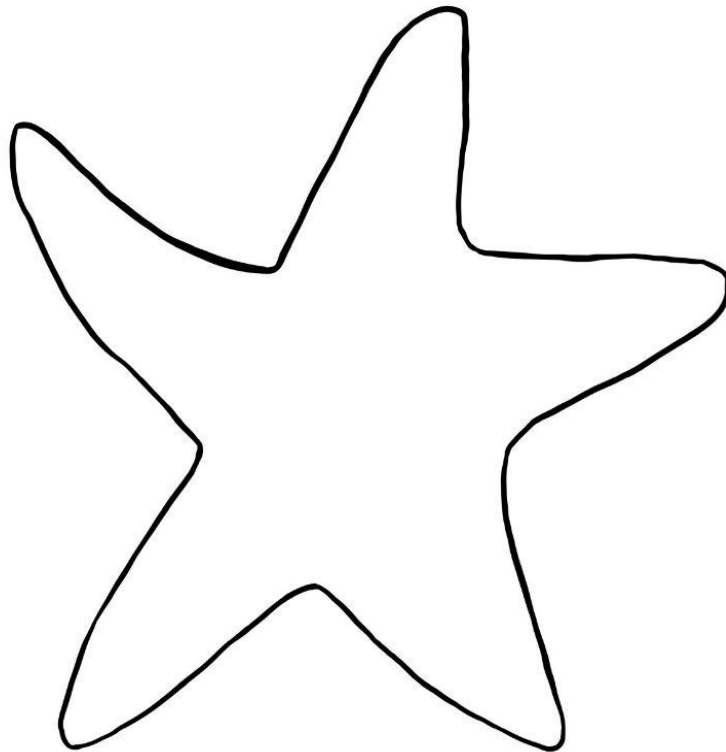
Print-out templates (pages 2-3)

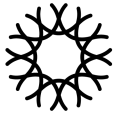
Crayons or colored pencils (optional)

Directions

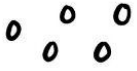
1. *Optional:* **Watch** the “Sea Star Anatomy” video to learn about what’s going on inside a sea star with Academy volunteer Aneeka.
2. **Print** and **color** the sea star silhouette (page 2) and sea star anatomy pieces (page 3).
3. **Read** the descriptions next to the anatomy pieces (page 3).
Based on the clues, where do you think they belong in the sea star’s body?
4. **Cut out** the sea star (page 2) and anatomy pieces (page 3).
5. **Assemble** the sea star anatomy puzzle by arranging the puzzle pieces on top of and below the sea star silhouette. Some pieces will overlap one another.

Sea Star Silhouette





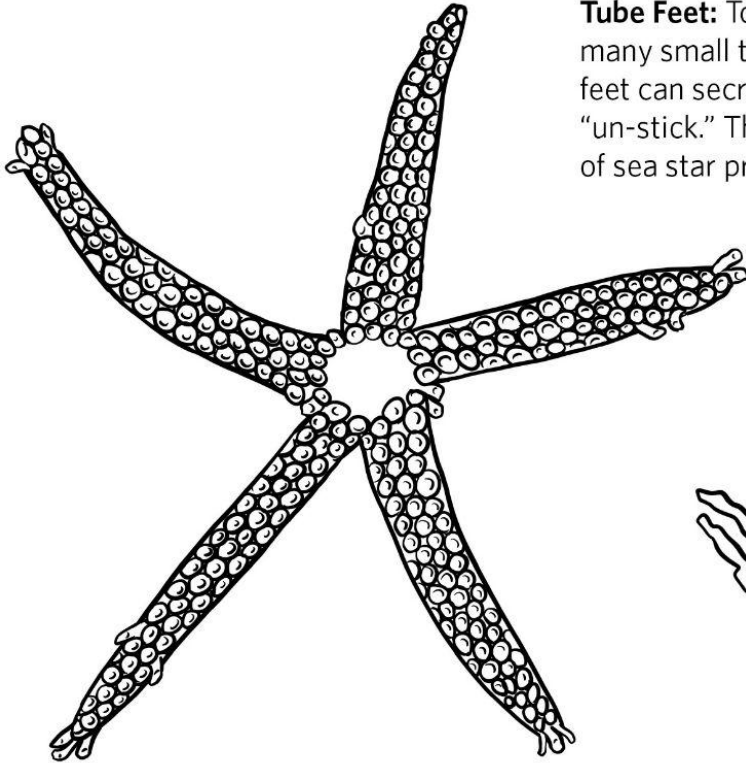
Sea Star Anatomy Pieces



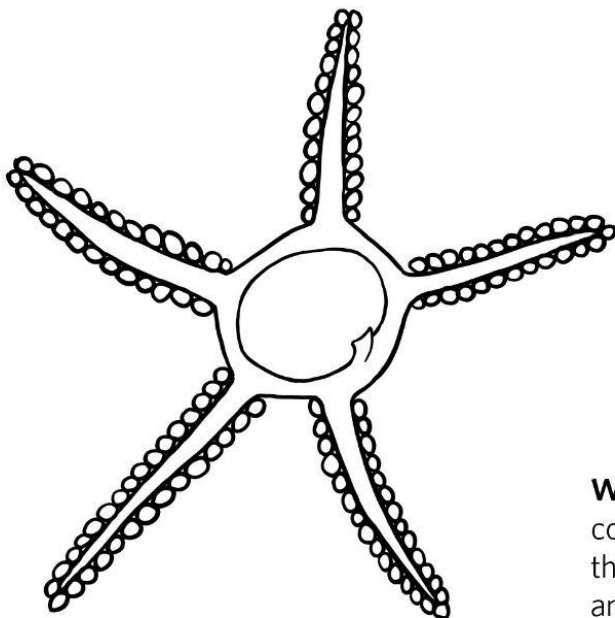
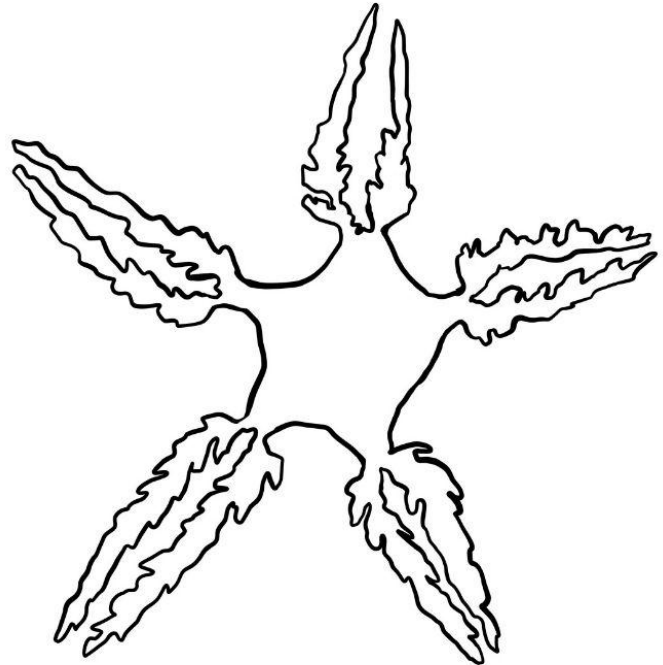
Eyespots: Sea stars have an eyespot at the tip of each arm that allows them to sense light and dark, and find their prey.



Madreporite: This spot on the top surface of the sea star brings water into its water vascular system. A small canal connects it to the *Ring Canal*.



Tube Feet: To move, sea stars can push and pull water through many small tube feet on the underside of their bodies. Tube feet can secrete a glue-like adhesive, as well as a substance to “un-stick.” They are helpful for gripping then opening the shells of sea star prey, like clams!



Stomach and Digestive Glands: A sea star’s mouth, in the center of the bottom surface of its body, connects directly to its stomach. The sea star can push its stomach outside of its body to start digesting food before pulling it back in. The digestive glands in the sea star’s arms absorb the vitamins the sea star needs from its prey.

Water Vascular System Canals: The central *Ring Canal* connects the *Radial Canals*, which are found in each arm of the sea star. The small circles on the ring canals show the ampullae, part of the tube feet.



California Coast

From the rocky shore to the kelp forest, California's coast is home to a wide array of living things. Can you spot:

California Mussels: Each mussel has two shells, so they're in the group of soft-bodied mollusks called *bivalves*, along with clams, oysters, and other similar animals.

Chiton: This oval-shaped mollusk's 8 plates of armor overlap, protecting its soft body underneath.

Double Crested Cormorant: These seabirds are excellent divers, and can be found drying their wings while taking a break on land.

Giant Green Sea Anemone: Like their relatives the jellyfish, anemones have stinging cells in their tentacles to help catch their prey.

Giant Kelp: Kelp forests are important habitats for ocean life along the California coast. Giant kelp has air pockets to keep the leaves near the surface, where the sun is the brightest.

Ochre Sea Star: These sea stars can open the shells of their preferred prey, mussels, using tiny "tube feet" on the underside of their five arms.

Octopus: These clever creatures are in a group of mollusks called *Cephalopods*, along with squid, nautilus, and cuttlefish.

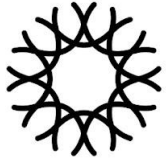
Opalescent Nudibranch: This fabulous sea slug has an ice blue body with bright orange tentacles called *cerata*.

Red Abalone: Known for their iridescent shells, these snail-like animals are popular prey for ocean animals and people alike.

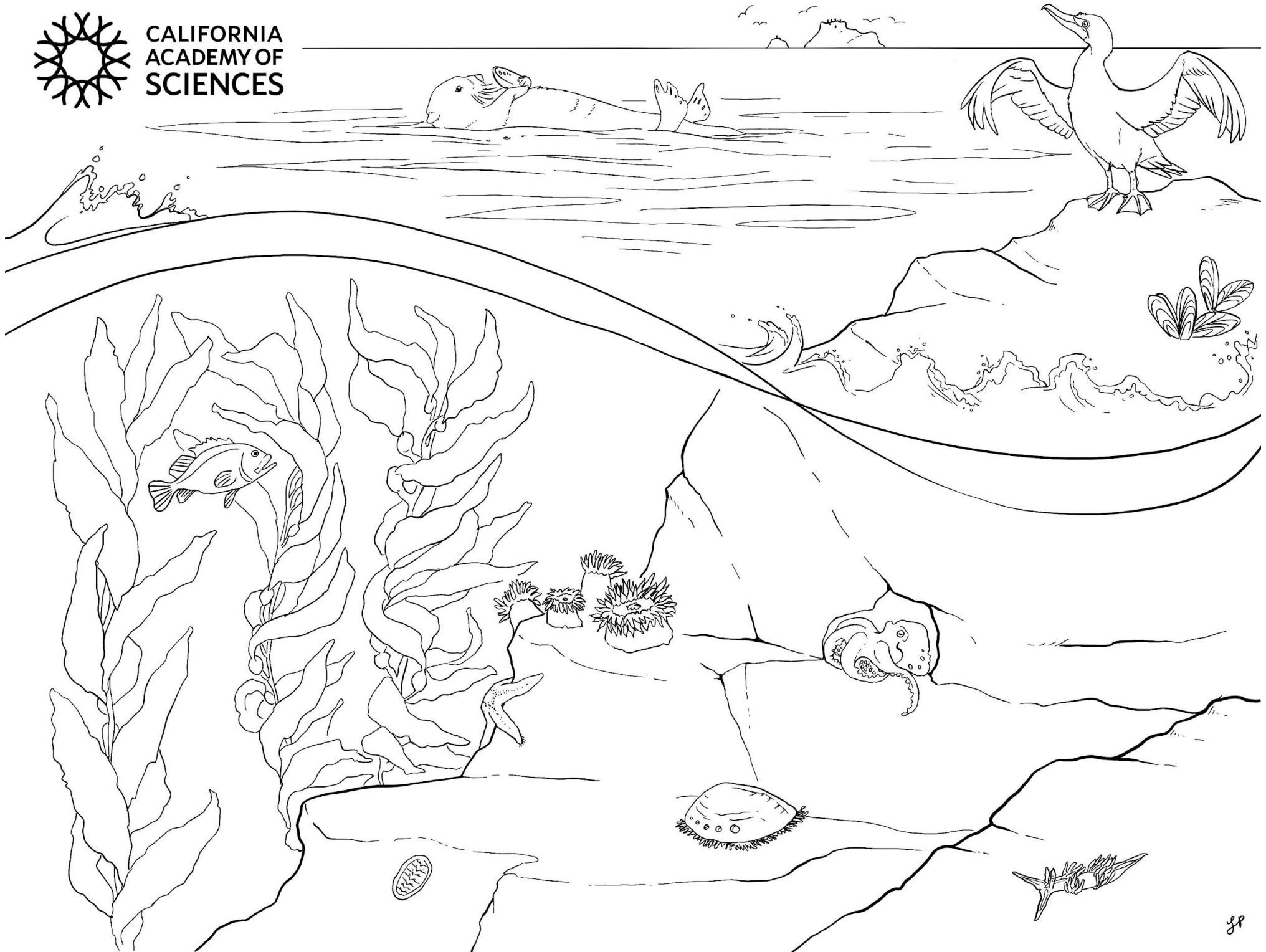
Southern Sea Otter: With the densest fur of all mammals, sea otters have up to one million hairs per square inch.

Yelloweye Rockfish: These fish are among the longest lived of the rockfishes—they can live up to 150 years!

Art by Louise Prescott for the California Academy of Sciences.



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Costa de California

Desde las costas rocosas a los bosques de quelpo, la costa de California es hogar de una gran variedad de organismos vivos. Puedes encontrar:

Mejillones de California: Cada mejillón tiene dos conchas, y por eso son puestos en el grupo de moluscos que tienen el cuerpo suave, los bivalvos, junto con las almejas, ostras, y otros animales similares.

Chiton: Este molusco de forma oval tiene 8 placas de armadura que se superponen y protege el cuerpo suave que está debajo.

Cormorán de doble corona: Estas aves del mar son buscadores excelentes, y se pueden ver secando sus alas mientras descansan en la tierra.

Gigante anémona verde del mar : Como sus parientes, las medusas, anémonas tienen células que pican en sus tentáculos que les ayudan a capturar su presa.

Quelpo gigante: Bosques de quelpo son habitación importantes para la vida marina alrededor de la Costa de California. El quelpo gigante tiene bolsas de aire que mantiene sus hojas en la superficie, donde la luz del sol es lo más brillante.

Arte de Louise Prescott para la Academia de Ciencias de California (California Academy of Sciences)

Estrella de mar ocre: Estas estrellas de mar pueden abrir las conchas de sus presas preferidas, mejillones, usando sus pies ambulacrales o "pies de tubos" que están en la parte inferior de cada de sus cinco brazos.

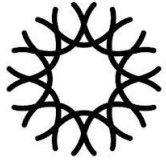
Pulpos: Estos animales inteligentes están en un grupo de moluscos llamado Cephalopoda que incluye calamares, nautilus, y sepias.

Nudibranquios opalescente: Estos babosas de mar fabulosos tienen un cuerpo de color azul como el hielo con tantáculos que son anaranjado brillantes que se llaman *cerata*.

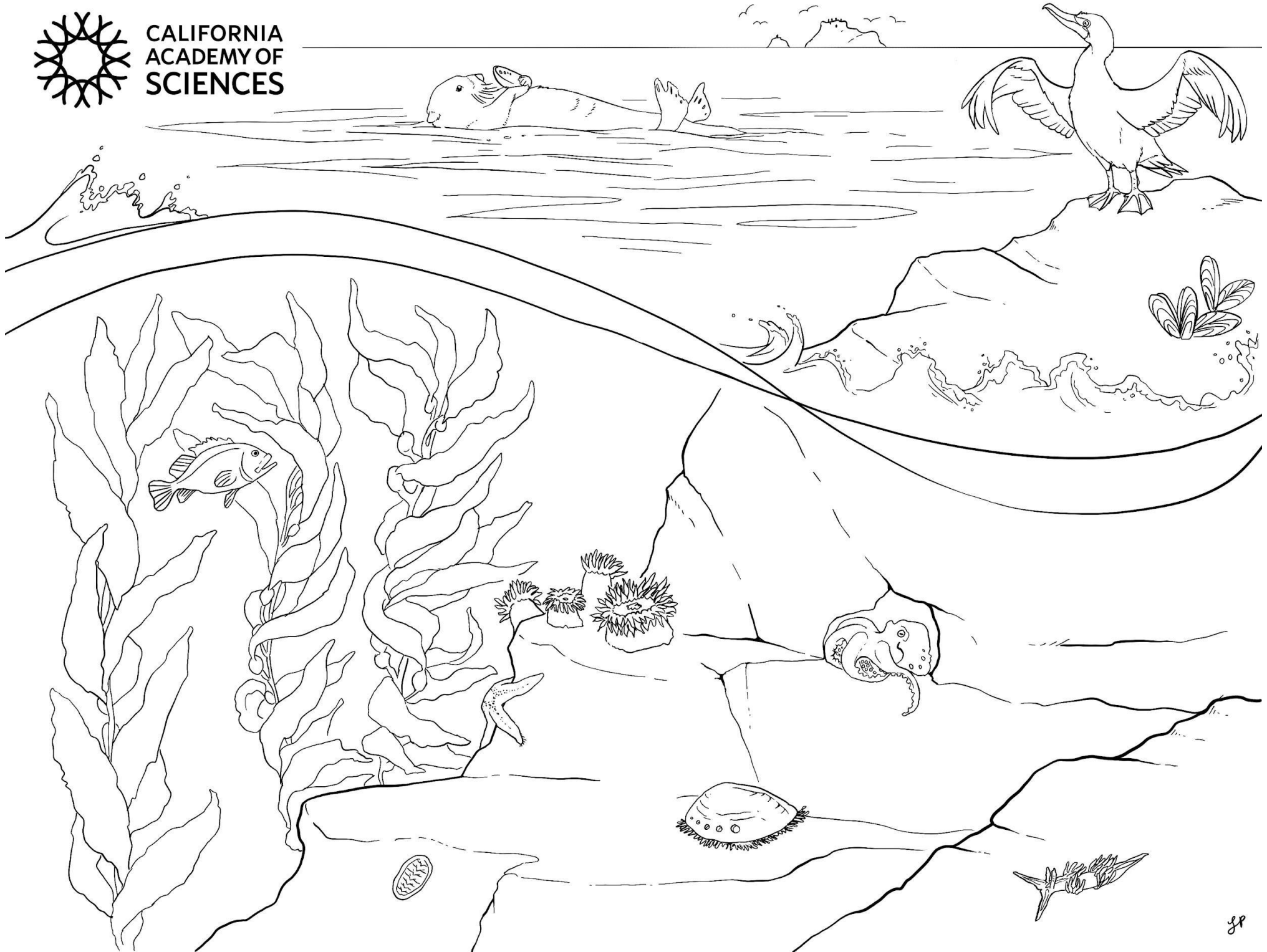
Abulón rojo: Reconocidos por sus conchas iridiscentes, estos animales que son parecidos a caracoles son presas populares entre ambos animales marinos y humanos.

Nutria marina del sur: Con el pelaje más denso entre todos los mamíferos, las nutrias del mar tienen hasta un millón de pelos en cada pulgada cuadrado.

Pez de roca de ojo amarillo: Estos peces se encuentran entre los peces de rocas que viven lo más longevo-pueden vivir hasta 150 años!



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Shifting Sheephead

California sheephead live off the coast of Southern California and Mexico. Like other fish in the wrasse family, they are all born female. However, when males are scarce and they're big enough, some of them will actually *become* male! This process can take between two weeks and several months and not only changes their sex, but their colors, size, and the shape of their head. Create a paper slider that demonstrates the female sheephead's transition to male.



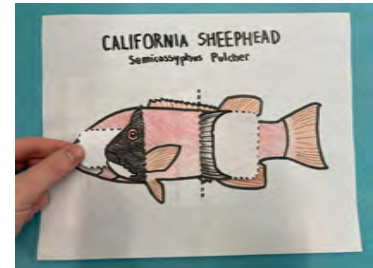
Materials

Scissors
Print out templates (page 3 and 4)
Crayons or colored pencils

Directions

1. **Print out** the coloring templates on page 3 and 4 on separate pieces of paper.
2. **Color in** the fish on both templates. Look at the reference photos on page 2 or do your own research to decide how you want to color. The female sheephead coloring sheet is the fish on page 3, and the male is the divided fish on page 4.
 - a. *Optional:* Add a background around the female sheephead. For example, draw and color in the kelp forest habitat where these fish usually live.
3. **Cut out** the two male sheephead pieces from page 4. Cut along the outside border and the dotted lines to ensure that you have easy-to-pull tabs.

4. **Cut along** the dotted lines on the female sheephead, making sure to only cut the dotted lines in the middle of the paper. To make this easier, gently fold the page in half and start the cut at the crease.
5. **Insert** the male sheephead pieces into the openings you just cut across the female sheephead one at a time, pull-tab first.
6. **You're done!** You've demonstrated some of the visible changes a female sheephead goes through as it transitions to become a male. What differences do you notice between the two? In addition to the changes you see here, the male sheephead will grow much larger and exhibit more territorial behavior.



Reference Photos

Male Sheephead

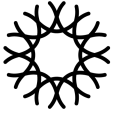


"California Sheephead (*Semicossyphus pulcher*)" by
Matt Elyash, California Department of Fish and Wildlife
CC-BY 2.0

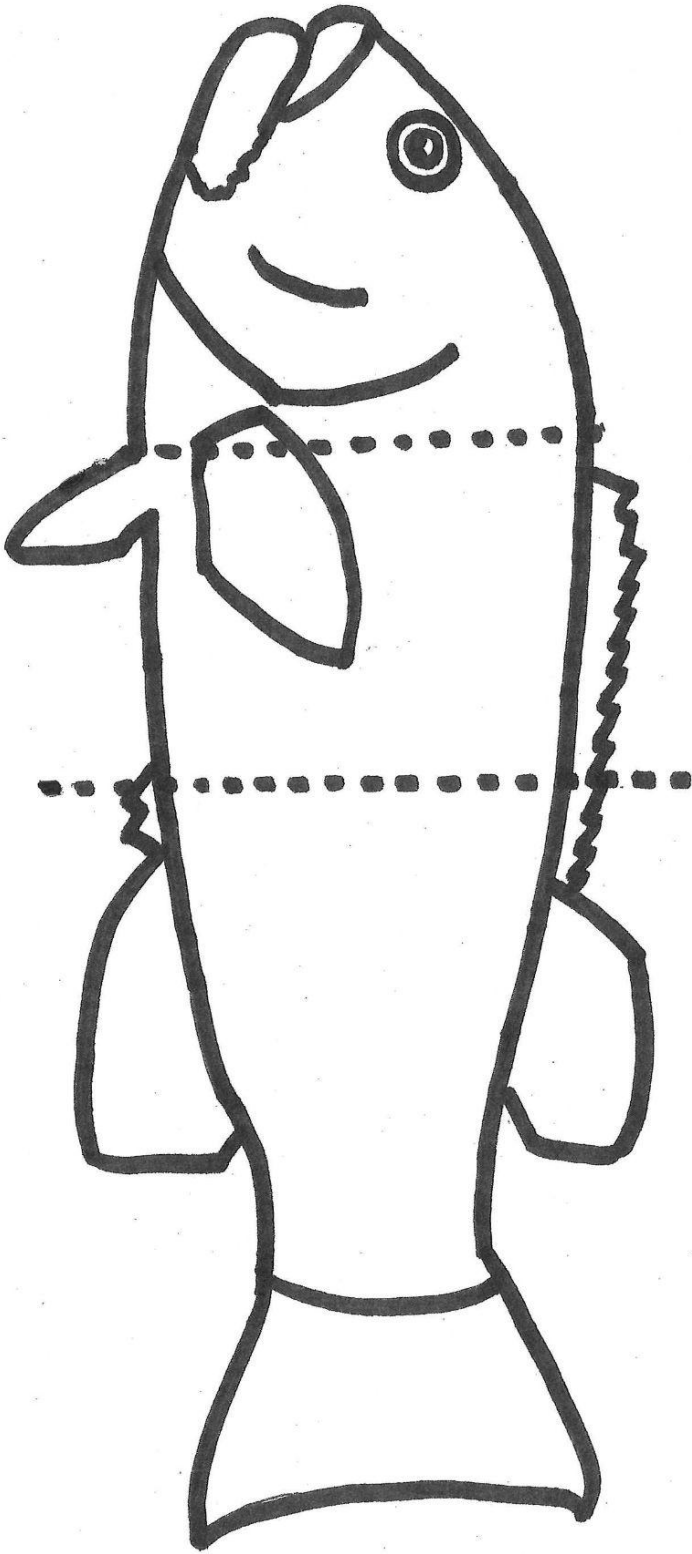
Female Sheephead



"Female CA Sheephead" by Dana Roeber
Murray, Heal the Bay
CC BY-NC-SA 2.0

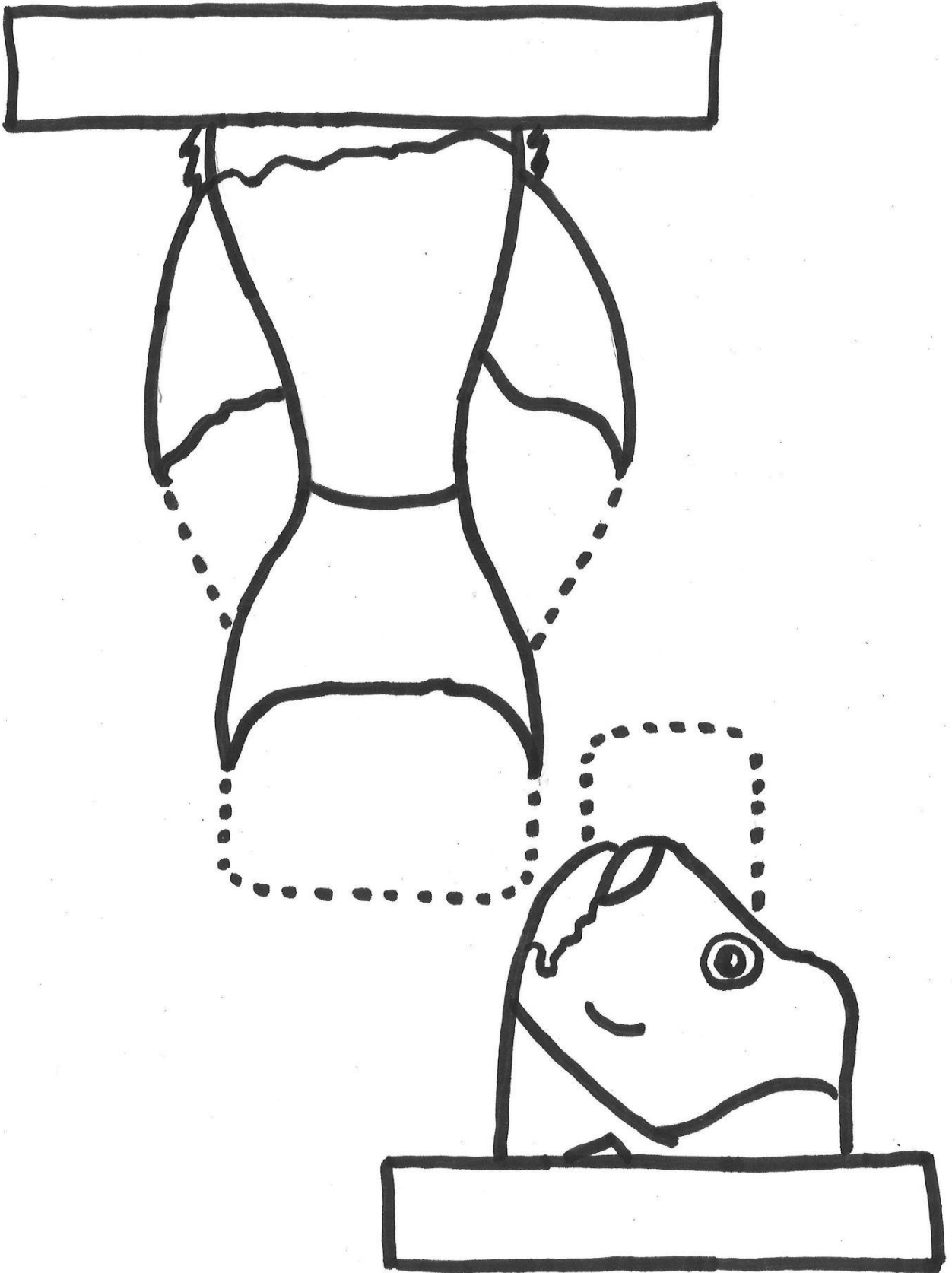


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CALIFORNIA SHEEPHEAD

Semicossyphus pulcher





Oil Spill Clean-Up!

The energy we use to power and manufacture our lives often comes from burning petroleum, also known as crude oil. Petroleum can spill into surrounding ecosystems while being refined or transported, with devastating effects. In this activity, you will simulate an oil spill and create your own strategy for cleaning it up.

Materials

Oil Spill worksheet (page 3)
Large plastic tub
Water
3-4 tablespoons olive oil
Habitat items:
rocks or clay
sticks
moss, lettuce, or other plants
feathers, furry fabric, or toy animals

Clean-up tools:
12" pieces of string
sponges
cotton balls
spoons
dish detergent
optional: eyedroppers
Optional: paper towels

Directions

1. **Print** the Oil Spill worksheet (page 3)
2. **Create your habitat:**
 - a. **Place** rocks or clay in the plastic tub to form an island tall enough that it will be partly out of the water when the tub is filled.
 - b. **Add** "plants" (sticks, lettuce, moss, etc) and "animals" (feathers and fake fur). Some can be on the island you made, but most should be in the water.
3. **Fill your tub** with a couple inches of water.



4. **Pour** the olive oil over your island, water, and habitat items to simulate an oil spill. Often, spills occur in the ocean from ships or underwater pipes and the oil is brought to shore by waves and currents.
5. **Observe and record** what you notice on your Oil Spill worksheet. How is each material reacting with the oil?
6. **Use** each cleaning supply item to remove or separate oil from the rocks, water, and habitat items. What do you notice?
7. **Record** how each cleaning tool works on your worksheet. Were some methods and cleaning supplies better to clean certain materials than others? Did what worked for rocks also work for feathers?
8. **Imagine** that instead of craft materials, oil spilled onto the fur and feathers of real animals. Oil can ruin fur's ability to keep an animal warm and undo the feather's ability to be waterproof, exposing animals to harsh elements. Whales and dolphins can accidentally breathe in oil when coming to the surface, and many other animals, including sea turtles, may accidentally eat or drink the oil. What other effects might there be of both the spill and the cleanup? At this time, burning fossil fuels like crude oil is still the primary way to make and power many things in our daily lives, from making plastic products to fueling cars. What can we, as humans, do to avoid these problems in the future?





Slippery Shores: Oil Spill Worksheet

Name: _____

Use this table to record how the habitat materials interact with the oil.

Material	Water	Rock	Feather	Stick	Fur	Plants
Reaction with Oil						

Use this table to evaluate each of the cleaning tools.

Cleaning Tool	Pros	Cons	What habitat material does it clean the best?	What effect does it have on the environment?
String				
Sponge				
Cotton Ball				
Spoon				
Dish Soap				
Eyedropper				