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Overview: Inverts are Everywhere

Ocean Discovery Unit

Guiding Concept: Students learn that invertebrates can be found everywhere and that science leaders study them in many different ways.

Goals:

Students build the belief:

- they can recognize science;
- science is important;
- science has relevance for their lives;
- they can do science;
- challenges can be opportunities to learn and grow, rather than permanent obstacles;
- a career in science is a possibility for them; and
- they can make a difference.

and they can ACHIEVE in science through:

- improved understanding of scientific concepts and process; and
- positive academic performance.

NGSS Alignment

Next Generation Science Standards:

Cross Cutting Concept:

Systems and systems models – students understand that a system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. They can also describe a system in terms of its components and their interactions.

Overarching Responsibilities of Fellows:

- Set-up and breakdown of supplies for all lessons.
- Classroom management & timing of lesson.
- Execution of all lesson material in this curriculum.
- Lead discussions & ask guiding questions to get students thinking about science.
- Use Belief and Science Discovery Process language during lesson.
- Provide rules for activities.
- Encourage participation from all students to create an inclusive environment.
- Determine floor management with team BEFORE the start of the lesson.
- Always using the principles of Accountability – Safety – Communication.
- Model whatever you are asking the students to do.

Invertebrates Are Everywhere Story

I am thrilled to embark on my next adventure with Ocean Discovery Institute by joining this year's Out of School camp! Over the years, Ocean Discovery has helped me believe that I can do science and become a science leader.

On the first day of camp, I meet the Ocean Discovery staff and other student science leaders. We take part in a Science Leader Challenge in the canyon, working together to complete a scavenger hunt and open clues that reveal our mission for the week. By the end of the challenge, I've made new friends, learned that we'll be studying invertebrates, and discovered that they live right here in our canyon. I'm excited because invertebrates seem so cool!

Throughout the week, we explore many different habitats where invertebrates live and discover how science leaders study them. At the rocky seashore, we meet live invertebrates like sea stars and snails, then design clay models to test which shapes can survive crashing waves. In the deep ocean, we do a squid dissection to learn about the amazing adaptations that help them survive in such a harsh environment. Later in the week, we find out how drones are used to study invertebrates living far out in the open ocean — so cool!

On the final day, we put our science into action by removing invasive plants from the canyon. We learn that invasive plants take up space and resources that native plants — and the invertebrates that depend on them — need to survive. My team works hard, and together we remove a lot of invasive plants. It feels great to know we've made a difference for our invertebrate friends.

I had so much fun this week, and I can't wait for my next Ocean Discovery adventure!

External Communications

Inverts are Everywhere Camp

Dive into Discovery at Our Invertebrates Are Everywhere Camp!

During this camp experience, students will:

- **Embark on a Canyon Quest:** Kick off the week with a Science Leader Challenge, working in teams to complete a scavenger hunt and uncover their mission — to explore the world of invertebrates and learn all about how science leaders study these fascinating creatures.
- **Investigate Rocky Seashore Life:** Learn about the rocky seashore and meet live invertebrates like sea stars and snails, then test model designs to see which shapes can survive crashing waves.
- **Explore the Deep Sea:** Conduct a hands-on squid dissection to learn about incredible adaptations that help animals survive the cold, dark, high-pressure deep ocean.
- **Jellies in the Sky:** Discover how drones help science leaders study invertebrates in the open ocean and practice drone-flying skills themselves.
- **Make a Difference:** Work together to remove invasive plants from the canyon, helping protect native plants and the invertebrates that depend on them.
- **Build a Science Leader Community:** Connect with new friends, enjoy healthy snacks, and reflect on the week's adventures through creative activities.

Schedule

Monday/ Friday Schedule:

PM Time	Activity
3:00p – 3:30p	Check-In / Snack Time (30)
3:30p – 3:45p	Community Building (15)
3:45p – 4:40p	Science Lab (55)
4:40p – 4:50p	Snack Break (10)
4:50p – 5:20p	Reflection / Believe Survey (Fridays) (30)
5:20p – 5:30p	Clean-up or awards (10)

Tuesday-Thursday Schedule:

PM Time	Activity
3:00p – 3:30p	Check-In / Snack Time (30)
3:30p – 3:50p	Community Building (20)
3:50p – 4:10p	Science Leader (20)
4:10p – 5:00p	Science Lab (50)
5:00p – 5:10p	Snack Break (10)
5:10p – 5:25p	Reflection (15)
5:25p – 5:30p	Clean-up (5)

Day 1: Observation – Canyon Invertebrates

Supplies:

*For one group of 10 students – multiple all supply numbers based on the number of groups expected.

Technology:

- Large Smart Board with "CI Inverts Are Everywhere Camp" PPT loaded to desktop
  - If a guest speaker joins - connect a speaker, microphone, microphone stand, and camera.
  - If a video will be shown - connect the speaker.
  - *PLAZA DEL SOL LAB ONLY* - connect the lavalier to speaker for instructor.

Community Building

- N/A

Science Lab:

- Supply Lost and Found (1)
- Invertebrates Are Everywhere Poster (will be used every day of the program)
  - Made from a large piece of butcher paper with a drawing including the canyons, rocky seashore, open ocean and deep ocean.
  - Labels for "Invertebrates Are Everywhere" Poster
    - Laminated in a large font "Invertebrates Are Everywhere"
    - Laminated in a slightly smaller font "Canyon", "Rocky Seashore", "Open Ocean", "Deep Ocean" "Observation", "Experiment", "Genetics", and "Dissection"
- Word Wall
  - "Word Wall" written in large letters at top
  - Laminated words in a large font:
    - Invertebrates – an animal without a backbone
    - Family – a group of people that care for you
    - Science Leader – A person of any age who uses science to make a difference in their community and in our world
    - Math Person – a person who does math = everybody!
- Student bins (used throughout the week) (1/student):
  - Science notebook (1)
  - Colored pencils (1 set)
  - Pencil (2)
  - Eraser (1)
- Fellows Teaching Bin (used throughout the week (1/group):
  - Painter tape (1)
  - Extra pencils (10)
  - Extra colored pencils
  - Dry erase markers (4)

- White board eraser (1)
- Spray bottle (1)
- 1st aid kit
- Ouch reports (a bunch)
- Incident reports (a bunch)
- Coloring pages (variety) (20)
- Believe Surveys (1/student)
- Certificates (1/student)

- Science Leader Challenge (2 of each item/group)
  - Backpack (1/group)
  - Science Leader Challenge card (on Canva) (laminated) (1/group)
    - Tiny Envelopes (9/card)
      - Glue a tiny envelope onto each square of the Scavenger Hunt card so envelopes create a 3x3 grid.
      - On each envelope glue a laminated card with one of the following scavenger hunt items:
        - Find an animal with at least two different colors on its body.
        - Find an animal with wings.
        - Find an animal living under a rock that is smaller than a quarter.
        - Find an animal that rolls up into a ball when you gently touch it.
        - Find an animal on a plant.
        - Find an animal with more than four legs.
        - Find an animal with spots.
        - Find an animal with a shell.
        - Find an animal smaller than a dime that is using camouflage to protect itself.
    - Tiny Clues for Science Leader Challenge Card (cut up and laminated) (1 set/group)
      - Place each tiny clue inside an envelope on the Science Leader Challenge Card.
    - Spanish Translation of Tiny Clues for Science Leader Challenge (1/group)
  - Dry erase marker (1/group)
  - Blue bucket (1)
  - Gloves (2 pairs)
  - Hand lens (1/student)
  - Microscope (1)
  - Fabric for headbands (different colors for each group) (1 student + 1 adult)

Set Up

- Write daily agenda on white board.
- Set up technology and test for Zoom call with science leader.
  - Check sound.
  - Check that the camera shows as many students as possible.
- Set up visual materials:
  - Open "OS Inverts are Everywhere" PPT slides and test links for the day.
  - Set out Word Wall words for the day.
- Science Lab
  - Prep materials for lesson.
  - Double check that all your Science Leader Challenge Card envelopes have a clue inside.

Check-In/Snack Time

Objective: Students settle into the space, get a nutritious snack and get to know one another and Ocean Discovery staff.

Questions: (**SLIDE**)

- What is your favorite ocean animal and why?
- What is one fun fact that you would like the group to know a about you?
- What's one thing you are looking forward to this week?

Community Building

Objective: Students learn each other's names and establish belief that they are a unique individual contributing to the community of science.

Activity:

- Introduce Community Building: (**SLIDE**)
    - Every day we start with Community Building which is a way for us to get to know each other and strengthen our team.
    - Being at OS Camp is a way to meet new people, make new friends, and get to know friends even better!
- Name whip
    - Stand in a circle.
    - Each person says their name loudly and clearly for all to hear.
    - Go around the circle 2-4 times. Change directions.
- Who Is it?
    - Stand in a circle.
    - One person is in the center, they close their eyes and spin in a circle with their arm extended until they stop.
    - Whoever the person in the center is pointing at immediately squats down.
    - The person to the left and right of the person squatting race to say the name of the person who is squatting.
    - Whoever says the name of the person squatting first stays in the circle the other person changes place with the person in the center.
    - Repeat the process until time is up.
    - Extension: The game is played mostly the same way, expect when the person squats the two people to the left and the right race to the say the person's name across from them the fastest (i.e. the person on the left wants to say the name of the person on the right faster than the person on the right says their name.).
- Final Name Circle.
    - Everyone in the group says the name of each person in the circle together.
    - Go around the circle slowly so people have time to think of the name before it is said.

Science Lab

Learning Objectives: Students will:

- learn they are part of the Ocean Discovery family and that the Living Lab will be their home for science learning this week,
- be able to describe what a science leader is,
- be able to name at least one part of the Science Discovery Process (Explore and Wonder, Make a Difference, etc.),
- be able to define what an invertebrate is and describe at least one example,
- work as a team to complete the Science Leader Challenge,
- use their observation skills to find living things in the canyon, and
- begin to recognize that invertebrates can be found in many ecosystems, including their local canyon.

Timing

- Introduction (10 min)
- Science Leader Challenge (35 min)
- Debrief (10 min)

Introduction

- Introduce Community Agreements (**SLIDE**)
    - At Ocean Discovery we believe everyone should Be Their Best Self.
    - To **Be Your Best Self**, you should:
        - **Be curious!**
            - Ask questions, make observations, and share your thoughts and ideas.
        - **Be respectful!**
            - Respect people, living things, and the environment around you.
        - **Be safe!**
            - Take care of yourself and others.
    - Ask students to give a silent thumbs up if they can agree to be their best self when working with Ocean Discovery.

- Pre-existing knowledge about Ocean Discovery
    - Ask students: (**SLIDE**)
        - Who has done an Ocean Discovery program before? What did you do?
        - Who has had Ocean Discovery in school? Where did you go? What did you do?
        - How many of you have visited the Living Lab before?
    - The Living Lab is the home of Ocean Discovery Institute. (**SLIDE**)
        - We want you to feel like this place is your home while you are here.

- Introduce the Ocean Discovery Family (**SLIDE**)

- Whether you have participated in Ocean Discovery programs before or this is your first Ocean Discovery program, you are all part of the Ocean Discovery Family.
- At Ocean Discovery, we define a "Family" as a group of people who care about you.
- All around you are people who care about you – your instructors, the other Ocean Discovery staff, friends you already know and perhaps some new friends you will make this week.

- Introduce Word Wall (**SLIDE**)
  - Family is an important word we want to remember so we will place it on our word wall.
    - (Point to word wall.)
  - The word wall is a place where we can add new and important vocabulary words and their definitions.
    - Anytime you need to remember the meaning of one of these words you can look at the word wall to help you.
    - If you think there is a word that is important to remember please let me know and I will add it.
    - (Place "Family" on the world wall.)

- Introduce Science Leaders (**SLIDE**)
  - One of the most exciting things about being a member of the Ocean Discovery family is that each of us is a science leader.
    - Ask students: What do you a think a science leader is?
    - Define <u>Science Leader</u> – a person of any age who uses science to make a difference in their community and our world.
  - Breakdown the definition.
    - People of any age = all of us!
    - Make a difference in their community and our world = making the world and where we live a better place.
    - (Place "Science Leader" on word wall.)

- Science Discovery Process (**SLIDE**)
  - All science leaders use the Science Discovery Process.
    - It is how science leaders do science.
    - Let's take a look at the Science Discovery Process.
    - (Go through each part of the Science Discovery Process. Provide a brief explanation, show the movement, say the words and then have students repeat it back to you.)

- Make a Difference: *At the center of the Science Discovery Process is Make a Difference. Science leaders try to solve problems and work to make the world a better place. That's why Make a Difference in at the center!* (**SLIDE**)
  - **Dance move**: Hands over heart, then open your arms out to the world.
  - **Sound**: Make a difference!

- Explore and Wonder: *Science leaders are always exploring and wondering about how they can solve problems and make the world a better place. They ask lots of questions and make observations using their senses like seeing, hearing, touching, tasting and smelling.* (**SLIDE**)
  - **Dance move**: Crossed arms/rub your chin/ make a questioning face.
  - **Words**: Explore!

- Investigate: *Science leaders like to set up experiments and collect information to try and answer their questions or understand their observations.* (**SLIDE**)
  - **Dance move**: Hands up to eyes like binoculars & look side to side.
  - **Sound**: Investigate!

- Analyze: *Once science leaders collect information and data, they like to look for patterns and come up with explanations.* (**SLIDE**)
  - **Dance move**: Typing on keyboard.
  - **Sound**: Analyze!

- Communicate: *Science leaders know it is really important to share the things they learn with other people.* (**SLIDE**)
  - **Dance move**: Put your hand up to your mouth as if you are shouting/trying to amplify the sound.
  - **Sound**: Communicate (say it with your hand up to your mouth as if to amplify/shout)!

- Make a Difference: *Remember Make a Difference is at the center of the Science Discovery Process. Science leaders work to make the world a better place with the things they learn.* (**SLIDE**)
  - **Dance move**: Hands over heart, then open your arms out to the world.
  - **Sound**: Make a difference!

- Practice Science Discovery Process: (**SLIDE**)
  - Have students go through the series of Science Leader Dances while saying the words a couple of times.

- You can change it up by doing slow motion, speed up version, super quiet, super loud, etc.
- The Science Discovery process is a cycle and so it never ends but Making a Difference is always at the center of it!

Science Leader Challenge

- Introduce the Science Leader Challenge (**SLIDE**)
  - Since we are all science leaders we will participate in a Science Leader Challenge today.
    - The goal of the challenge is to figure out what we will be learning about this week.
  - To do this, each team will receive a Science Leader Challenge Card. (**SLIDE**)
    - There are nine envelopes on the card.
      - (Show an example.)
    - Each envelope has a description of something you and your team need to find in either the Rooftop Garden -OR- in the canyon.
    - Each time you find something that matches a description on one of the cards, your team will put a tally mark on that card using a dry erase marker.
      - (Demonstrate this.)
    - When your team gets three tally marks on any card, you may open up the envelope of that card to read the clue inside.
    - The clues will help figure out what we will be learning about this week.
    - Your goal is to open all the envelopes in the given time.
- Expectations (**SLIDE**)
  - Be Your Best Self
    - Be curious!
      - Ask questions and help your team find all the items on our challenge card.
    - Be respectful!
      - We travel as a team and stay together! Listen to others' ideas.
      - Do not open any envelopes until you get three tally marks on the card on the outside.
    - Be safe!
      - Walk in the canyon and stay on trails.
- Roles: (**SLIDE**)
  - Determine group roles.
    - Tally Person – marks off things the group finds on the challenge card.

- Clue Reader – reads the clues to the group.
- Leave No Trace Person – carries a blue bucket to collect any trash as we go.
- Navigator – decides which direction the group should go.

- Prep for Challenge.
  - Divide students into two groups.
    - Assign each group an adult.
  - Each group:
    - Give matching colored fabric ribbons to each student to wear.
    - Decide on roles in each group.

- Begin Activity:
  - (Walk students out to the canyon.)
    - Do a head count before leaving the lab.
  - (Throughout the challenge:)
    - Keep your group together at all times.
    - Do regular head counts.

- Complete the Challenge
  - Take the last five minutes to walk back to your classroom.
  - Congratulate students on completing the challenge!
  - (Collect Leave No Trace buckets.)

Debrief

- Introduce the theme of the week:
  - Ask students: What type of organism do they think they will be studying this week? (**SLIDE**)
    - If students seem stumped review some of the clues from the envelopes.
    - Invertebrates!

  - Ask students: What is an invertebrate? (**SLIDE**)
    - Invertebrates: Animals without a backbone.
      - Have students touch their spine – that is your backbone.
      - Are you an invertebrate? No.
      - (Ask students to put “Invertebrates” on the Word Wall.)
    - 6-8 Adaptation:
      - Breakdown the word “Invertebrate”
      - In = not/without
      - Vertebra = backbone

- Ask students: What are some examples of invertebrates?
  - If they don't refer to them, remind students of all the organisms they found to fill out their bingo card.

- Today we observed invertebrates using different types of tools:
  - Using our eyes – normal magnification. (**SLIDE**)
  - Using a hand lens – which magnifies most things x2.
    - Magnification means to make something look bigger.
    - When we say something is magnified x2 then it looks two times bigger.
  - Science leaders might also use a microscope to look at an invertebrate.
    - Most basic microscopes can magnify x4 to x40.
    - Ask students, how much bigger would a fly wing look at x4? X40?
  - Science leaders have extremely powerful microscopes called electron microscopes. (**SLIDE**)
    - This special microscope lets science leaders see things like viruses, bacteria, or the tiny parts inside a cell—things that are millions of times smaller than your fingernail!
    - This photo is a from an electron microscope which magnified the fly x3000!

- Introduce the Inverts are Everywhere poster.
  - Throughout the week we will learn about invertebrates and the many ways science leaders have figured out to study these diverse organisms!
    - All week we will add to this poster as we learn about different types of invertebrates and the places they live.
    - (Ask a student to add the laminated words "Invertebrates Are Everywhere" to the poster.)

  - Invertebrates live right here in our canyon, but did you know Invertebrates can be found Everywhere on our planet?
    - From canyons, to the deep sea, to the rocky seashore, to the open ocean, to Antarctica – Inverts are Everywhere!
    - Fun fact: 97 out of every 100 animals on Earth are Invertebrates!

  - Ask students: Where did we find invertebrates today? – The Canyon.
    - (Ask a student to add the laminated word "Canyon" to the poster.)

  - Today we used our observations skills to locate and learn about invertebrates.
    - (Ask a student to add the laminated word "Observations" to the poster)

- Science Leaders are Math Leaders. (**SLIDE**)
    - Did you know that science leaders are math leaders too?
        - It's true! You can't do science without math!
    - Can you think of a time when you did math today?
        - Counting (Tally marks)
        - Thinking about distances covered and time.
        - Magnification
    - You may be surprised to find out how much math you do already. (**SLIDE**)
        - Each of us does math every day, all day, most of the time without even realizing it!
        - Have you ever looked at a clock to figure out how much time is left in a class? How much time you have before you need to leave for a sports practice or a game? That's math!
        - Have you ever gone to a grocery store and looked at all the checkout lines to decide which one is shortest? That's math!
        - Have you ever walked into a store to buy something and tried to figure out the total cost of the item you want with tax, to see if you have enough money for it? – That's math!
    - All of us are math people!
        - (Ask a student to place "Math Person" on word wall.)
    - Three Principles of a Math Mindset (**SLIDE**)
        - At Ocean Discovery Institute we believe three things about math:
            - Everyone is a math person.
            - It's powerful to do math in a community.
            - Making mistakes is part of the process.
        - This week as we are doing lots of science, we will keep our eyes open for times when we are also doing math!
    - Great job science leaders!
        - Tomorrow we will continue learning about invertebrates!

Day 2, 3, or 4: Experiments – Rocky Seashore Invertebrates

Supplies:

*For one group of 10 students – multiple all supply numbers based on the number of groups expected.

Technology:

- Large Smart Board with "CI Inverts Are Everywhere Camp" PPT loaded to desktop
    - If a guest speaker joins - connect a speaker, microphone, microphone stand, and camera.
    - If a video will be shown - connect the speaker.
    - *PLAZA DEL SOL LAB ONLY* - connect the lavalier to speaker for instructor.

Community Building

- N/A

Science Leader

- Zoom link
- Curiosity Cube w/ pre-populated questions below (1/age group)
    - K – 2nd Grade
        - Do you have any pets?
        - What is your favorite animal?
        - What do you think is fun about being a science leader?
        - What tools do you use in your job?
        - What is your favorite food?
        - Why do you think it's important to protect the Earth?
    - 3rd – 5th Grade
        - If I want to be a science leader what is something I should start doing now?
        - Where are you from?
        - How do you use math in your job?
        - What was your favorite subject in school?
        - Have you ever faced a challenge in your life? What did you do about it?
        - What do you like most about being a science leader?
    - 6 – 8th Grade
        - What is the most difficult thing about your job?
        - Who do you admire/look up to?
        - Why did you choose the college you did?
        - What do you like to do on the weekends?
        - What is your favorite sports team?
        - Why do you think it's important for students from City Heights to become science leaders?

Visual Materials:

- Community Agreements stand
- Invertebrates Are Everywhere Poster
- Laminated words: “Rocky Seashore” and “Experiment”
- Word Wall laminated words:
  - Experimentation – to test something
  - Adaptation – something that helps an animal survive
  - Area – the total space taken up by a flat object.

Lab Materials:

- Painters tape (1)
- Live Invertebrates (3-4/group)
  - Each student should have the chance to interact with two animals. There can be multiples of a species, no one species should make up more than 50% of the organisms and greater diversity overall is optimal.
  - Best invertebrates for this lesson: Giant Keyhole Limpets, Ochre Sea Star, Chiton, Snails (the larger the better)
  - Invertebrates not to use for this lesson: Hermit crabs
- Small aquaria w/ lids (1/student)
- Dry rags (4)
- Dry towels (4)
- Large plastic bin (1)
- Bucket of clay (1)
- Laminated “Survivor” sign (1)
- Laminated “Non-survivor” sign (1)
- Rocky Seashore Models (1)
- Small piece (3’ x 5’) of plexiglass with 1” x 1” square graph paper attached to bottom (1)
- Large white board + easel (1)
- Dry erase marker (1)
- Outlines of rocky seashore invertebrates (pre-cut) (1/student)
- Small art supply plastic bins filled with colored pencils, crayons, and markers (4)
- Scotch tape rolls (4)
- Orange Home Depot buckets (12)

Set Up

- Write daily agenda on white board and set on white board stand
- Set up technology and test for Zoom call with science leader.
- Set up visual materials:
    - Open "CI Inverts Are Everywhere Camp" PPT slides and test links for the day.
        - Be sure to move past commercials for any videos.
    - Put up Word Wall Poster and set words for the day at instructor station.
    - Put up Inverts are Everywhere Poster.
- Ensure there are diverse invertebrates and enough for each student to have one.
    - Place each invertebrate in a small aquarium and place a lid on top.
- Place all aquaria back in the tank so that they stay chilled and aerated until they are needed for the lab.
- Place acrylic panel at an angle inside the large plastic tub (to create a "rocky seashore").
- Fill home depot bucket with water about 2/3 full.
- Divide clay into equal pieces (about 1in balls) one per student + 2 additional/adult and place back in the clay bucket.
- Wet two wash clothes and place off to the side with a dry towels and hand sanitizer (for students to clean clay off hands).
    - Enter student names randomly into first set of brackets.
- Set up a spot where you can lay out both the "Survivor" and "Non-Survivor" laminated cards with enough space to lay survivor and non-survivor clay invertebrates out after experiment.
- Prep small plastic art supply bins with pre-cut outlines of rocky seashore invertebrates, crayons, colored pencils and markers.

- Prep small plastic art supply bins with pre-cut outlines of rocky seashore invertebrates, crayons, colored pencils and markers.

Check-In/Snack Time

Objective: Students settle into the space, get a nutritious snack and get to know one another and Ocean Discovery staff.

Questions: (**SLIDE**)

- If you could have any superpower, what would it be and why?
- What is your favorite meal to eat or cook with your family?
- If you had an invertebrate as a friend what would you do together?

Community Building

Objective: Students continue to build belief that they are a unique individual contributing to the community of science.

Activity:

- Review Community Agreements (**SLIDE**)
    - (See Day 1)

- Nautilus of Knowing (**SLIDE**)
    - Expectations:
        - Stand in a circle.
        - One person starts in the center.
        - They complete the following statement out loud “My name is… and somethings I like is…”
        - Anyone in the circle who likes the same thing, will run up to the person in the center and link arms with them.
        - If more than one person runs up the first person to link arms stays and the other person returns to the circle.
        - The people in the center should create a spiral with the first person in the center – like a nautilus shell.
        - Statements cannot be repeated.
        - Continue the game until everyone is part of the Nautilus.
    - Debrief:
        - Ask students: What is something you learned about someone today?

- Review daily agenda on the white board.

Science Leader:

Objective of the Station: Students will meet a science leader, hear about their pathway to becoming a science leader, and have an opportunity to ask questions.

- Provide an overview of the Science Leader portion of the program.
    - Today we will meet virtually with a science leader.
        - Learn about their pathway to becoming a science leader, what they do in their work, and their passion for the ocean and the wetlands.
    - You will also have the opportunity to ask the science leader questions.
        - (If time allows: brainstorm questions students want to ask – write these on a whiteboard where everyone can see.)

- Introduce Science Leader.
    - Tell the students who they are about to meet (science leader's name) a science leader who (describe what they do in 1-2 sentences and where they work).
        - (Connect Zoom Call).
    - (Welcome the Science Leader.)
    - (Conduct the interaction as one would an interview.)
        - Interview tips:
            - You may change the order or modify the questions based on the Science Leader's responses.
            - If a Science Leader is answering a question that may need to be wrapped up, you can move to the microphone to signal that you want to speak.
            - After the Science Leader answers a question, in a sentence or two, reaffirm the point they are making and how it ties to the students' experience.

        - Interview questions asked by Fellow (~10 min):
            - Ask the first 2 questions:
                - Can you please introduce yourself and tell us about your job and what you love about it? (2 minutes)
                - Tell us about your pathway to your current job. For example, what got you interested in science, your education, etc. (2 minutes)
            - Allow students to ask questions of their own from each group (2-4 minutes).
                - If students are reluctant to ask, hand out the curiosity cube and let them roll and ask the question.
            - Last question to finish out the interview:
                - Students are investigating invertebrates in many ecosystems like the open ocean and the deep sea, and learning about the different ways

science leaders can learn more about invertebrates through techniques like dissection, experiments, and drones, why do you think this work is important? (2 minutes)

- (Have students say “Thank you!” and all clap for the science leader.)
- (Disconnect Zoom call.)

Science Lab

Learning Objectives: Students will:

- be able to define "rocky seashore" and describe at least one challenge animals face living there,
- be able to define what an adaptation is and give at least one example of an adaptation in a rocky seashore invertebrate,
- observe live rocky seashore invertebrates and make conjectures about adaptations they have for survival,
- use the Science Discovery Process to investigate how adaptations help rocky seashore animals survive strong waves,
- create and test a clay model invertebrate, then analyze results to identify survival traits,
- use math skills to measure and compare surface area of "survivor" vs. "non-survivor" models, and
- add new knowledge to the "Invertebrates Are Everywhere" poster to track learning throughout the week.

Timing

- Introduction (10 min)
- Live Invertebrates (15 min)
- Rocky Seashore Invertebrates: Experimentation (20 min)
- Debrief (10 min)

Introduction:

- Review the previous day using the Word Wall and Invertebrates Are Everywhere poster.
    - Potential questions include:
        - What kinds of organisms are we studying this week?
        - Where did we find invertebrates yesterday?
        - What method did we use to study invertebrates yesterday?

- Introduce Rocky Seashore. (**SLIDE**)
    - Today we will move closer to the ocean and explore invertebrates that live at the rocky seashore.
    - Ask students: What do you already know about the rocky seashore?
        - Rocky seashore: a coastal area made of rocks.

- Life at the Rocky Seashore (**SLIDE**)
    - Life at the rocky seashore can be physically demanding.
    - Let's watch a short video about the rocky seashore, while we are watching make observations about what you see.
        - (Play video.)
    - Animals who live there must deal with many things such as:

- Waves – get knocked off rocks, carried out to the open water, etc.
- Rocks moving around – get injured, lose a hiding place, etc.
- Rain – turning saltwater tide pools into freshwater tide pools.
- Water and lack of water – dry out, drown, etc.
- Sunlight – dry out, etc.
- Predators – escaping from animals that want to eat you
- Prey – finding food to eat, etc.

- Animals that live at the rocky seashore must be adapted to live there.

- Introduce/review adaptation. (**SLIDE**)
  - Define Adaptation: something that helps an animal to survive.
    - (Add "Adaptation" and definition to the Word Wall if you have not already.)
    - (Show Adaptations slide.)
    - Have students come up with examples of adaptations for a polar bear.
      - Fur – warmth
      - White fur – camouflage to catch prey
      - Claws – to catch prey, etc.

- Rocky Seashore Adaptations (**SLIDE**)
  - The animals that live at the rocky seashore also must have adaptations to help them survive life there, which we know is pretty tough.
    - For example: Compare high tide and low tide.
    - These images were taken at the exact same place.
    - You can see that the rocky seashore looks really different during high and low tides.
    - During high tide, the water covers the invertebrates, but most of the water is gone during low tide.
  - What could happen to the invertebrates if they aren't covered by water?

        - They could dry out—many marine invertebrates have soft, squishy bodies, and without water, they might dry out and die.

- Science Discovery Process
    - Today we will explore how invertebrates at the rocky seashore are adapted to waves by doing an experiment using the Science Discovery Process.
    - Question: (**SLIDE**)
        - As science leaders, we will use the Science Discovery Process to answer the question: What adaptations can help an invertebrate avoid getting knocked off the rocks by waves?
    - Investigation: (**SLIDE**)
        - Each person will build a model of an invertebrate that they think could survive at the rocky seashore.
        - You will then place your model invertebrate on our "rocky seashore".
            - (Show the model rocky seashore.)
        - I will then create a "wave" using this bucket of water.
            - (Hold up an orange Home Depot bucket.)
        - Any invertebrate that stays stuck on the rocky seashore will be considered a "survivor" while those knocked off will be "non-survivors".

<u>Live Invertebrates:</u>

- Before you create your model invertebrate, we will give you some time to look at some living examples of invertebrates from the rocky seashore. (**SLIDE)**
    - Expectations for invertebrates:
        - You may touch it gently with two fingers.
        - Be respectful of the invertebrates. Don't squeeze or pull them.
        - Be brave, as this your chance to learn more!
- We will place an invertebrate in front of you in a small aquarium. (**SLIDE)**
    - You will have ~3 minutes to observe your invert, try to focus on what adaptations might help these invertebrates survive the waves at the rocky seashore.

- After you have had a chance to touch/observe your invertebrate, make a quick sketch of that invertebrate in your science notebook.
    - (Have students open to "Science Lab-Rocky Seashore Invertebrates" page in their science notebook.)

- Divide students into groups based on the number of invertebrates you have.
    - Give students 2-3 minutes to touch and observe the invertebrate.
    - Give students 1-2 minutes to make notes and draw pictures in their science notebook.
    - Rotate animals until students have seen a minimum of two invertebrates.

<u>Rocky Seashore Invertebrates: Experimentation:</u>

- Hypothesis: (**SLIDE**)
    - Ask students: What is a hypothesis?
        - Hypothesis: an educated guess based on information you already know.\
    - You will have five minutes to create an animal that you think can survive at the rocky seashore using a piece of clay.
        - Be sure to consider what you observed when looking at our living rocky seashore invertebrates
        - Give each student a piece of clay.
        - Set digital timer for five minutes.
    - As students finish have them come up and add their clay invertebrate to the rocky seashore.

- Review Data Collection: (**SLIDE**)
    - (Once all clay animals are attached to the "rocky seashore" have students step backwards out of the "splash zone.)
    - Time to test your hypotheses!
    - (Take the bucket and create a "wave" by dumping the water over the entire panel.)
        - (BE CAREFUL not to create too strong of a wave that knocks everything off!)

- Data Collection:

- (Take the clay invertebrates that fell off and place next to the "non-survivor" laminated card.)
- (Take the clay invertebrates that stayed attached and place next to the "survivor" laminated card.)

- Analysis: (**SLIDE**)
  - We will now analyze our data to determine what kinds of adaptations can help animals survive at the rocky seashore:
    - Ask students to look at "survivors" to find similarities that helped them stay attached to rocky seashore after the wave. Potential questions include:
      - What similarities do you notice about the survivors?
      - What do you think helped these animals stay stuck to the rocks?

  - Large Sticking Area
    - Let's compare a survivor vs. a non-survivor.
      - (Choose one of each and place them on the graphed plexiglass and turn it over to show the side with the graphing squares.)
      - Ask students:
        - K-2:
          - Which animal has more area sticking to the glass?
            - Have students count boxes on graph paper.
          - How does that help the survivor?
        - 3rd-8th:
          - What do you notice?
          - Compare the survivor vs. the non-survivor using math.
            - Have students count boxes on the graph paper.
            - This is called area.
            - Area = the total space taken up by a flat object.
            - (Have a student add "Area" to word wall.)
          - How does that help the survivor?

    - Large Sticking Area

- Having a larger sticking area is an adaptation that can help animals survive at the rocky seashore.
- The larger the sticking area an animal has the better able it is to stay stuck to rocks and avoid being pulled off by waves.

- Two types of Large Sticking Areas we see at the rocky seashore include:
  - Muscular Foot (snails, chitons, etc.):
    - Kinesthetic movement: Curl arm to show muscle and point to foot. Say "Muscular foot!"
  - Tube feet (sea stars)
    - Kinesthetic movement: Fingers wiggling. Say "Tube feet!"

- Flat Body
  - Another adaptation you will see at the rocky seashore is animals having a flat or low-profile body.
    - A flatter body shape means you have less area that is being hit by the waves.
    - Less impact from waves = less chance to get knocked off
  - Kinesthetic movement: stand up straight w/ legs together and arms straight at your side. Say "Flat body!"

- Round body shape
  - Another adaptation you will see at the rocky seashore is animals have round body shapes versus a blocky or more square shapes.
    - Allows water to flow around you more easily.
    - When water flows around you vs. catching on corners, you are less likely to get pulled of the rocks.
  - Kinesthetic movement: Use your hands to make a giant circle in front of your face Say "Round shape!"

- If time allows: have students practice the kinesthetic movements a few times.
  - Loud voice, whisper voice, slow motion, etc.

Debrief

- Return to the Inverts are Everywhere poster. (**SLIDE**)
  - We have been learning about invertebrates and the many ways science leaders study these diverse organisms!

- We will continue to add to our poster today!

- Ask students: Where did we find invertebrates today? – Rocky Seashore.
  - (Ask a student to add the laminated word "Rocky Seashore" to the poster.)

- Today we did an experiment to learn more about invertebrates.
  - (Ask a student to add the laminated word "Experiment" to the poster)
  - Though our experiment we learned some common adaptations rocky seashore animals have, including:
    - Flat bodies
    - Large Sticking Area
    - Round Body Shapes

- Each day we will add invertebrates that we have studied to our poster.
  - Today we will add invertebrates to the rocky seashore.
  - Choose an invertebrate in your bin to color and then we will add it to the poster.
    - (Give students a time limit to work.)
    - (When a student is finished help them tape their invertebrate to the Invertebrates Are Everywhere Poster.)

- Science Leaders are Math Leaders.
  - Reminds students that science leaders are math leaders too! (**SLIDE**)
    - Can you think of a time when you did math today? (**SLIDE**)
      - Looking at area of survivors vs. non-survivors, etc.
    - Remind students that all of us are math people!
  - This week as we are doing lots of science, we will keep our eyes open for times when we are also doing math!

- Great job science leaders!
  - Tomorrow we will continue learning about invertebrates!

Day 2, 3, or 4: Dissection – Deep Ocean Invertebrates

Supplies:

*For one group of 10 students – multiple all supply numbers based on the number of groups expected.

Technology:

- Large Smart Board with "CI Inverts Are Everywhere Camp" PPT loaded to desktop
    - If a guest speaker joins - connect a speaker, microphone, microphone stand, and camera.
    - If a video will be shown - connect the speaker.
    - *PLAZA DEL SOL LAB ONLY* - connect the lavalier to speaker for instructor.

Community Building

- N/A

Science Leader

- Zoom link
- Curiosity Cube w/ pre-populated questions (1/age group)

Visual Materials:

- Community Agreements stand
- Invertebrates Are Everywhere Poster
- Laminated words: "Deep Ocean" and "Dissection"
- Word Wall Laminated words:
    - Dissection – to cut open a plant or animal to study its internal body parts
    - Explore – to investigate in order to learn more
    - Internal Anatomy – inside the body
    - External Anatomy – outside the body

Lab Materials:

- Painters tape (1)
- Painters tape (1)
- White board (1)
- White board stand (1)
- Dry erase marker (2)
- Dry erase eraser or rag (1)
- Butcher paper or other to cover tables
- Trash bags (2)
- To dispose of squid parts
- Squid for dissection (1/2 students)
- Box gloves (1)
    - Size small for K – 3rd

  - Size medium for 4th – 8th
- Dissection tools (1 of each item/pair of students):
  - Tweezers
  - Scissors
- Instructors' dissection tools (1/Instructor and Fellows)
  - Pointer, scissors, Tweezers
- Squid external anatomy + Velcro pieces (1/pair of students)
- Squid internal anatomy + Velcro pieces (1/pair of students)
- Outlines of squid (pre-cut) (1/student)
- Small art supply plastic bins filled with colored pencils, crayons, and markers (4)
- Scotch tape rolls (4)

Set Up

- Write daily agenda on white board and set on white board stand
- Set up technology and test for Zoom call with science leader.
- Set up visual materials:
  - Open "CI Inverts Are Everywhere Camp" PPT slides for the day.
  - Put up Word Wall Poster and set words for the day at instructor station.
  - Hang up Invertebrates are Everywhere poster and words.
- Cover all tables with butcher paper for dissection.
- Place squid, dissection tools, and trash bags in the back of the lab.
- Place 1 pair of gloves into each students' bin.
- Prep small plastic art supply bins with pre-cut outlines of squid, crayons, colored pencils and markers.

Check-In/Snack Time

Objective: Students settle into the space, get a nutritious snack and get to know one another and Ocean Discovery staff.

Questions: (**SLIDE**)

- What is something weird that you are afraid of?
- Can you think of a time this week when you were doing science? What were you doing?
- If you could choose an invertebrate to have as a pet, which would you choose and why?

Community Building

Objective: Students continue to build belief that they are a unique individual contributing to the community of science.

Activity:

- Review Community Agreements (**SLIDE**)
    - (See Day 1)

- Turn that Frown Upside Down (**SLIDE**)
    - Expectations:
        - Pair everyone up.
        - Pairs will stand back-to-back.
        - When I say “Turn that frown upside down!” you will turn around and face your partner with your best frowny face.
        - First person to laugh is out.
        - Pair up remaining competitors.
        - Play until there are only two people left.
        - Form a circle around them for the final “Frown-off”.
        - Crown the ultimate Frown Champion.
        - If time remains play another round.
    - Debrief:
        - Ask students: Was it difficult to hold your frown? Why?

- Review daily agenda on the white board.

Science Leader:

- Provide an overview of the Science Leader portion of the program.
    - Today we will meet virtually with a science leader.
        - Learn about their pathway to becoming a science leader, what they do in their work, and their passion for the ocean and the wetlands.
    - You will also have the opportunity to ask the science leader questions.
        - (If time allows: brainstorm questions students want to ask – write these on a whiteboard where everyone can see.)

- Introduce Science Leader.
    - Tell the students who they are about to meet (science leader's name) a science leader who (describe what they do in 1-2 sentences and where they work).
        - (Connect Zoom Call).
    - (Welcome the Science Leader.)
    - (Conduct the interaction as one would an interview.)
        - Interview tips:
            - You may change the order or modify the questions based on the Science Leader's responses.
            - If a Science Leader is answering a question that may need to be wrapped up, you can move to the microphone to signal that you want to speak.
            - After the Science Leader answers a question, in a sentence or two, reaffirm the point they are making and how it ties to the students' experience.

        - Interview questions asked by Fellow (~10 min):
            - Ask the first 2 questions:
                - Can you please introduce yourself and tell us about your job and what you love about it? (2 minutes)
                - Tell us about your pathway to your current job. For example, what got you interested in science, your education, etc. (2 minutes)
            - Allow students to ask questions of their own from each group (2-4 minutes).
                - If students are reluctant to ask, hand out the curiosity cube and let them roll and ask the question.
            - Last question to finish out the interview:
                - Students are investigating invertebrates in many ecosystems like the open ocean and the deep sea, and learning about the different ways science leaders can learn more about invertebrates through techniques like dissection, experiments, and drones, why do you think this work is important? (2 minutes)
    - (Have students say "Thank you!" and all clap for the science leader.)

- (Disconnect Zoom call.)

Science Lab

Learning Objectives: Students will:

- be able to define what an invertebrate is and name at least three examples,
- be able to describe the deep ocean and name at least one challenge animals face there (cold, darkness, pressure),
- be able to explain that animals have adaptations that help them survive in the deep sea,
- be able to explain how dissections help science leaders learn about invertebrates,
- work as a team to complete the squid dissection and identify both external and internal anatomy,
- begin to make the connection that science and math go hand in hand, and
- begin to recognize that invertebrates are found in many different ecosystems, including the deep ocean.

Timing

- Introduction (10 min)
- Dissection (35 min)
- Debrief (10 min)

Introduction:

- Review the previous day using the Word Wall and Invertebrates Are Everywhere poster.
  - Potential questions include:
    - What kinds of organisms are we studying this week?
    - Where did we find invertebrates yesterday/this week?
    - What method did we use to study invertebrates yesterday/this week?

- Introduce Deep Ocean. (**SLIDE**)
  - Today we will dive into the deep ocean and look at invertebrates that lives there.
  - Ask students: What do you already know about the deep ocean?

- Life in the Deep Ocean
  - Science leaders generally consider anything below 200 meters/~660 feet to be the deep sea because light quickly begins to disappear and it gets cold quickly. **(SLIDE**)
    - Science leaders have designated the different layers of the ocean.
    - There are different layers of the ocean based on how much light reaches each part.
  - The layers are called: Sunlight zone, Twilight zone, and Midnight Zone.
    - Sunlight Zone – The top layer, lots of light and temperatures are warmer.
    - Twilight Zone – The middle layer where it is dim and cold.

        - Midnight Zone – The bottom layer, deep and dark zone where sunlight never reaches.
    - Everything in the deep ocean is under a lot of pressure. (**SLIDE**)
        - The deeper you go, the more water is above you, and every drop has weight.
        - In the deep sea, there are miles of water pressing down, like stacking thousands of heavy blankets on top of you at once.
        - With every foot you descend, the pressure increases.
        - By the time you reach the deep ocean, the pressure is strong enough to crush things that aren't built to handle it.

- Introduce/review adaptation. (**SLIDE**)
    - Define Adaptation: something that helps an animal to survive.
        - (Add "Adaptation" and definition to the Word Wall if you have not already.)
        - Have students come up with examples of adaptations for a polar bear.
            - Fur – warmth
            - White fur – camouflage to catch prey
            - Claws – to catch prey, etc.

- Deep Sea Adaptations (**SLIDE**)
    - Animals that live in the deep sea must have special adaptations to survive in an environment that is cold, dark, and under extreme pressure.

- Introduce Squid (**SLIDE**)
    - Today we are going to take a very close look at one animal that lives in the deep ocean…squid!
    - Ask students: What do you know about squid?
    - Squid are invertebrates and come in many shapes and sizes:
        - Smallest: Thai Bobtail Squid - 0.5 inch
        - Largest: Giant Squid – 49 feet
    - Squid can be found in oceans all over the world – warm tropical water and cold seas, shallow water to deep ocean trenches.
    - Show squid video. **STOP video at 1:20**.
        - https://www.youtube.com/watch?v=UxvzjrDE1Kk
        - Explain that Humboldt squid are not man-eaters.

- Dissection (**SLIDE**)
    - Today we will use another method for studying invertebrates – Dissection.
        - Ask students: What do you know about dissection?
        - Define: Dissection: to cut open a plant or animal to study its internal body parts.
        - (Add "Dissection" and definition to the Word Wall.)
    - Ask students: Why would we do a dissection?
        - We want to learn more about a plant or animal.
    - Today we will be doing a squid dissection to learn more about how squid are adapted for life in the deep ocean. (**SLIDE**)
        - We will learn about the inside (internal) and the outside (external) body parts of fish.
        - Internal Anatomy – inside the body
        - External Anatomy – outside the body
        - (Place "internal and external anatomy" on the Word Wall.)

- Expectations (**SLIDE**)
    - When doing a dissection, it is important to respect the animal you are dissecting as they are helping us to learn more about how the world works.
    - During the dissection be your best self:
        - Be curious: ask questions, make observations, and share these with others.
        - Be safe: take care with dissection tools which can be sharp or pointy
        - Be respectful: the squid you are dissecting is helping us to learn more about how the world works and to become better science leaders, so treat your squid with respect.
    - Review potential reactions to dissection: Excited, nervous, etc. (**SLIDE**)
        - Whatever you feel is appropriate.
        - You can take a quick break if you need to but try to hurry back so you don't miss too much exploring.
        - We never say "gross!", instead we day "Ooooohh science!"
    - (Have student put on gloves from their box.)
        - Only one pair of gloves so don't take them off until we are done.
        - Do not touch yourself or others after you have touched the squid even with gloves on.

- External Anatomy

- Exploration. (**SLIDE**)
  - Explain that students will have 2-3 minutes to explore the outside of the squid.
  - They should look at it, touch it, and make some observations.
  - (Pass out squid.)
  - (Give students 2-3 minutes to explore the squid.)

- Anatomy (**SLIDE**)
  - Explain to students that each person will receive a drawing of the outside of a squid and some names of the external anatomy.
    - Velco the names of the external anatomy where you think they belong.
    - (Demonstrate this)

  - (Pass out laminated external anatomy pictures and associated Velcro anatomy parts.)
    - (Be sure all students are on the external anatomy side.)

<u>External Structures</u>

- Review each part of the external anatomy:
  - **Eyes**
    - Adaptation: The eye is large compared to its body size. Larger eyes are necessary because there is little light in the deep ocean. The larger the eye, the more light it can let in, allowing it to see even in the darkness of the deep ocean.
    - Giant squid have the largest eye in the animal kingdom.
    - Squid can see in black and white but not color.
  - **Tentacles**
    - These are the two longer appendages with suction cups only on the ends.
    - Adaptation: They are used to strike out and grab prey.
  - **Arms**
    - There are eight with suction cuts running down the entire length.
    - Used to hold onto prey and bring it towards the mouth.
    - Some squid have barbs in each suction cup to help them catch larger prey.
  - **Chromatophores**
    - Squid use chromatophores to change color and communicate.
    - Muscles controlled by the nervous system surround each chromatophore. Muscles expand or contract to reveal the color of pigment inside the chromatophore.
  - **Siphon**

- Flexible – it is how squid move. They take water in through their mantle and squeeze it out through the small siphon–like jet propulsion. It's like covering part of the nozzle of a garden hose and creating a jet of water.
- Squid generally move backwards because of the direction of the siphon.

- **Fins**
  - Used for steering and stabilization.
  - It can be used to propel squid at slow speeds.
- **Mantle**
  - The mantle opens to take water in, and then muscles close the opening to push water through the siphon for propulsion.
  - Squid have a hydrodynamic body shape to move through the water at high speeds. Water passes over its body easily without any blockages
- **Line of Symmetry**
  - Many animals, including squid, have something called symmetry.
    - This means their body can be divided into two matching halves — like a mirror image.
    - For example, A rectangle has a line of symmetry. If you fold it along that line, both sides match.
    - For example, a butterfly has a line of symmetry down it's back. If you fold it along that line the sides will match up.
  - Ask students: Where do you think the line of symmetry is on your squid? (**SLIDE**)
    - Squid have a lateral line of symmetry down their center.
    - This line of symmetry is an adaptation that:
      - makes it easier for the squid to move in a straight line because both sides of the body are balanced, so they can swim, crawl, or walk without tipping over, and
      - it is more aerodynamic or hydrodynamic, so it's easier to move quickly through water or air to catch prey or escape predators.

- Internal Anatomy (**SLIDE**)
  - Exploration.
    - Explain internal squid exploration.
      - Students will have 2-3 minutes to explore the inside of the squid.
      - They should look at it, touch it, and make some observations.
      - (Give students 2-3 minutes to explore the squid.)
  - Anatomy (**SLIDE**)

- Explain to students that each person will receive a drawing of the inside of a squid and some names of internal anatomy.
    - Velco the names of the internal anatomy where you think they belong.
    - (Demonstrate this)

- (Pass out laminated internal anatomy pictures and associated Velcro anatomy parts.)
    - (Be sure all students are on the internal anatomy side.)

- Explain how to use dissection tools and demonstrate how to cut open the squid.
    - (Determine for K-2nd if you need to cut the squid open for them.)

- (Pass out dissection equipment.)
    - (Give students five minutes to explore the inside of the squid.)

o Debrief internal squid exploration
- Review each part of the internal anatomy:

<u>Internal Structures</u> **(SLIDE)**
- **Gills**
    - Gills bring oxygen into the squid from the ocean water.
    - Gills are "feathery" to allow maximum surface area which allows them to absorb more oxygen from the ocean water.
- **Ink Sac**
    - Used to limit vision to confuse and escape from predators.
    - Over the centuries, squid ink and ink sacs have been used in a variety of human applications including anti-microbial, immune response enhancing, anti-retroviral and potential anticancer drugs as well as ink for writing and painting.
- **Hearts** (can be difficult to see):
    - o Squid actually have three hearts!
    - o Used to pump oxygenated blood around the body
- **Gonads**
    - **o** Male squid – gonads are a large white sac.
    - **o** Female squid – gonads have eggs. Can have up to 700 eggs.
- **Beak**
    - **o** Beak is used to tear food into smaller pieces before eating.
    - **o** Students may be able to remove the entire buccal mass (round springing ball in center of arms and tentacles). If they do so carefully and a long thing thread also comes out this is the esophagus which connects to the stomach.

- **Pen**
    - Demonstrate how to remove the ink sack.
    - Have students remove the ink sac using tweezers and place to the side.
    - Demonstrate how to remove all internal organs by grasping the arms and tentacles and holding the mantle down so the organs can be removed in once piece.
    - Have students locate the pen.
    - Explain that the pen is not a backbone but an internalized shell that stiffens the squid and provides a point for muscle attachment.
- Squid ink tattoos.
    - Show students how to remove the pen.
    - Show students how to break open the ink sac and give themselves a squid ink tattoo using the pen and ink.

- Clean-up
    - (Remove all squid from tables)
    - (Have all students remove and dispose of gloves.)
    - (Have students wash hands.)

- Science Notebook (**SLIDE**)
    - Have students open their notebook to "Science Lab – Deep Ocean Invertebrates" page.
        - Ask students: Can you draw a line of symmetry on the squid?
        - Ask students: Which parts of the squid can you label?
            - Have students label: eyes, arms/tentacles, chromatophores, siphon, and fins on the squid diagram.

Debrief

- Return to the Inverts are Everywhere poster.
    - We have been learning about invertebrates and the many ways science leaders study these diverse organisms!
        - We will continue to add to our poster today!

    - Ask students: Where did we find invertebrates today? – Deep Ocean.
        - (Ask a student to add the laminated word "Deep Ocean" to the poster.)

    - Today we did a dissection to learn more about invertebrates.
        - (Ask a student to add the laminated word "Dissection" to the poster)

        - Through our dissection, we learned some adaptations squid have to survive in the deep ocean, including:
            - Large eyes
            - Ink Sacs
            - Chromatophores
            - Pen

    - Each day we will add invertebrates that we have studied to our poster.
        - Today we will add squid to the deep ocean.
        - Take a squid from your bin to color and then we will add it to the poster.
            - (Give students a time limit to work.)
            - (When a student is finished, help them tape their invertebrate to the Invertebrates Are Everywhere Poster.)

- Science Leaders are Math Leaders. (**SLIDE**)
    - Remind students that science leaders are math leaders too!
    - Can you think of a time when you did math today?
        - Looking at different sizes of squid.
        - Looking at lines of symmetry.
            - Looking to see if both halves match is a way scientists use geometry in real life, and this helps science leaders describe and compare animals,
    - This week as we are doing science, keep your eyes open for times when you are also using math!

- Great job science leaders!
    - Tomorrow we will continue learning about invertebrates!

-

Day 2, 3, or 4: Drones – Open Ocean Invertebrates

Supplies:

*For one group of 10 students – multiple all supply numbers based on the number of groups expected.

Technology:

- Large Smart Board with "Mission to Mars Camp" PPT loaded to desktop
  - If a guest speaker joins - connect a speaker, microphone, microphone stand, and camera.
  - If a video will be shown - connect the speaker.
  - *PLAZA DEL SOL LAB ONLY* - connect the lavalier to speaker for team lead.

Community Building

- Human Bingo Cards (laminated) (1/person)
- Dry erase marker (1/person)
- Clipboard (1/person)

Science Leader

- Zoom link
- Curiosity Cube w/ pre-populated questions (1/age group)

Visual Materials:

- Community Agreements stand
- Invertebrates Are Everywhere Poster
- Word Wall laminated words: "Open Ocean" and "Drones"

Lab Materials:

- Drone w/ camera function + remote (1)
- Smaller drones (3)
- Jellie cutouts (laminated) (37)
- Blue tape (1 roll)
- Jellies photo (laminated) (1/pair of students)

Set Up

- Write the daily agenda on white board.
- Set up technology and test for Zoom call with the science leader.
- Set up visual materials:
  - Open "Inverts Are Everywhere Camp" PPT slides for the day.
  - Hang up Invertebrates are Everywhere poster and words.
- In Plaza Del Sol parking lot – create two large "x" approximately 10 feet apart.
  - This will the drone take-off a landing areas.
- Set the 37 laminated jellies out around the parking lot (on the side closest to the Scientist in Residence.
- Make sure all drones are charged and ready to be flown.

Check-In/Snack Time

Objective: Students settle into the space, get a nutritious snack and get to know one another and Ocean Discovery staff.

Questions: (**SLIDE**)

- Tell us one thing you like to do for fun/in your free time?
- It takes approximately 8 months to fly to Mars, would you be a part of a mission to Mars? Why or why not?

Community Building

Objective: Students continue to build belief that they are a unique individual contributing to the community of science.

Activity:

- Review Community Agreements (**SLIDE**)
    - (See Day 1)

- Human Bingo (**SLIDE**)
    - Each person will receive a Bingo Card.
    - You will walk round and try to find someone who can initial your sheet for each box.
        - K-2 Adaptation:
            - Explain what initials are.
            - Have students use a single initial when possible or students can choose a shape or other easy sketch to represent themselves (ex. a smiley face).
    - The statement you sign must be true.
        - Example: I can only put my initial in the box that says I have more than two siblings, if I really have more than two brothers or sisters.
    - One person can initial a max of two boxes.
    - We are playing Black Out Bingo so the goal is to get every box initialed.
    - There is no need to rush – encourage students to ask follow up questions when they learn something.

- Process Reflection: (**SLIDE**)
    - Ask students:
        - What is something you learned that you have in common with someone else here?
        - What is something new you learned about someone?

- Review daily agenda on the white board.

Science Leader:

- Provide an overview of the Science Leader portion of the program.
    - Today we will meet virtually with a science leader.
        - Learn about their pathway to becoming a science leader, what they do in their work, and their passion for the ocean and the wetlands.
    - You will also have the opportunity to ask the science leader questions.
        - (If time allows: brainstorm questions students want to ask – write these on a whiteboard where everyone can see.)

- Introduce Science Leader.
    - Tell the students who they are about to meet (science leader's name) a science leader who (describe what they do in 1-2 sentences and where they work).
        - (Connect Zoom Call).
    - (Welcome the Science Leader.)
    - (Conduct the interaction as one would an interview.)
        - Interview tips:
            - You may change the order or modify the questions based on the Science Leader's responses.
            - If a Science Leader is answering a question that may need to be wrapped up, you can move to the microphone to signal that you want to speak.
            - After the Science Leader answers a question, in a sentence or two, reaffirm the point they are making and how it ties to the students' experience.

        - Interview questions asked by Fellow (~10 min):
            - Ask the first 2 questions:
                - Can you please introduce yourself and tell us about your job and what you love about it? (2 minutes)
                - Tell us about your pathway to your current job. For example, what got you interested in science, your education, etc. (2 minutes)
            - Allow students to ask questions of their own from each group (2-4 minutes).
                - If students are reluctant to ask, hand out the curiosity cube and let them roll and ask the question.
            - Last question to finish out the interview:
                - Students are investigating invertebrates in many ecosystems like the open ocean and the deep sea, and learning about the different ways science leaders can learn more about invertebrates through techniques like dissection, experiments, and drones, why do you think this work is important? (2 minutes)
    - (Have students say "Thank you!" and all clap for the science leader.)

- (Disconnect Zoom call.)

Science Lab

Learning Objectives: Students will:

- be able to define what a jelly is and explain why it is an invertebrate,
- be able to name at least one adaptation that helps jellies survive in the open ocean,
- be able to explain why studying jellies can be challenging for science leaders,
- be introduced to drones as a scientific tool and explain why they might be used to study jellies,
- work as a team to complete a drone-based jelly survey simulation,
- add new knowledge to the "Invertebrates Are Everywhere" poster to track learning throughout the week.

Timing

- Introduction (10 min)
- Drone and Jelly Survey (35 min)
- Debrief (10 min)

Introduction:

- Review the previous day using the Word Wall and Invertebrates Are Everywhere poster.
  - Potential questions include:
    - What kinds of organisms are we studying this week?
    - Where did we find invertebrates yesterday/this week?
    - What method did we use to study invertebrates yesterday/this week?

- Introduce the Open Ocean. (**SLIDE**)
  - Today we will dive into the open ocean and the invertebrates that live there.
  - Ask students: What do you know about the open ocean?

- Life in the Open Ocean (**SLIDE**)
  - The open ocean is very large it is the largest part of the ocean—it stretches across the globe and covers more than half of Earth's surface.
  - In the open ocean, there are no rocks or seaweed to hide behind. It's wide and empty like a desert, but made of water.
  - Currents move the open ocean water around like underwater rivers.
  - Food can be hard to find in the open ocean. Some animals eat tiny plankton. Others have to swim long distances to find larger prey like fish.
  - Even though the open ocean can look pretty empty, it is actually full of life!

- Introduce Jellies (**SLIDE**)
  - One type of invertebrate that lives in the open ocean is jellies!

- Ask students: What do you know about jellies?
    - Some people may call them jelly fish but that is actually incorrect because jellies are not fish- fish have a backbone!
    - Jellies are invertebrates!

- Let's watch a video about jellies. (**SLIDE**)
    - Ask students: What do you notice about jellies?

- Share some facts: (**SLIDE**)
    - Jellies have lived in the ocean for over 500 million years.
    - They are made mostly of water.
    - They come in many sizes and shapes.
    - They have stinging tentacles to catch prey.
    - They are plankton and can drift with currents for long distances.

- Studying Jellies. (**SLIDE**)
    - While jellies have been around a long time and somethings about them are known, science leaders still have much to learn about these fragile invertebrates.
    - Explain that jellies live in the open ocean, moving with currents and spread out over large areas, which makes them hard to count or observe.
    - Ask students: If you were a science leader, how would you study something that moves constantly and can be far from shore?

- Drones (**SLIDE**)
    - One way science leaders can study jellies is with drones.
    - Drones are small aircraft controlled from the ground.
    - They are piloted remotely, meaning the person flying them can be standing on land while they pilot the drone over a pod of whales or over a group of jellies.
    - Can take photos and videos from above.
    - Allow science leaders to observe animals that are far away or difficult to see.

Drone and Jelly Survey

- Mission:
  - You will be working together as science leaders using drones to conduct a jelly survey.
  - First, each of you will get a turn to fly a drone for practice.
  - Then you will work with your team to use our best drone to take a photo of the jellies and try to figure out the total number of jellies in the area.
  - *K-2nd Grade Adaptation:*
    - *Students will help fellows pilot a drone (not done individually).*

  - Expectations (**SLIDE**)
    - Explain that everyone will get a chance to fly and land a drone.
    - Your goal when flying to lift off from one of the blue "X" on the ground and then fly over and land on the other blue "X".
    - Be respectful when your turn is over.
    - Land the drone gently before handing the controls off to another person
    - Have a growth mindset.
      - Flying a drone can be challenging.
      - Just because you don't get it into the air right away – don't give up!

- Walk students up to the Plaza Del Sol.
  - Show students the drone they will be flying.
    - Demonstrate how to use controls.

  - Break students into groups (1 adult/group)
    - Look at the timing so that each student in your group gets an equal turn at flying the drone.

  - Return to the main group to conduct your research.
    - Instructors will fly the large drone but students will help decide what direction and how high/low to fly.
    - The goal is to take a photo of the jellies.

- Return to the classroom. (**SLIDE**)
  - Explain to the students that you will upload the photo your group took with the drone and hand out copies.
    - (Give each pair of students a copy of the jellies photo and a dry erase marker.)
  - Ask students to count the number of jellies.
  - Ask students:
    - How many jellies were there? 37

- How did using the drones make counting easier?
- Can you think of other animals drones could help us study?

Debrief

- Return to the Inverts are Everywhere poster. (**SLIDE**)
  - We have been learning about invertebrates and the many ways science leaders study these diverse organisms!
    - We will continue to add to our poster today!
  - Ask students: Where did we find invertebrates today? – Open Ocean.
    - (Ask a student to add the laminated word "Open Ocean" to the poster.)
  - Today we used drones to learn more about invertebrates.
    - (Ask a student to add the laminated word "Drones" to the poster)
    - We learned that drones can be used to study invertebrates and other organisms that are far away or difficult to get to.
    - Drones are also great to studying animals that science leaders don't want to disturb.
  - Each day we will add invertebrates that we have studied to our poster.
    - Today we will add jellies to the open ocean.
    - Take a jelly from your bin to color and then we will add it to the poster.
      - (Give students a time limit to work.)
      - (When a student is finished, help them tape their invertebrate to the Invertebrates Are Everywhere Poster.)

- Science Leaders are Math Leaders. (**SLIDE**)
  - Remind students that science leaders are math leaders too!
  - Can you think of a time when you did math today?
    - Counting jellies
    - Flying drones: When flying a drone, you constantly use math to figure out things like the distances you want to move your drone to go from one location to another and the heights you want to be sure you don't fly your drone so low that it crashes, etc.
  - This week as we are doing science, keep your eyes open for times when we are also using math!

- Great job science leaders!
  - Tomorrow we will continue learning about invertebrates!

Day 5: Make a Difference for Invertebrates

Supplies:

*For one group of 10 students – multiple all supply numbers based on the number of groups expected.

Technology:

- Large Smart Board with "CI Inverts Are Everywhere Camp" PPT loaded to desktop
    - If a guest speaker joins - connect a speaker, microphone, microphone stand, and camera.
    - If a video will be shown - connect the speaker.
    - *PLAZA DEL SOL LAB ONLY* - connect the lavalier to speaker for instructor.

Community Building

- N/A

Visual Materials**:**

- Community Agreements stand
- Invertebrates Are Everywhere Poster
- Laminated words:
    - Invasive species – a species not typically found in an area
    - Native species – a species that belongs in an area
    - Make a Difference – work science leaders do to help the world

Lab Materials:

- Painters tape (1)
- Gloves (20)
- Shovels (6)
- Invasive and Native Plant ID cards w/ lanyard (12)
- Blue Buckets (20)
- Spring scale (2)
- Rope – to hang the spring scale from (1)
- Calculator (1)
- Thought bubble cut outs (10)

Set Up

- Write daily agenda on white board and set on white board stand
- Set up visual materials:
  - Open "Inverts Are Everywhere Camp" PPT slides for the day.
  - Hang up Invertebrates Are Everywhere Poster.
- Hang spring scale somewhere students can all see buckets being weighed.
- Have a calculator readily accessible near spring scale.

Check-In/Snack Time

Objective: Students settle into the space, get a nutritious snack and get to know one another and Ocean Discovery staff.

Questions: (**SLIDE**)

- What was your favorite part of the week?
- What will you share with your friends and family about the Inverts are Everywhere camp?
- Who would you bring back to the Living Lab and what would you show them?

Community Building

Objective: Students continue to build belief that they are a unique individual contributing to the community of science.

Activity:

- Review Community Agreements (**SLIDE**)
    - (See Day 1)

- Extreme Rock-Paper-Scissors (**SLIDE**)
    - Each person will pair up with someone.
    - When I say "Go" you will play a match of Rock-Paper-Scissors against the person you are paired up with.
        - Best 2 out of 3 wins the match.
    - The person who doesn't win the match will follow the winner around chanting their name and being their "champion".
        - (Demonstrate.)
    - The winner of the match will walk around until they find another winner to face off against.
        - Best 2 out of 3 wins.
    - Continue until there are only two winners left with everyone behind the two winners cheering.
        - Best 2 out of 3 wins – Ultimate Rock-Paper-Scissors Champion!

- Review daily agenda on the white board.

Science Lab

Learning Objectives: Students will:

- Be able to explain why make a difference is an important part of the Science Discovery Process,
- be able to define "invasive species" and "native species" and explain why native species are important for invertebrates,
- work as a team to identify and remove invasive plants from the canyon,
- use math skills to weigh invasive plants, add totals, and share the group's results, and
- recognize that invertebrates can be found in many ecosystems, that science leaders study them in many ways and be able to name and describe two of those ways, and
- begin to recognize that their actions—like removing invasive plants—can help protect invertebrates and their habitats.

Timing

- Introduction (10 min)
- Invasive Plant Removal (25 min)
- Analyze Invasive Plants (10 min)
- Debrief (10 min)

Introduction

- Review the previous week using the Word Wall and Invertebrates Are Everywhere poster.
    - Potential questions include:
        - What kinds of organisms have we studied this week?
        - Where are some places we have found invertebrates?
        - What are some ways that science leaders study invertebrates?

- This week, we have learned that invertebrates can be found everywhere. (**SLIDE**)
    - We have discovered invertebrates in the canyon, at the rocky seashore, in the open ocean and in the deep ocean.
    - We have also learned that there are many ways to study invertebrates, including observations, experimentation, drones and dissection to name a few.

- Introduce Making a Difference. (**SLIDE**)
    - As science leaders it is important that we not only learn about science, but we also take that information and try to make a difference in the world.
        - (Point at Science Discovery Process)
        - (Have a student add "Make a Difference" to word wall.)

    - Today we will all work together to make a difference! (**SLIDE**)

- Will return to the canyon where we started our week.
- Ask students: What invertebrates did we see in the canyon back on Day 1?
- Today we will return to the canyon to help those invertebrates.

- Introduce invasive (**SLIDE**)
  - All the plants we saw in the canyon are not supposed to be there.
    - Plants that aren't supposed to be there are called <u>invasive species</u>.
      - Definition: Invasive Species – a species not typically found in an area.
    - Invasive plants are bad because they take up space that native plants normally use.
      - Definition: Native species – a species that belongs in an area
    - (Have a student add "Invasive and Native Species" to word wall.)
  - Ask students: Would it be better for invertebrates to have more invasive or native plants in the canyon? Why? (**SLIDE**)
    - More native plants because they provide food and habitat for the invertebrates that live in the canyon.
  - Today, we will help make a difference in our canyons by removing invasive plants, creating more room for native plants. (**SLIDE**)
    - We can help you tell the difference between native and invasive plant species by using this card.
    - (Pass out plant id cards.)
    - Review both sides of the plant id cards.
  - When you are in the canyon today and you think you have found an invasive plant- call over a staff member to confirm. (**SLIDE**)
    - If it is an invasive plant you can put on your gloves and use your hands and a shovel to remove the plant.
    - It is best to remove as much of the root structure as possible so the invasive plant does not grow back.
    - Place the invasive plant into your blue bucket.
  - At the end of the day, we will weigh the buckets to see how many pounds of invasive plants are removed today!
  - (Hand each student a pair of gloves, a blue bucket and a trowel.)

<u>Invasive Plant Removal:</u>

- (Walk students out into canyon.)

- Explain physical boundaries that students can work within.
    - (Post an adult at each boundary and make sure all students are within the sight of at least one adult.)
- (Give five and two-minute warnings.)
- (Count students and walk back to lab.)

Analyze Invasive Plants:

- Create/assign student expert roles: (**SLIDE**)
    - Data scribe (1): Will write invasive plant weights on the smartboard
    - Mathematician (1): Will use the calculator to add total amount of pounds of invasive plants
    - Lab technician (1): Will gather all the invasive species from the buckets into a large trash bag to be disposed of.

- Weigh Invasive Plants: (**SLIDE**)
    - (Have all students open to "Science Lab – Make a Difference" page in their science notebook.)
    - Have each student place their blue bucket on the spring scale and share the weight in pounds to group.
        - (Data scribe will record all weights on the board and students will copy this into their notebook.)
    - Have each student place the invasives from their blue bucket into the trash bag the Lab technician has.
    - Have each student place their blue bucket in a pile to the side.
    - Repeat the above until all blue buckets have been weighed.
    - The mathematician will add the total pounds of invasive plants removed and announce the total to the group.
        - (Students will record this in their notebook.)

Debrief:

- Potential questions include: (**SLIDE)**
    - How does removing invasive plants help invertebrates?
    - How does it feel to make a difference?

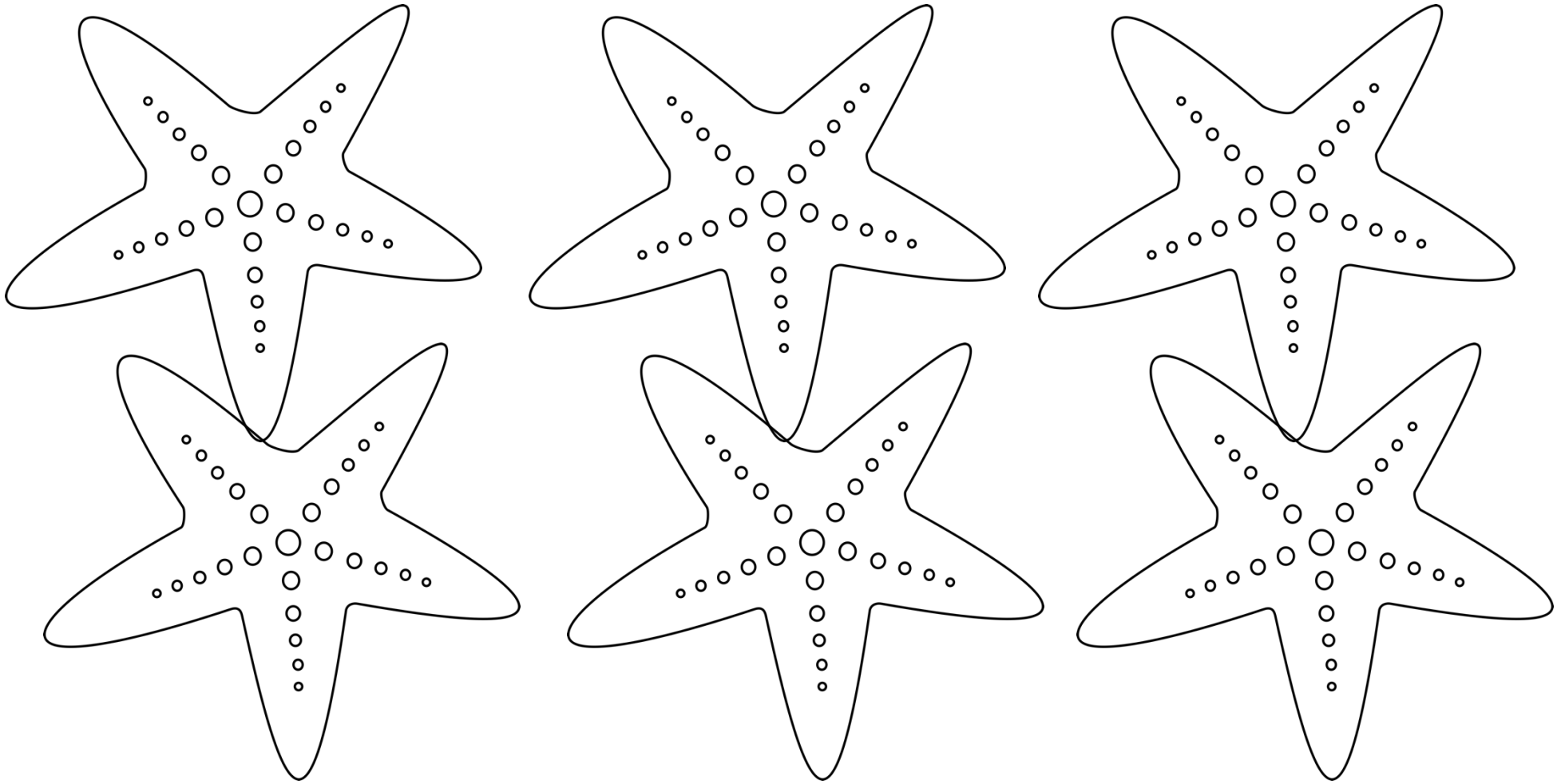
- Great job making a difference today, science leaders!
    - Together, you cleaned up xx pounds of invasive plants from the canyon, and OS Camp students have cleaned up xx pounds of invasive plants this year so far! That's amazing!
    - You have helped the invertebrates that live in the canyon by removing invasive plants and making room for native plants that provide food and housing for invertebrates.

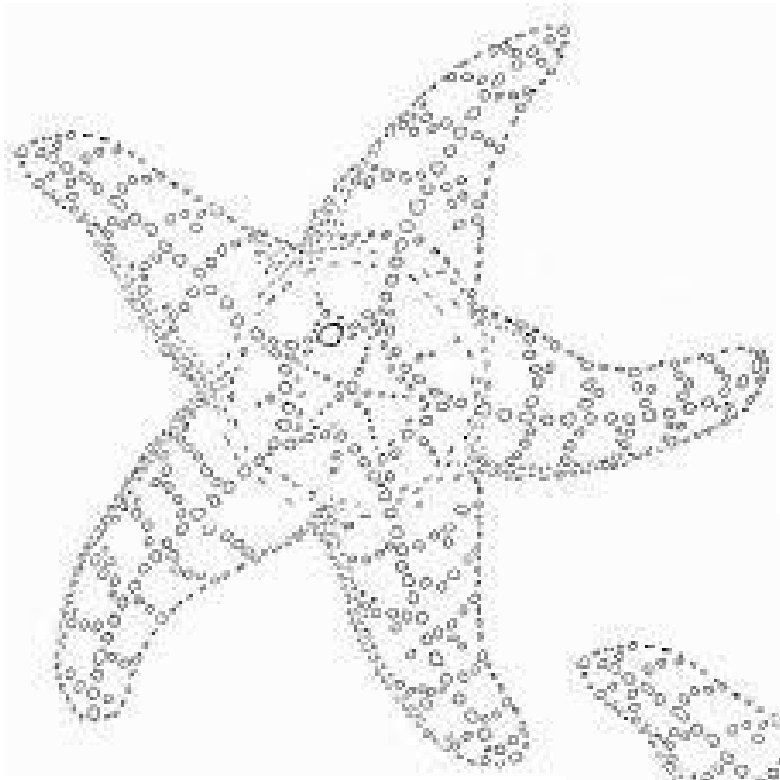
- As science leaders this week we have learned about many different invertebrates that live in different places.
    - (Point to Inverts are Everywhere poster.)

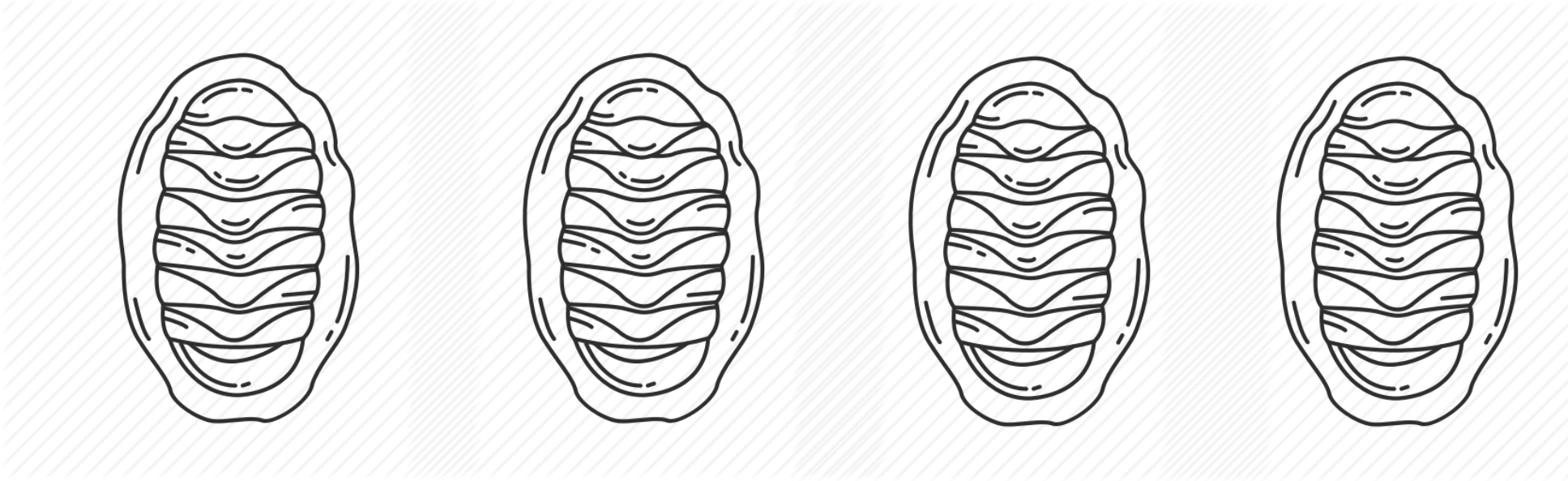
- Ask students: What other ways can humans protect invertebrates from the land to the rocky seashore to the ocean? (**SLIDE**)
    - Although we only had time to make a difference in one way – removing invasive species from the canyon, we want to capture all the different ways we can help protect invertebrates.
    - We will ask you to record one way humans can help protect invertebrates on your thought bubble. (**SLIDE**)
        - K-2 Adaptation: Students can draw the ways humans can help protect invertebrates.
        - (Give each student a thought bubble)
    - Invite each student to put their thought bubble on one of the invertebrates on the poster that their statement would be helping.

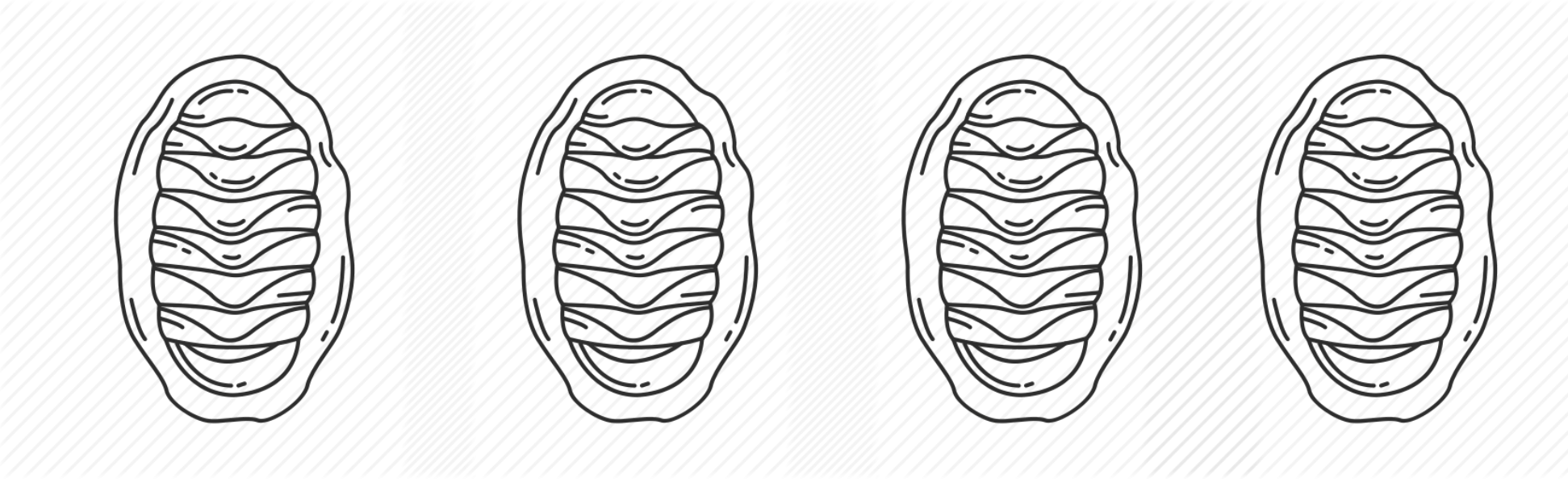
MATERIALS FOR LESSON

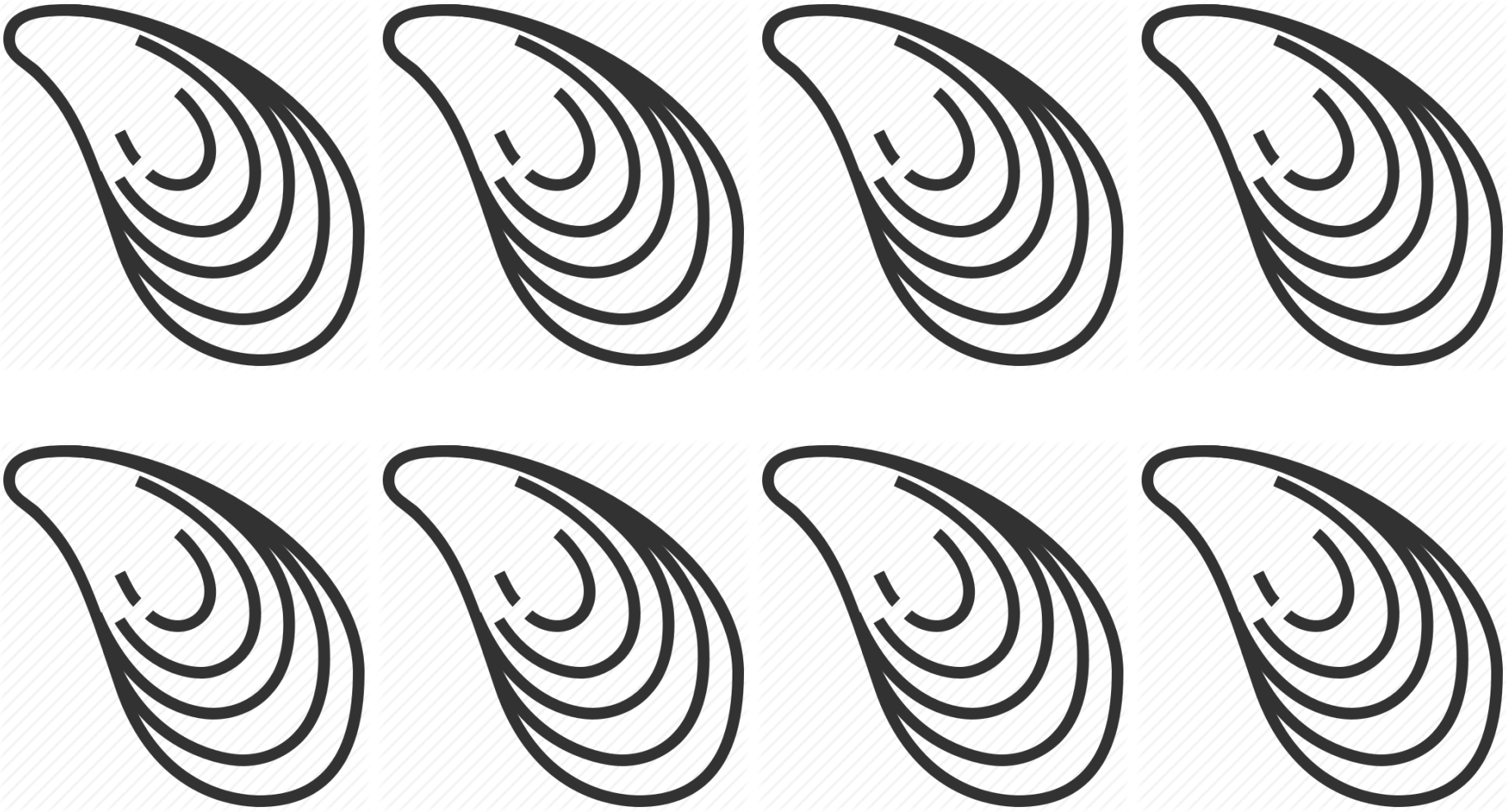
OUTLINES ROCKY SEASHORE INVERTEBRATES

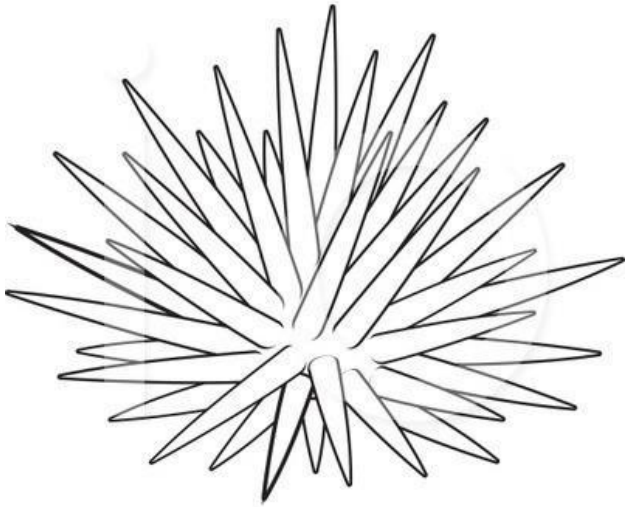
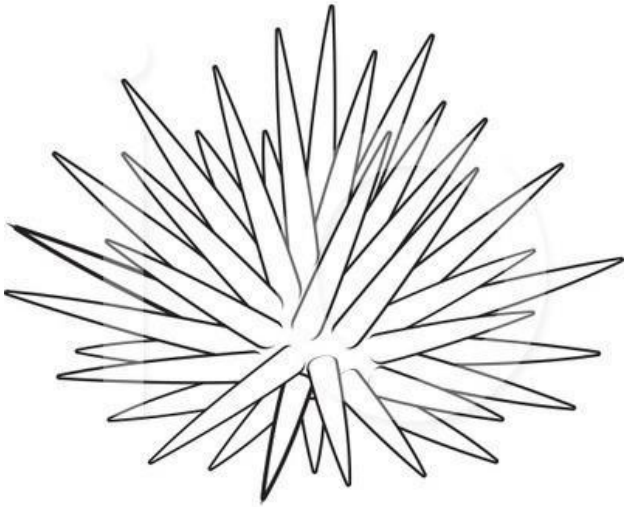
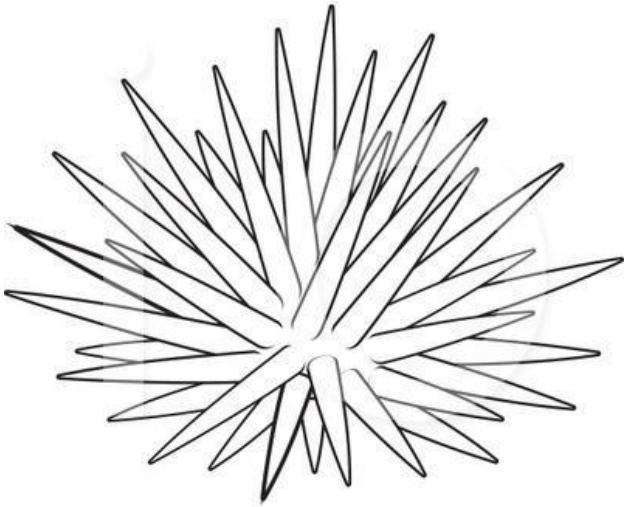
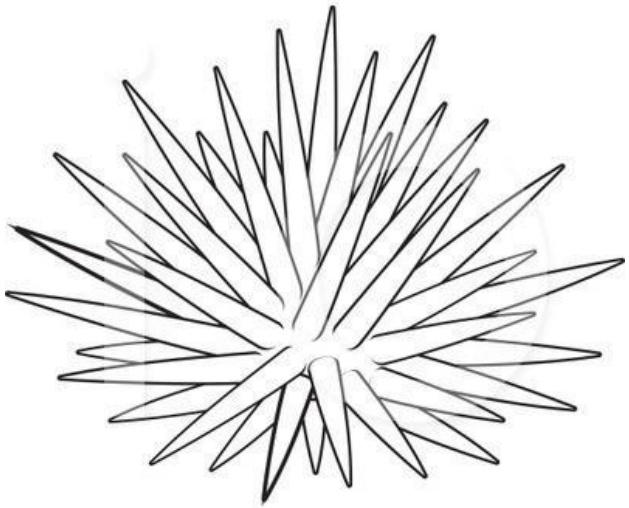
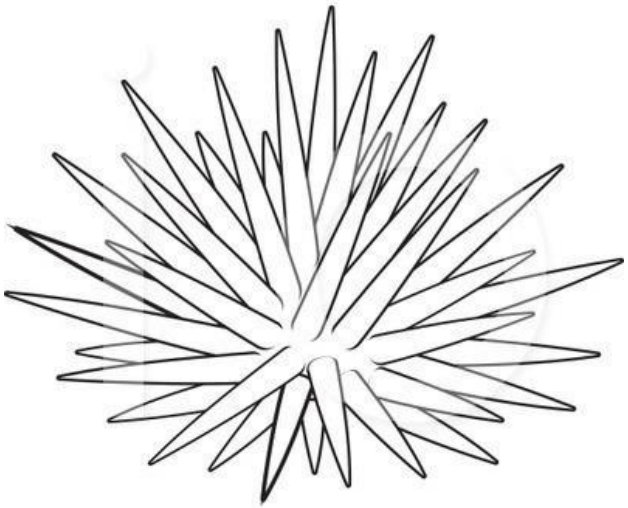
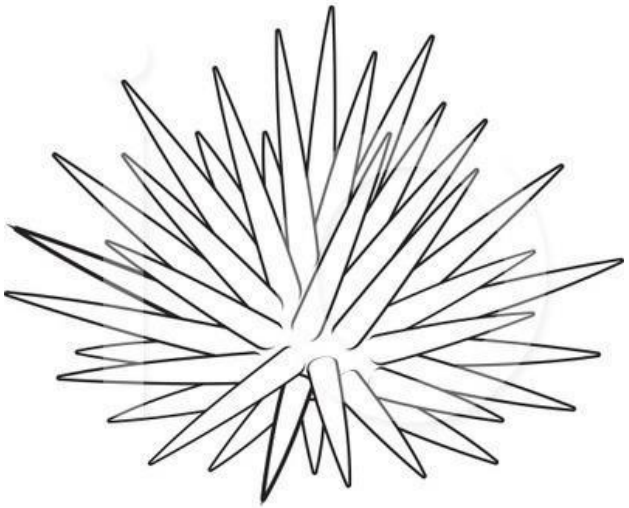


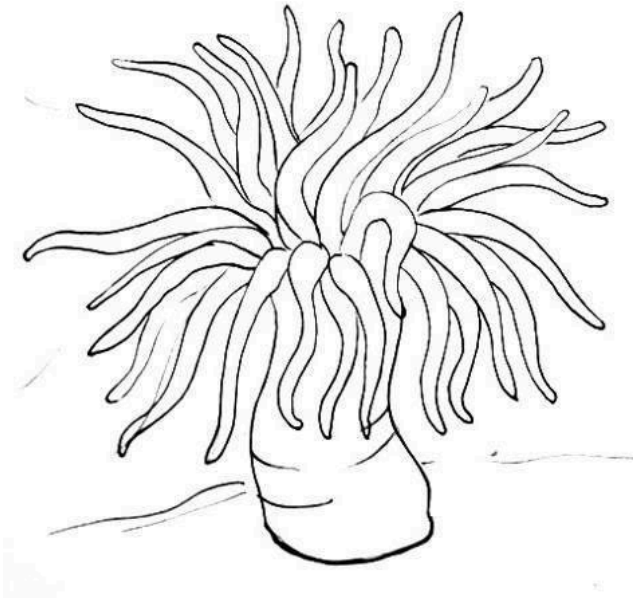


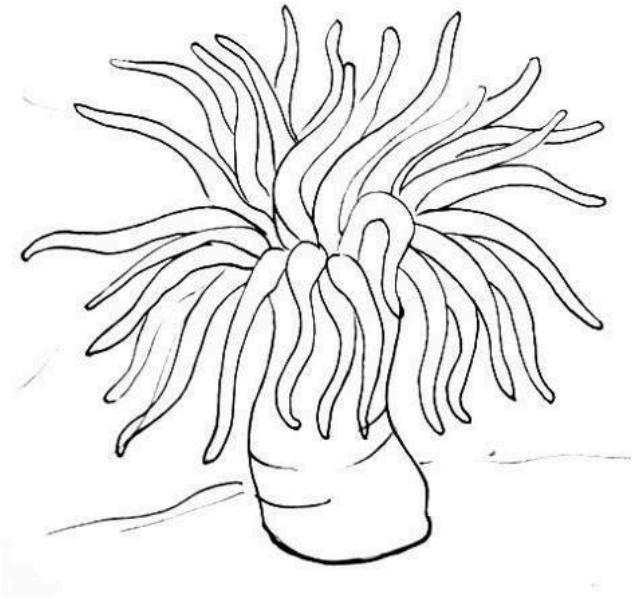


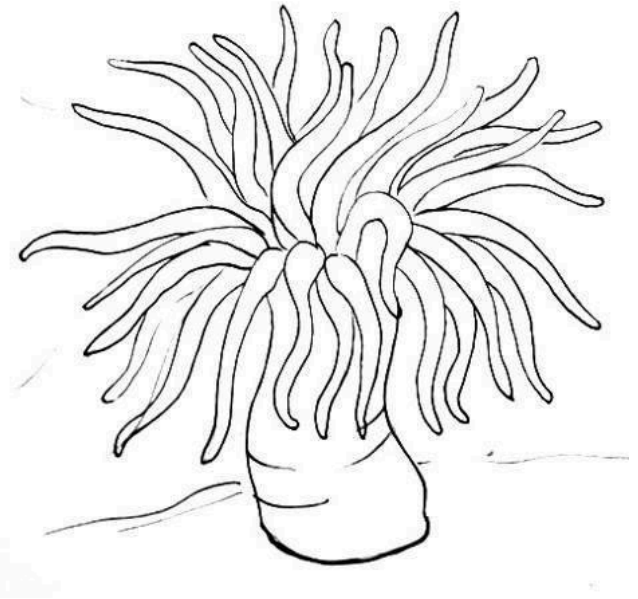


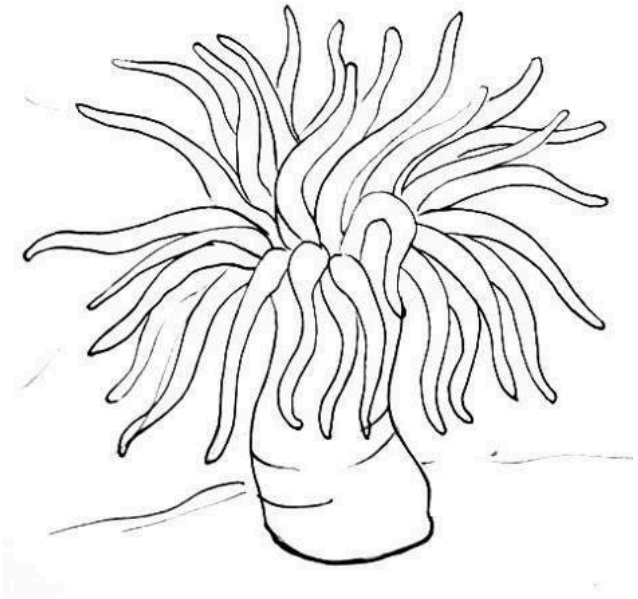


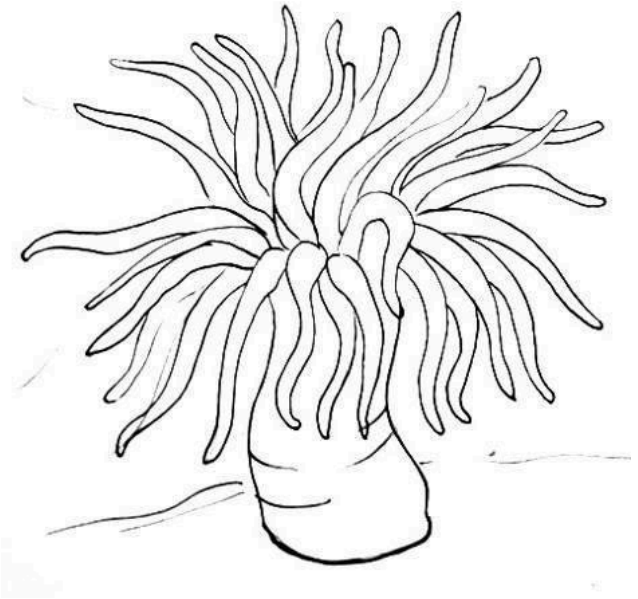







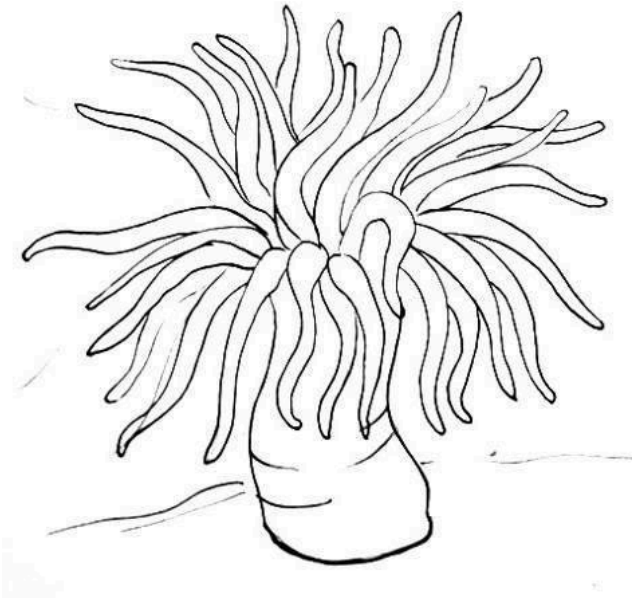


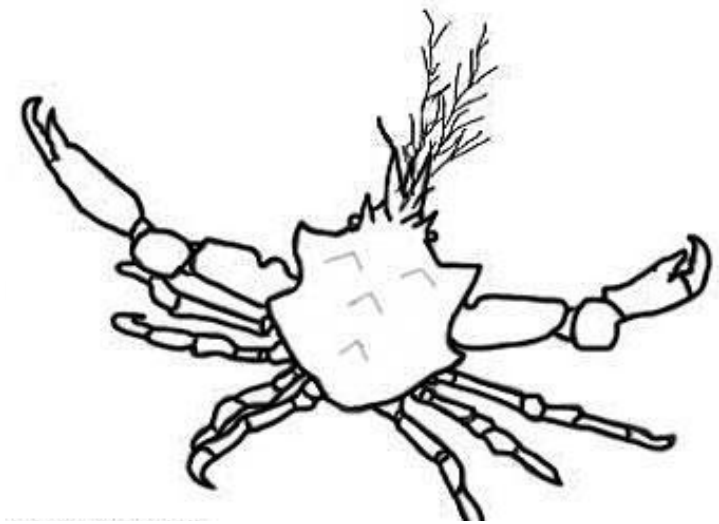


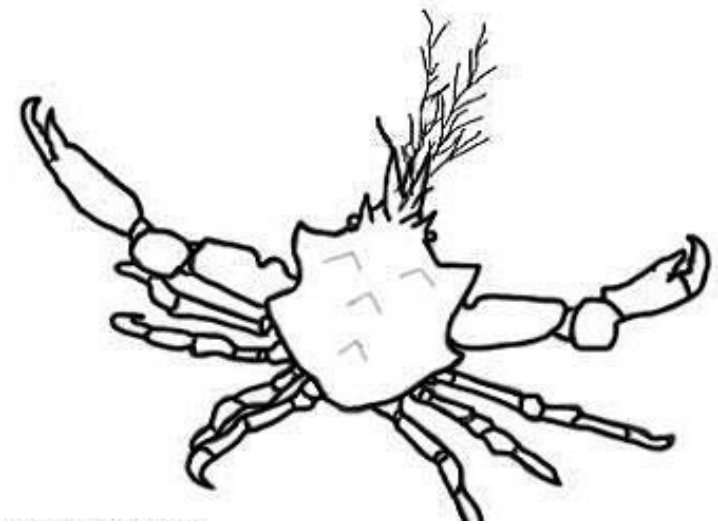


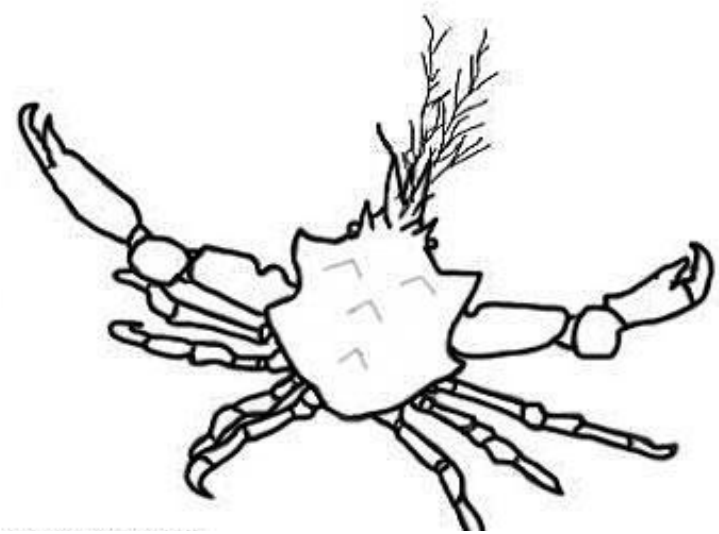


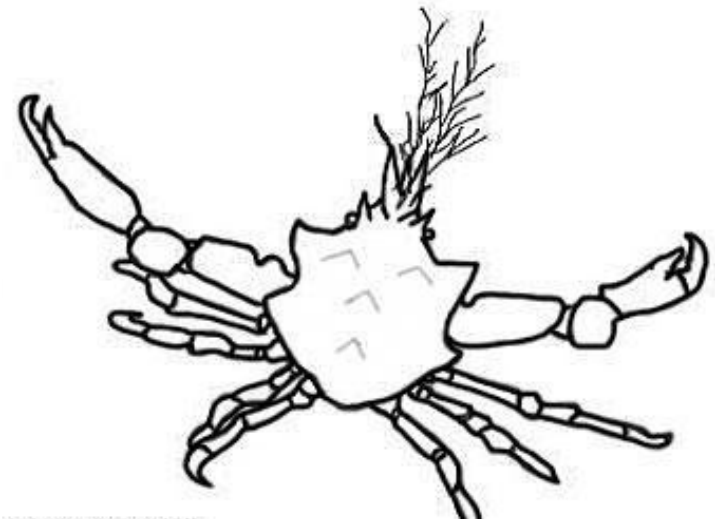


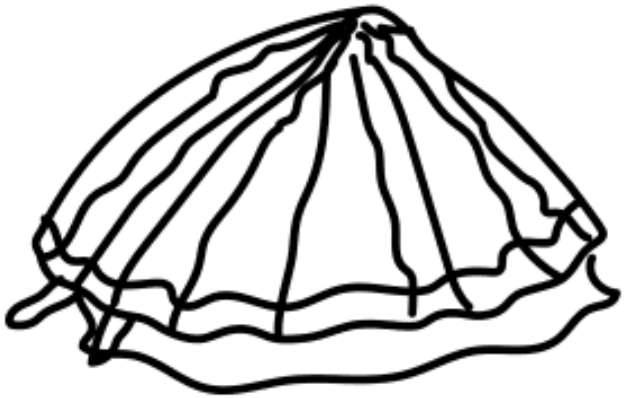
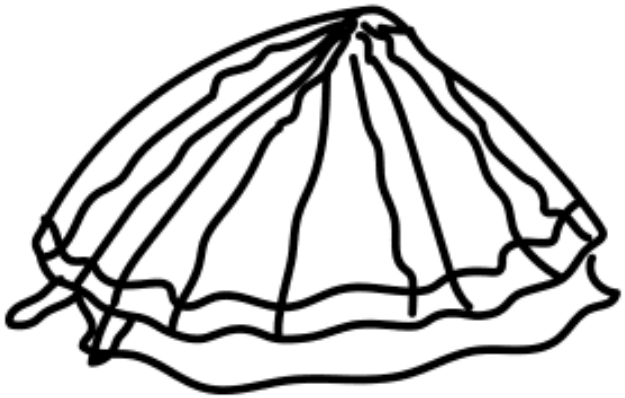
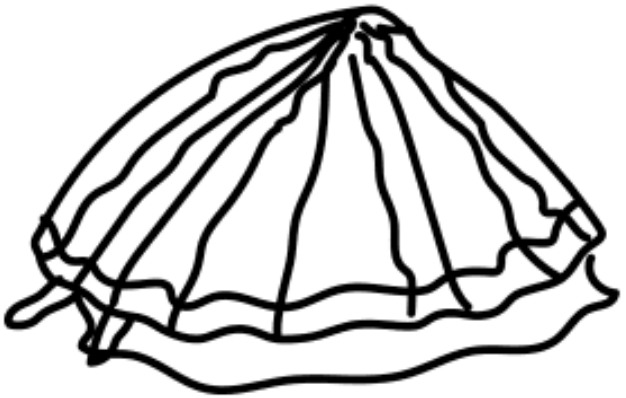
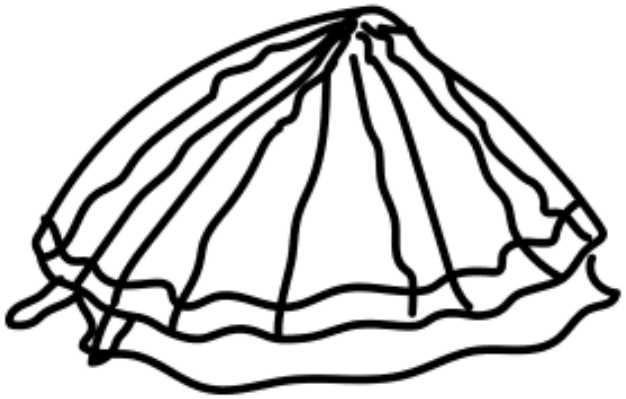
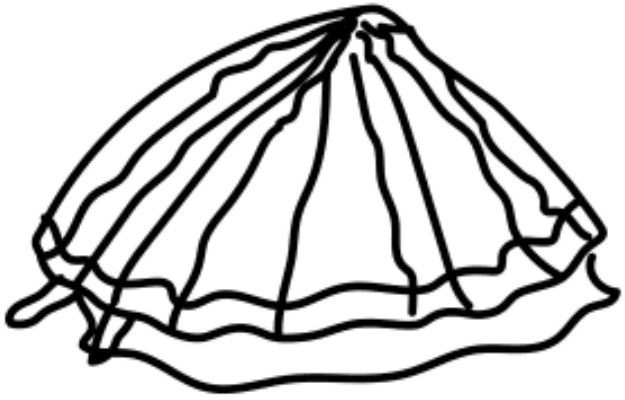
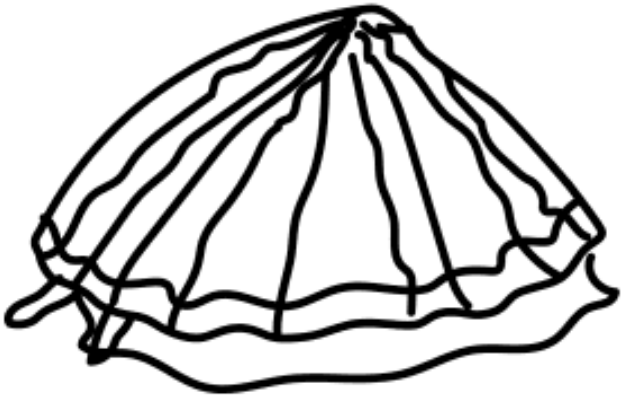


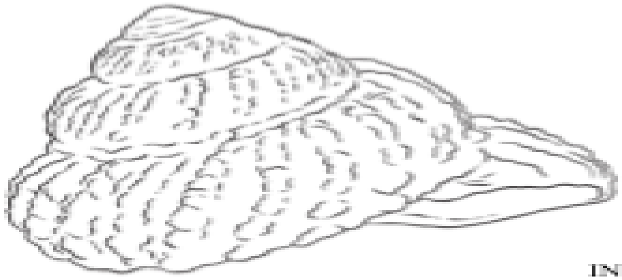










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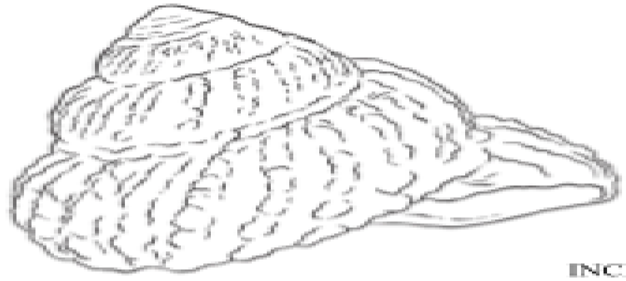

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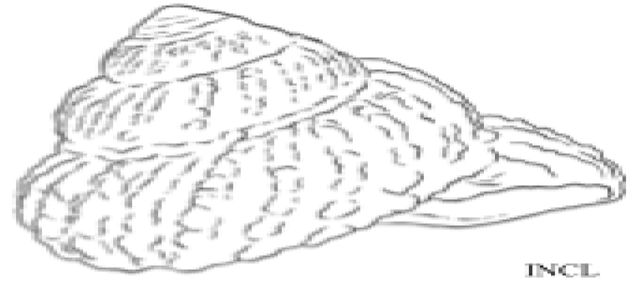

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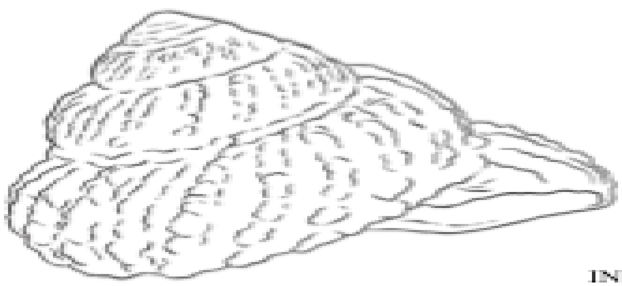

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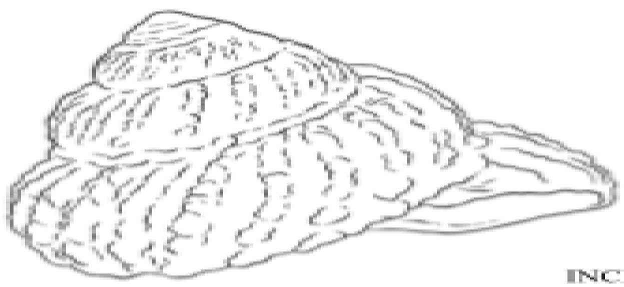

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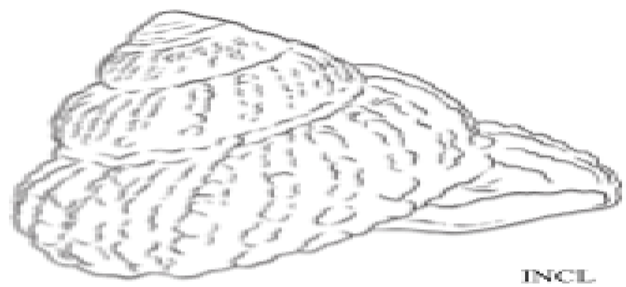

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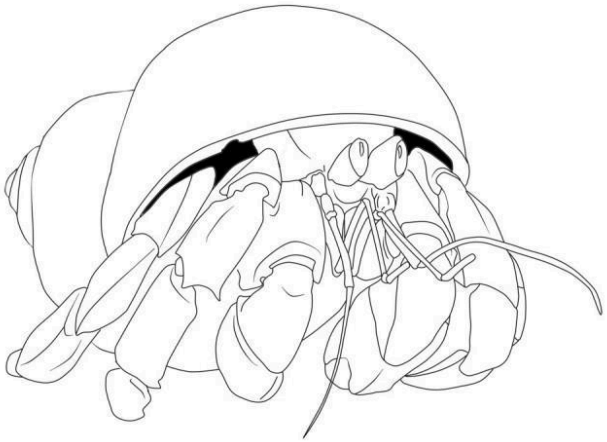

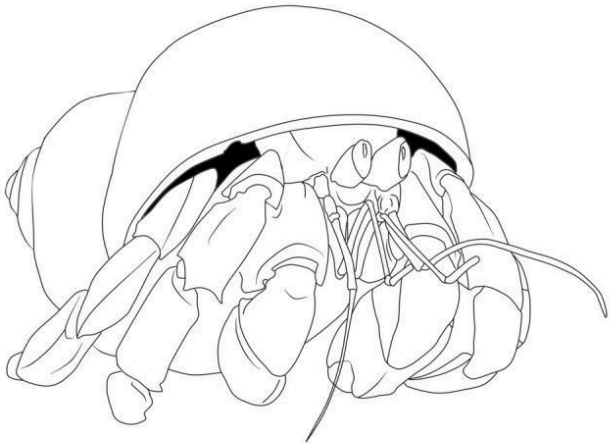

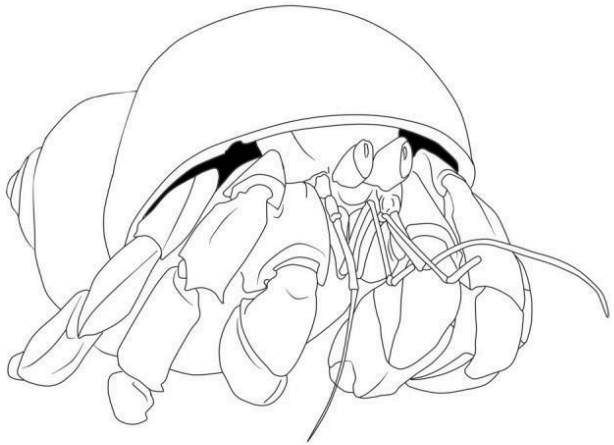

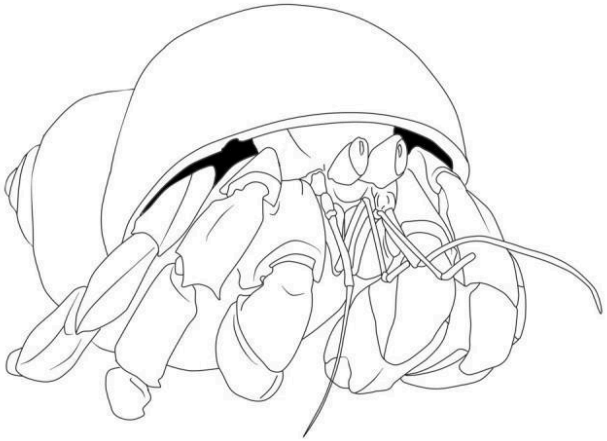

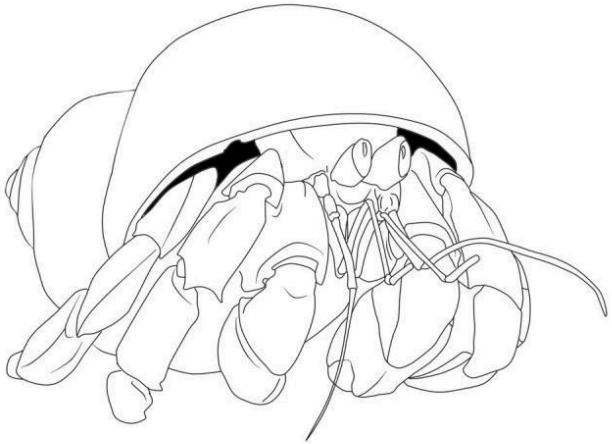

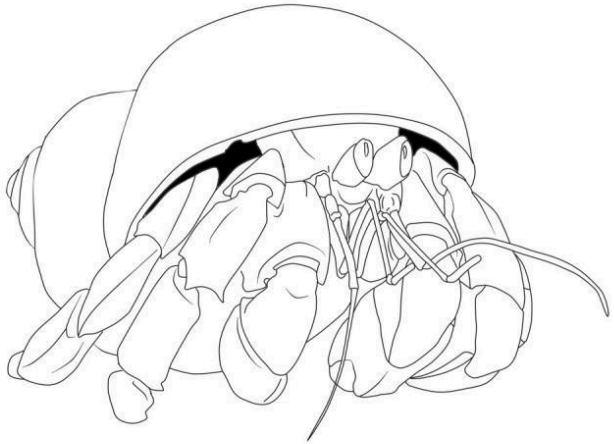

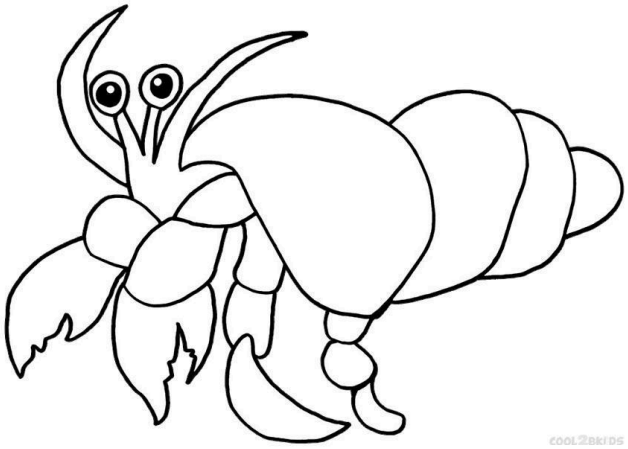
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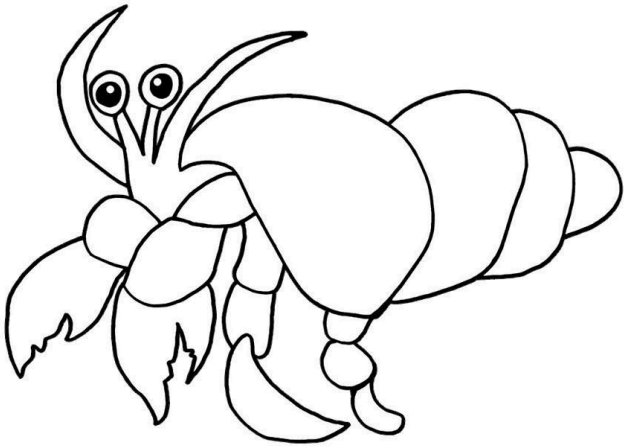
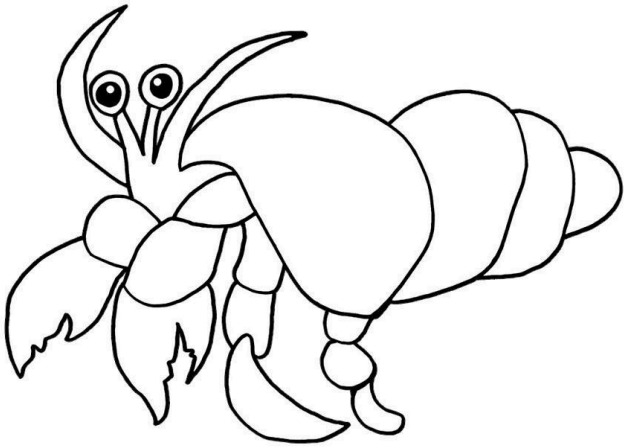
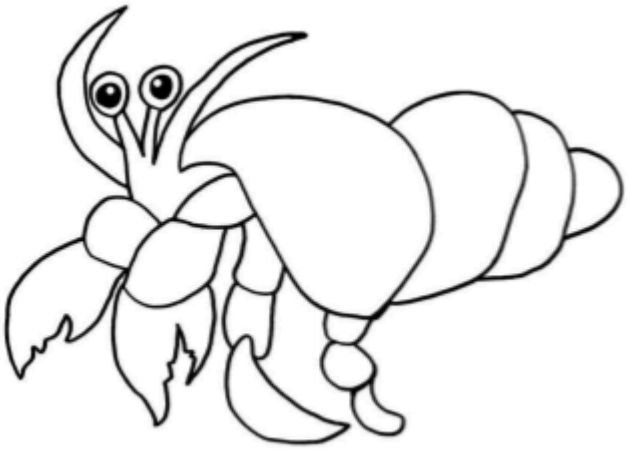
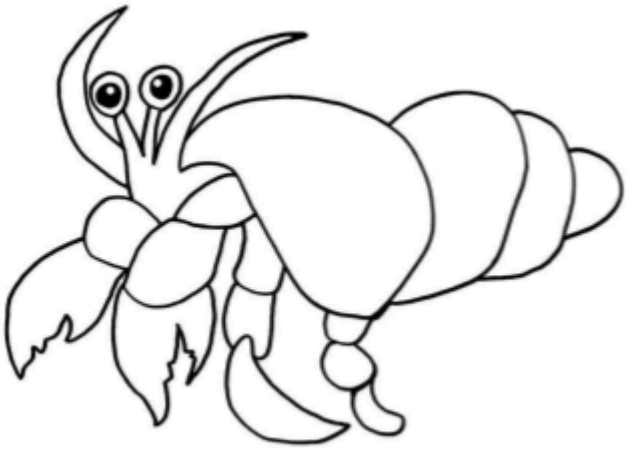
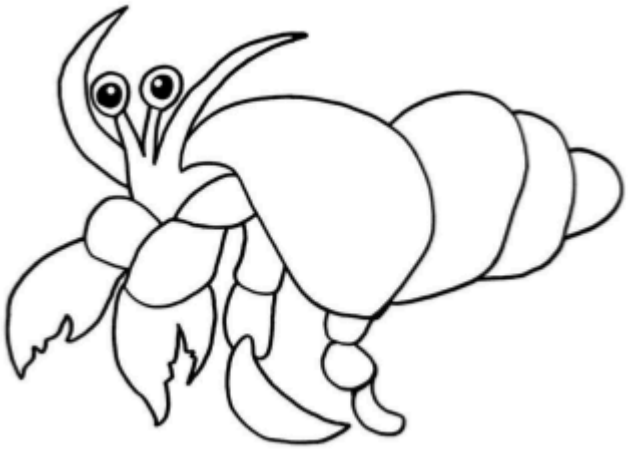
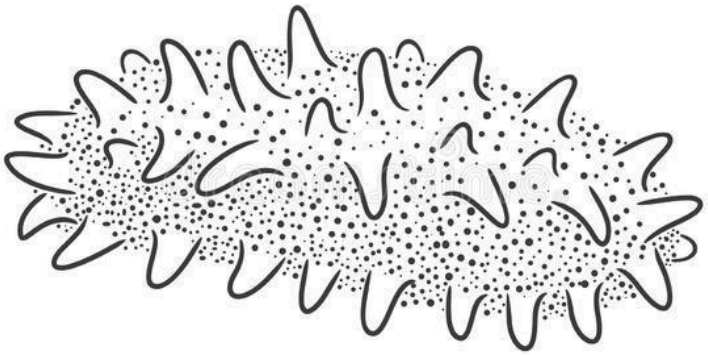


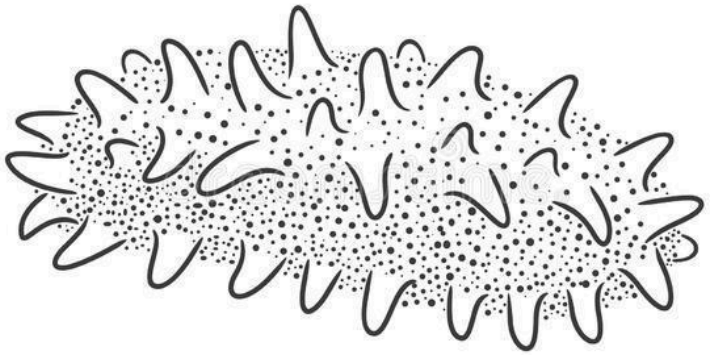


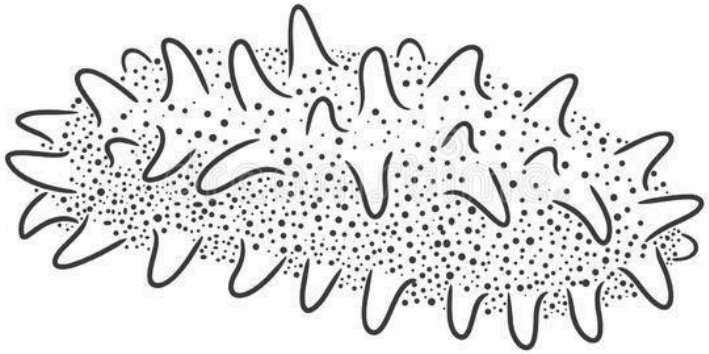


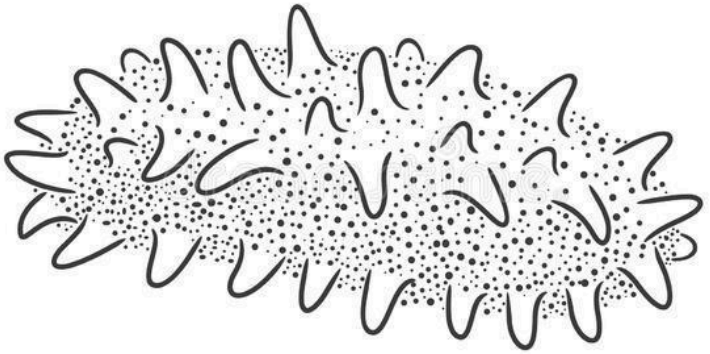


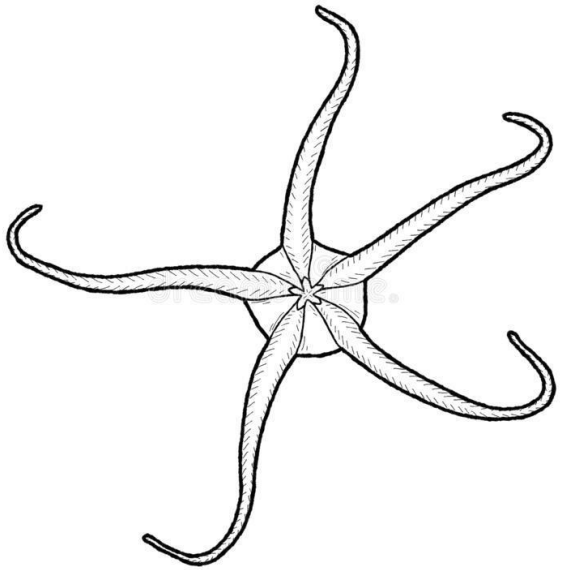


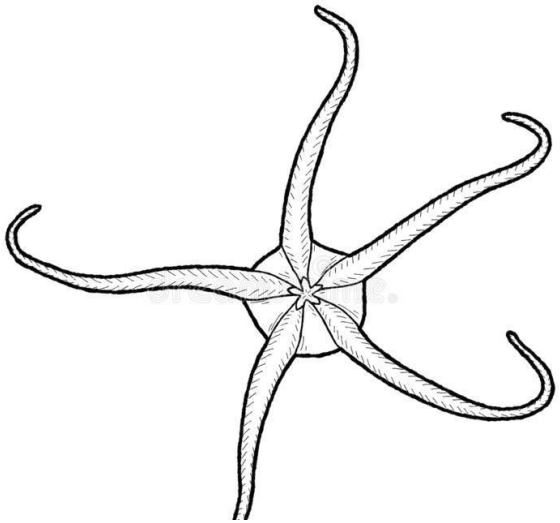


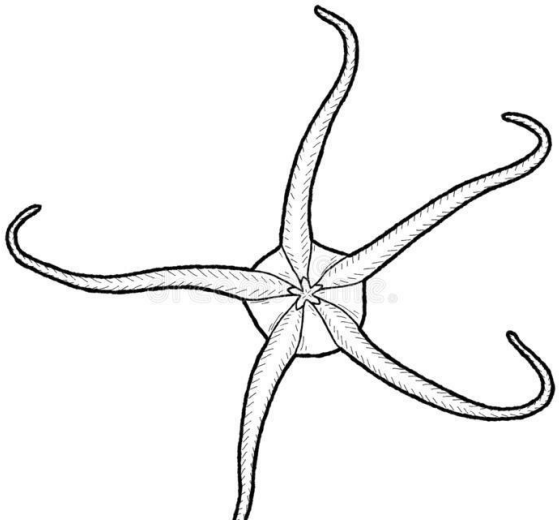


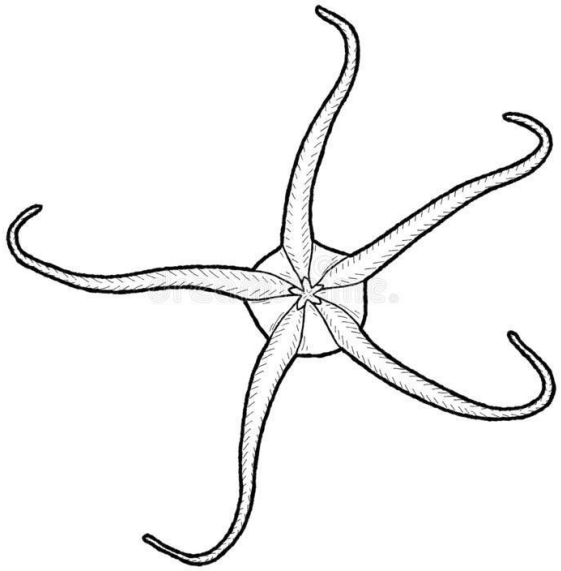


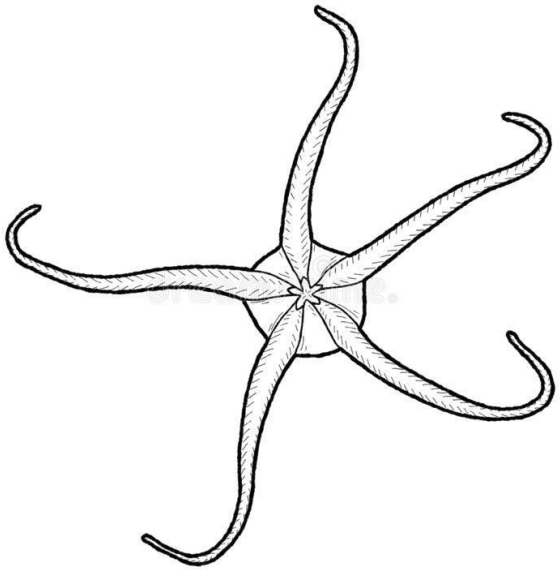


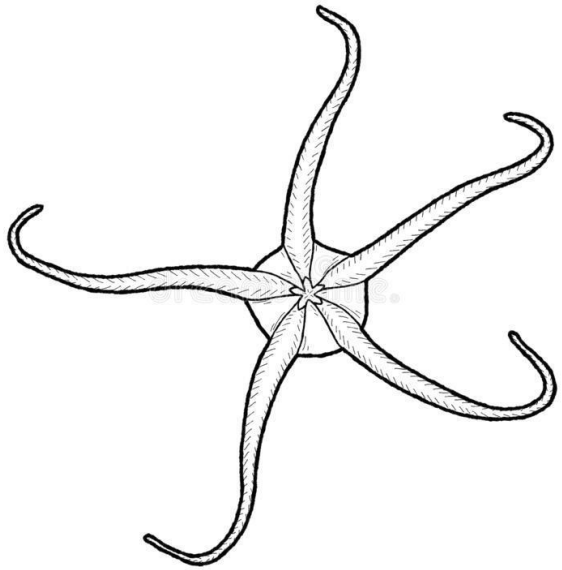




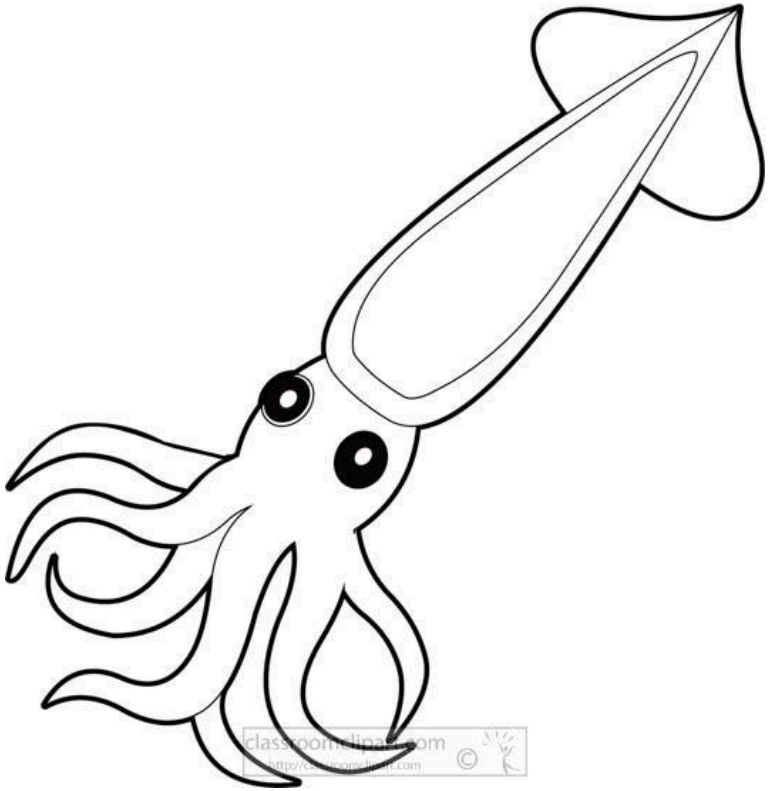


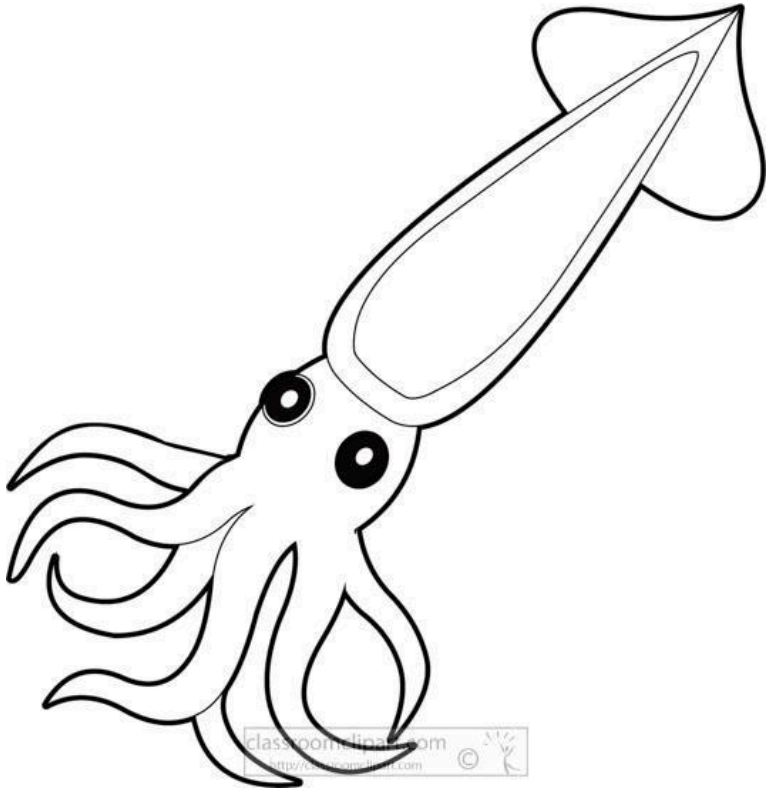




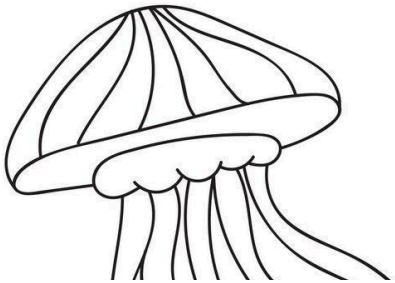
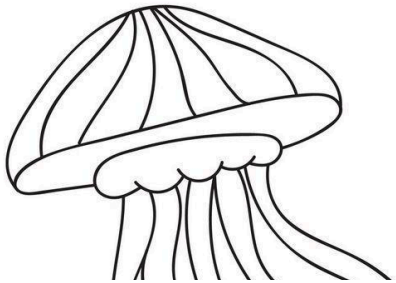
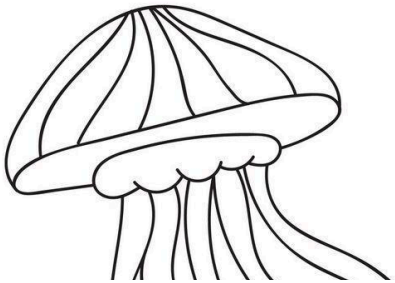
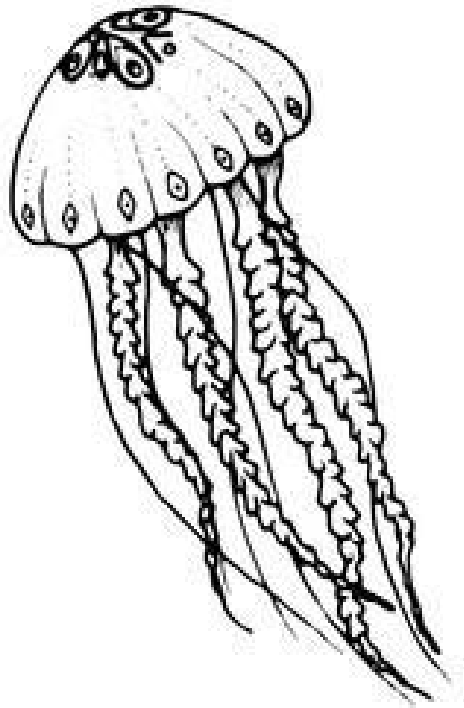
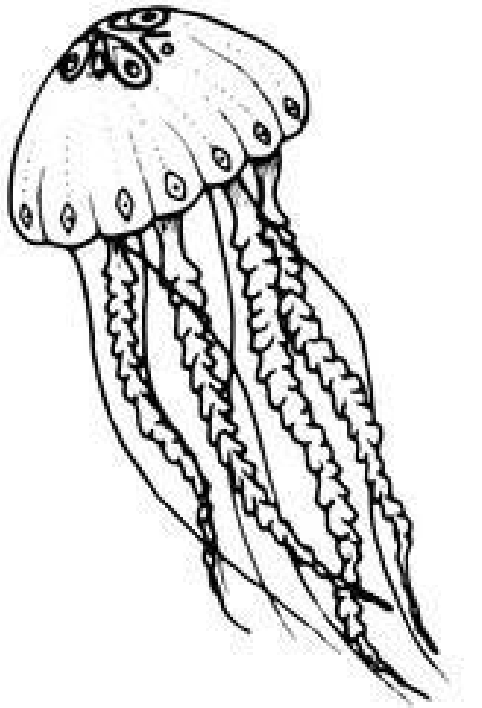
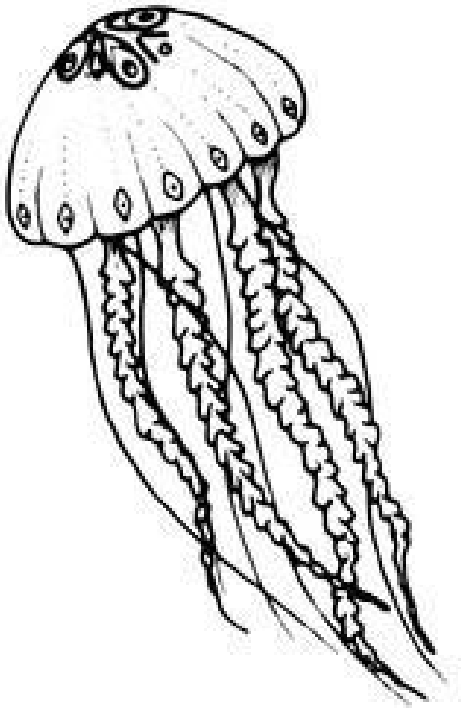
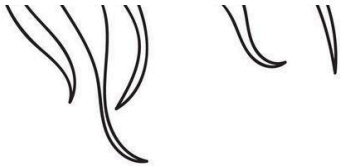


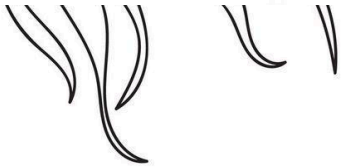
OUTLINE OF SQUID



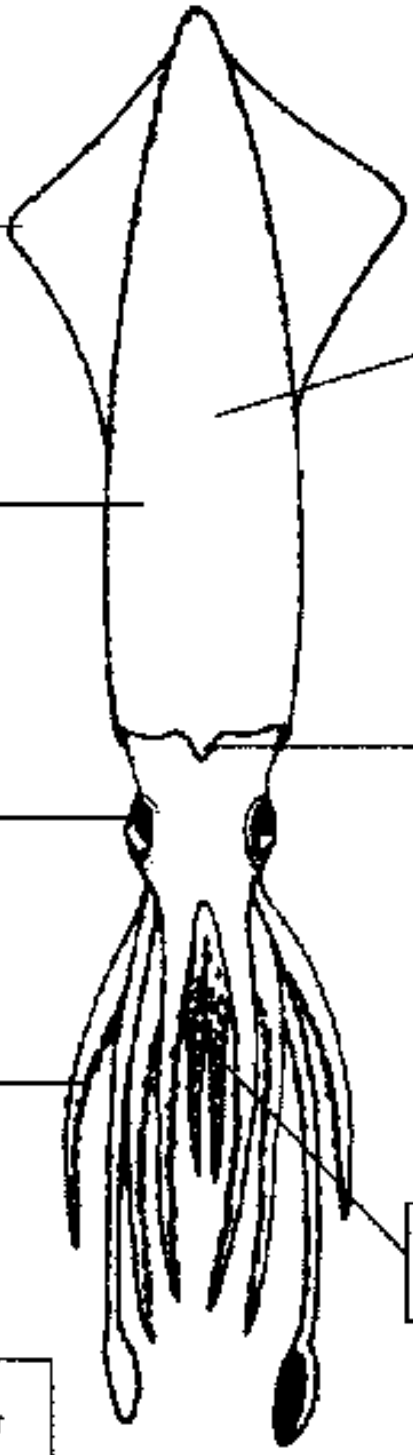


OUTLINES OF JELLIES



Squid: External Anatomy



FIN
These help squid change direction when swimming.

MANTLE
This is the main part of the squid's body--all the organs are inside.

CHROMATOPHORES
These spots change size to change the squid's color for camouflage or possibly communication.

PEN
The squid is related to other "shelled" animals like clams and snails. The pen is all that is left of the shell the squid's ancestors once had.

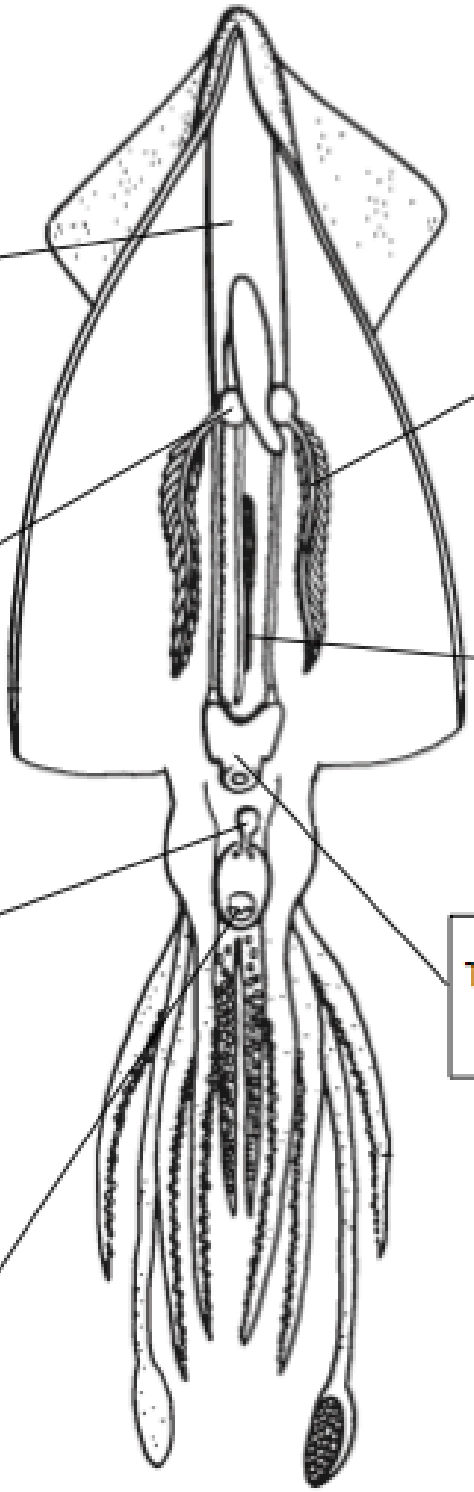
EYE
Squids have a well developed eye that allows them to see about as well as people!

ARM
Squid have 8 arms covered suction cups.

SUCTION CUPS
The suction cups help the squid to hold onto food.

TENTACLE
The tentacles are longer than the arms and have suction cups only at the tips. These are used to pass food to the shorter arms and then to the mouth.

Squid: Internal Anatomy



GONAD
This is the reproductive organ. In males it is white, in females, clear.

GILLS
Absorb oxygen from the water

HEART
For blood circulation

INK SAC
The squid releases ink from this gland in times of danger, which is then pushed through the siphon.

BRAIN
The squid's brain is highly developed for an invertebrate.

SIPHON
This tube squirts out water so that the squid moves like a jet airplane.

BEAK
The squid mouth parts resemble a bird's beak!

Great Online Resource: https://www.instructables.com/Squid-Dissection

- Full squid dissection with photos

Fun Facts about Squid

- The squid is one of the most highly developed invertebrates. Some of the animal's structures explored in this lesson illustrate the ways in which the squid has adapted to life in the ocean. Its streamlined body and "jet propulsion" which occurs as the squid squeezes water out of its body through its siphon, make the squid a fast, active predator. This animal also has a very good defense mechanism.
- All mollusks have a soft body with a special covering called the mantle, which encloses all of the body organs such as heart, stomach and gills.
- Squid can be as small as a thumbnail, or as large as a house. The giant squid, Architeuthis, can measure 60 ft. in length and weigh three tons!
- Squid have ten arms, which are wrapped around the head. Eight are short and heavy, and lined with suction cups. The ninth and tenth are twice the length of the others, and are called tentacles. Suction cups are only on the flat pads at the end of the tentacles.
- Squid feed on small crustaceans, fish, marine worms, and even their own kind! They use their tentacles to quickly catch their prey, which is pulled in by the arms and down to the radula, or beak, which uses a tongue-like action to get food to the mouth so it can be swallowed whole.
- Squid are a major food source for many fishes, birds and marine mammals.
- Squid produce a dark ink that they use to escape from predators. When a squid is startled, the ink is released through the anus, and the cloud of inky water confuses the predator while the squid swims away.
- After mating, a female squid will produce 10-50 elongated egg strings, which contain hundreds of eggs each. In many species, the parents will soon die after leaving the spawning ground. The egg strings are attached to the ocean floor, are left to develop on their own, and hatch approximately ten days later.
- Squid are an important part of the ocean food web. Squid are gaining popularity as a food source for humans around the world. Overfishing is a growing concern because there are no regulations on squid harvesting.
- Southern California squid populations spawn mainly in the winter (December to March).
- Squid are seined commercially at their spawning grounds. About 6,000 metric tons are taken yearly for human food and bait.