Hawaii's Rocky Shore

Concepts
The food web concept will demonstrate how animals depend upon one another and plants for food in the rocky shore ecosystem. Students will understand that each level is crucial to the balance of the system.

HCPS III Benchmarks
SC1.2.2
SC1.3.1
SC1.4.1
SC1.5.2

Duration
2 hours

Source Material
MARE Rocky Seashores

Vocabulary
Community
Food chain/web
Grazer
Producer
Scavenger

Rocky Shore Food Web Drama

Summary

Over two consecutive lessons, students will learn the relationship between animals and plants on rocky seashores. During the first lesson, each student will make a costume of a rocky shore organism. On a poster board with a rocky shore community drawing, students learn the roles of their specific organism and where they live on the rocky shore.

During the second lesson, students use their costumes to act out the interactions and relationships between each level of the rocky shore food chain. At the end of the lesson, students discuss questions that are designed to extend their understanding from the rocky shore community drama.

Objectives

- Students will be able to demonstrate the relationships between members in a rocky seashore food chain.

Materials

Large white construction paper to print the templates
Brown paper to construct sea cucumbers
Green tissue paper to make limu costume
Glue, tape, coloring markers, and scissors
Blue ribbon to represent ocean's tide line
2 poster board pieces or display board for rocky shore food web drawings

Making Connections

The concept of the food web applies to many ecosystems. The rocky shore is a good example of a food web because of the vast amount of living organisms and the complex system they form as a community dependent on one another.

Teacher Prep for Activity

Please practice making each type of costume before the actual lesson. Construct a food chain model out of construction paper to represent the different groups (i.e. yellow paper for the sun, green paper for producers, blue paper for the grazers, red for the predators, and brown for the scavengers). Print the templates using large construction paper. Make rocky shore community drawings on poster board or foam display board. Be sure to include proper tidal zones.

Background

We simplify the **food chain** system of rocky shore **community** into three groups: the **producers**, the **grazers** and the **scavenger**s/predators. Producers include algae (*limu*) and plankton. Both algae and plankton produce energy through photosynthesis, and they are the basis of the food chain. Most of the grazers in this lesson feed on algae, and some may capture plankton that drift by (although plankton mostly live in the pelagic zone of ocean). Limpets (ʻopihi), nerites (pipipi), and helmet urchins (hauʻukeʻuke) graze on algae found on rocks. They all have shells that protect them from the crashing waves. Rock-boring urchins (ʻina) excavate the solid rock surface and create burrows to protect themselves from waves and predators. They capture drifting plankton and algae with their spines.

Sea cucumbers (loli) are grazers and also scavengers. They feed by slowly sweeping their down-turned mouth back and forth across the bottom. Swallowing sand, sediment or mud, sea cucumbers filter out the organic matter and excrete the remainder. Sea stars are predators and scavengers. They attack urchins by putting their stomach over their prey and either digesting it outside the body or swallowing it whole. Brittle stars are scavengers because they use their tube feet to search for food on the ocean floor. They are also predators because they use their tube feet to capture drifting plankton.

On the other hand, the size of a crab's pincers usually indicates its foraging habit. For example, rock crabs (aʻama) are scavengers with small pincers that pick up small pieces of food on the rocks (e.g. limu and dead animal matter). Their flattened bodies and long legs are well adapted to wave-battered environment. Hermit crabs (unaʻuna) are scavengers. They are adapted to occupy shells of all shapes and sizes. Unlike other "true" crabs, hermits have soft tails and must be protected with shells from other animals. When threatened, a hermit retreats into its shell and seals the entrance with an oversized flap (called the operculum).

Procedure

Day 1, preparation and learn the roles of rocky shore organisms:

1. Assign each student a role in the rocky shore community. Divide the class into the sun, the moon, producers (algae and plankton), grazers (ʻopihi/limpets, sea cucumbers, pipipi snails, and urchins), and scavengers/ predators (crabs and sea stars). For example, you may assign 2 algae, 2 plankton, 2 ʻopihi, 1 sea cucumber, 3 pipipi snails, 2 rock-boring urchins, 2 helmet urchins, 1 sea star, 1 brittle star, 1 rock crab, and 1 hermit crab to a class of 18 students.
2. Distribute materials and templates for students to make their own hats and costumes.
3. After students finish their costumes, gather the class in an area in front of the rocky shore community poster board. Using the examples on the poster board, go over the roles of a producer, grazer, predator and scavenger.
4. Using their own costumes, have students present the roles of their organism (steps 3 and 4 can be done in the beginning of day 2).

Day 2, rocky shore community drama:

1. Set up a stage area. Review the roles of each food chain level and explain the rules of rocky shore drama. For example, while rehearsing the role of the grazers (herbivores), ask the students what a grazer eats (algae and phytoplankton). Have the students act out how a grazer would eat using their costume. Finally, tell students that they should act like a grazer eating algae and planktons during the drama.

2. Use the slides provided in the "Rocky Shore Drama Scenes" Powerpoint folder.
3. Start the drama by having producers and grazers take the stage first, but everybody hunkers down and stays still (low tide).
4. Teacher and a student (or helper), holding the blue ribbon on each end, rise the water level to represent high tide. You may choose to have the sun to enter the stage at this time also. Algae sway with the motion of the current, and plankton drift around the stage with the ocean current. Grazers such as rock-boring urchins stand still and grab the plankton that drift pass them. The helmet urchin moves around slowly, but consistently scrapes the algae off the rock. The narrator explains that sun brings energy to plants and phytoplankton, and they grow into food for the grazers. The teachers may have the characters enter the stage one by one, to avoid chaos.
5. Scavengers/ predators enter the stage. A sea star preys on urchins, 'opihi, and pipipi by enclosing them with its tube feet. A brittle star grabs the planktons that drift by and scavenge from the ocean bottom. A crab mostly scavenges the ocean bottom, but it can also prey on a pipipi snail.
6. The teacher lowers the blue ribbon, all members hunker down for the low tide. The sun sets and the moon rises.

Questions for discussion (you may have students answer the questions by acting with their costumes):

1. How do members of rocky shore community interact with each others (for example, how does a predator interact with a grazer)?
2. What is the source of energy for the community?
3. What do producers provide for the community?
4. What do consumers provide for the consumers?
5. How would the rocky shore community be affected if we eliminated one of the groups? (for example, what would happen if all the grazers were gone? *Use the construction paper food chain prop and remove a group so they can visualize this link missing*)
6. (Bonus question) Which group do you think has the highest population of species? Why?

Assessments

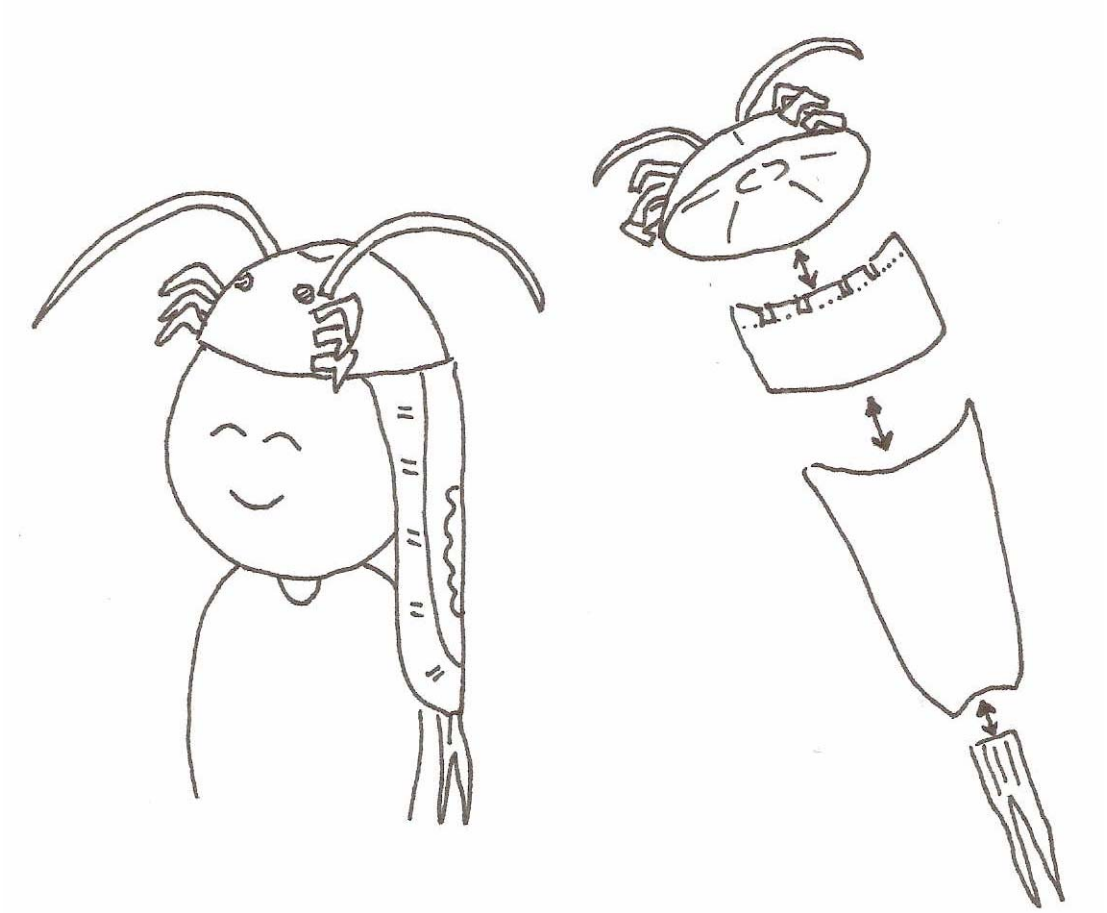
Rocky shore community drama and discussion.

Supplemental materials:

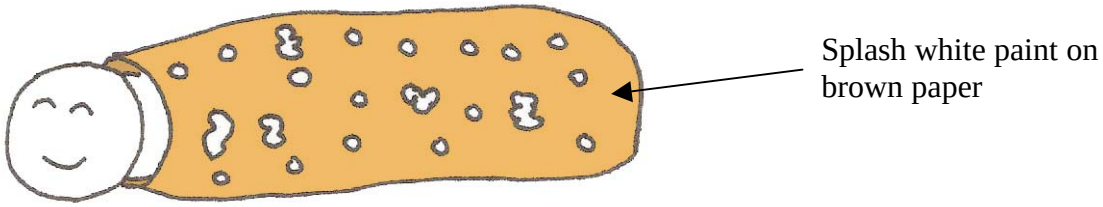
Templates for puppets
Rocky shore food chain drama scene descriptions

Producer #1: Algae. Cut pieces of green tissue paper and tape them on a shirt (or a pillow case) for student to wear.

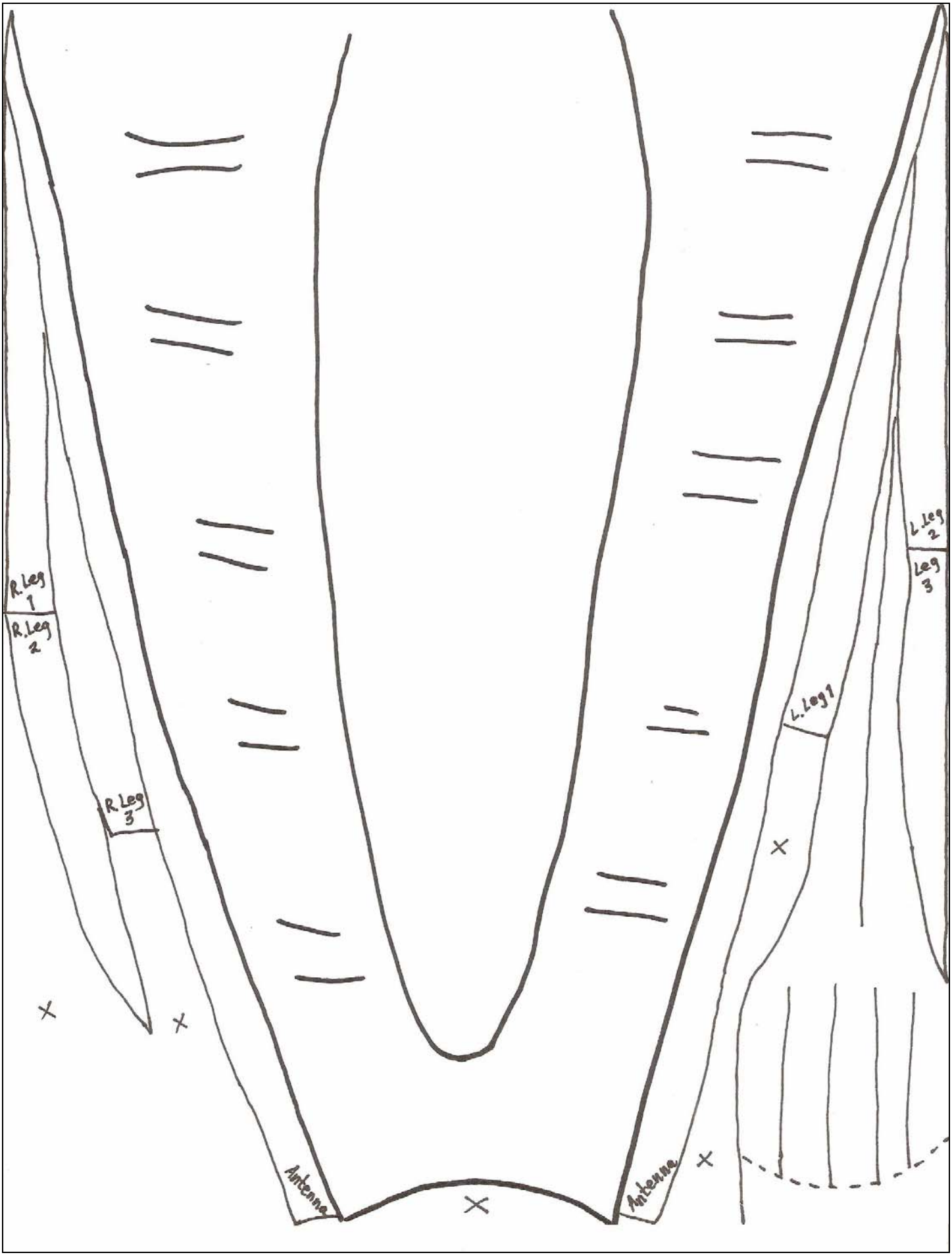
Producer #2: Plankton (templates on p.3 and 4)



Grazer #1: Sea cucumber

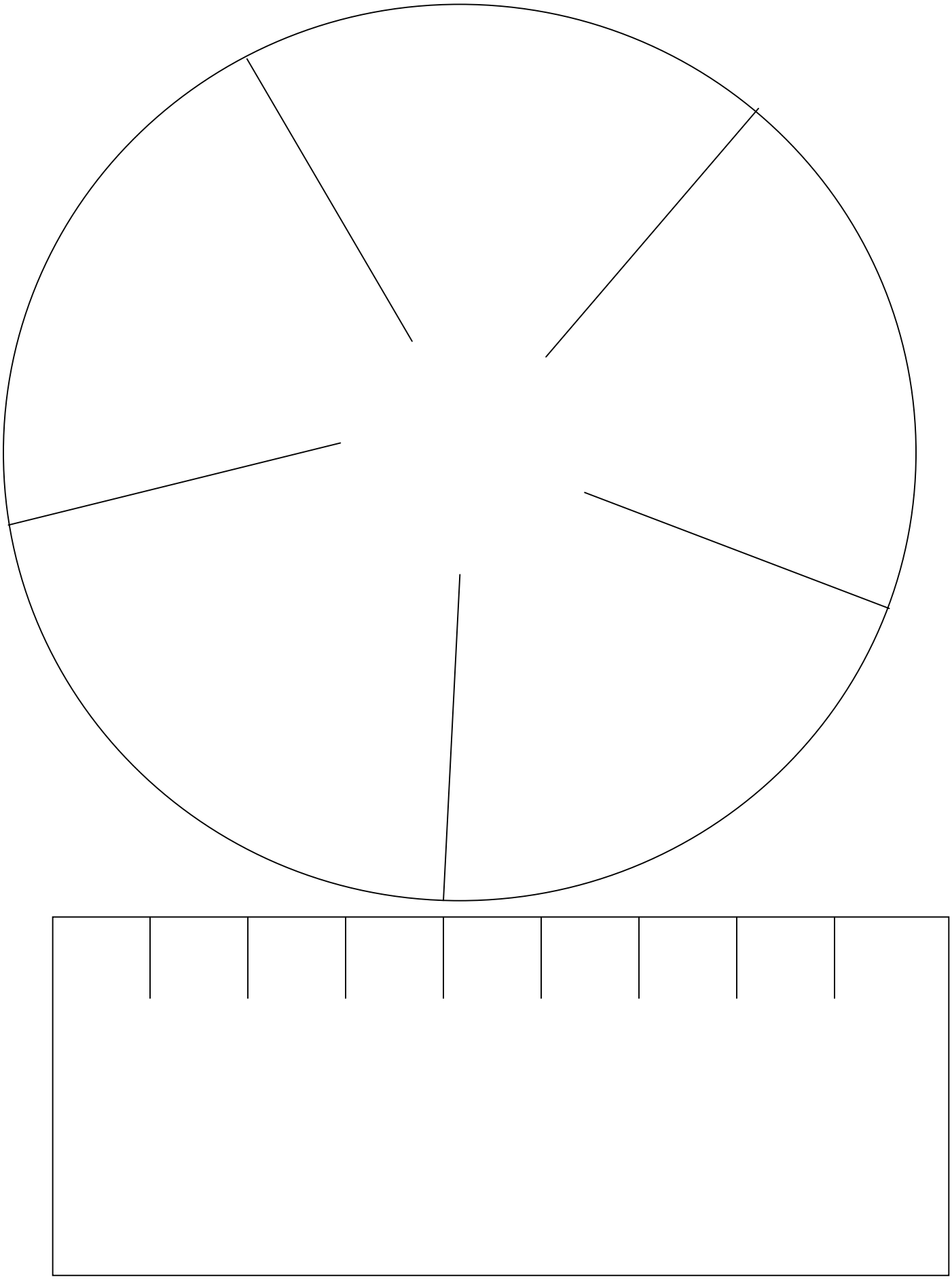


Plankton

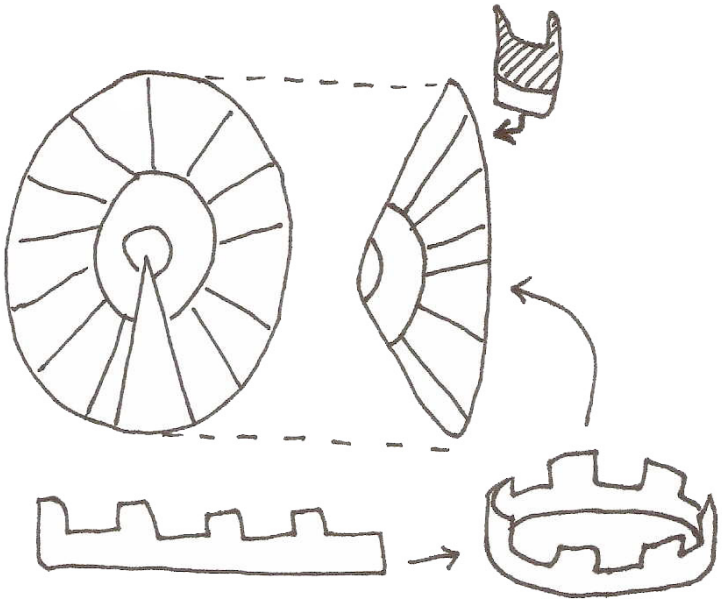


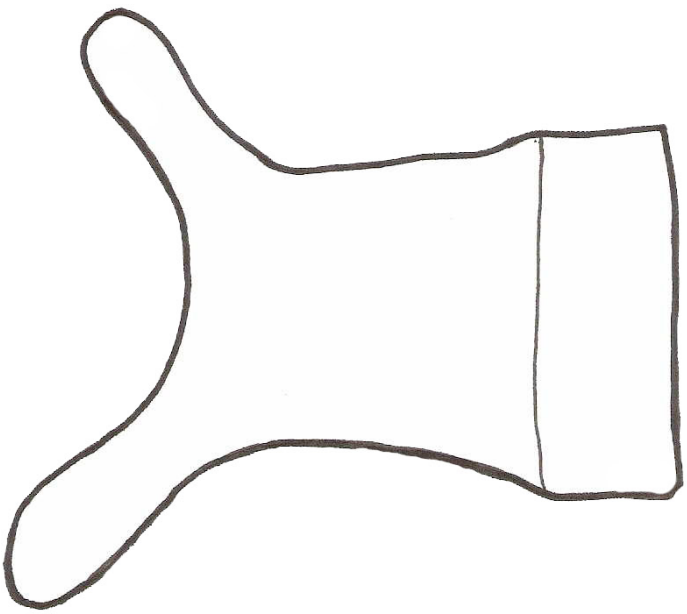
-Rocky shore food web 3 -

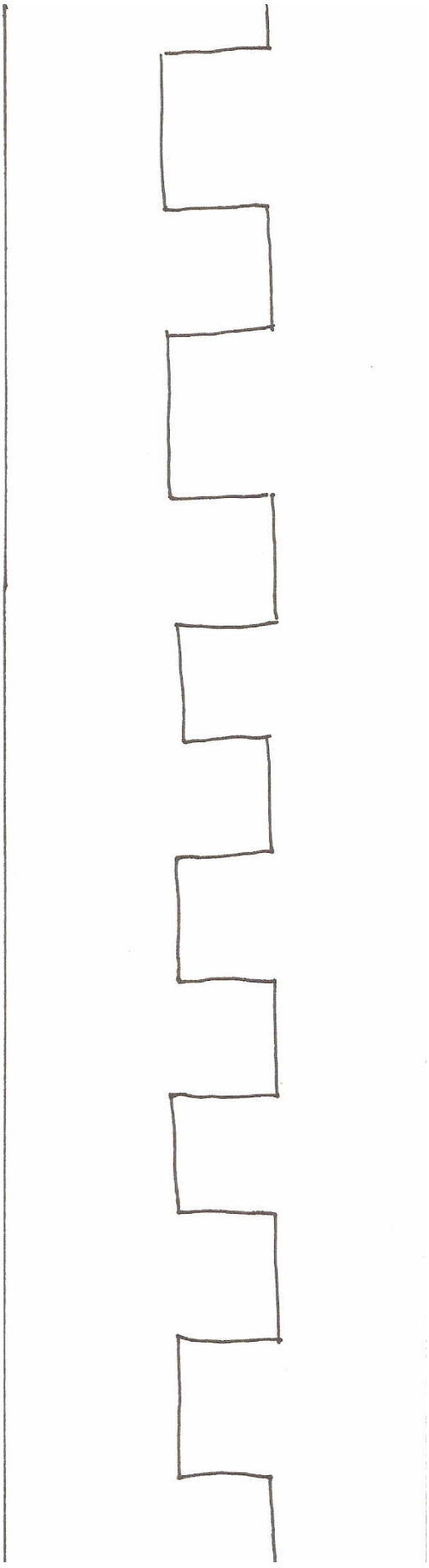
Plankton head part



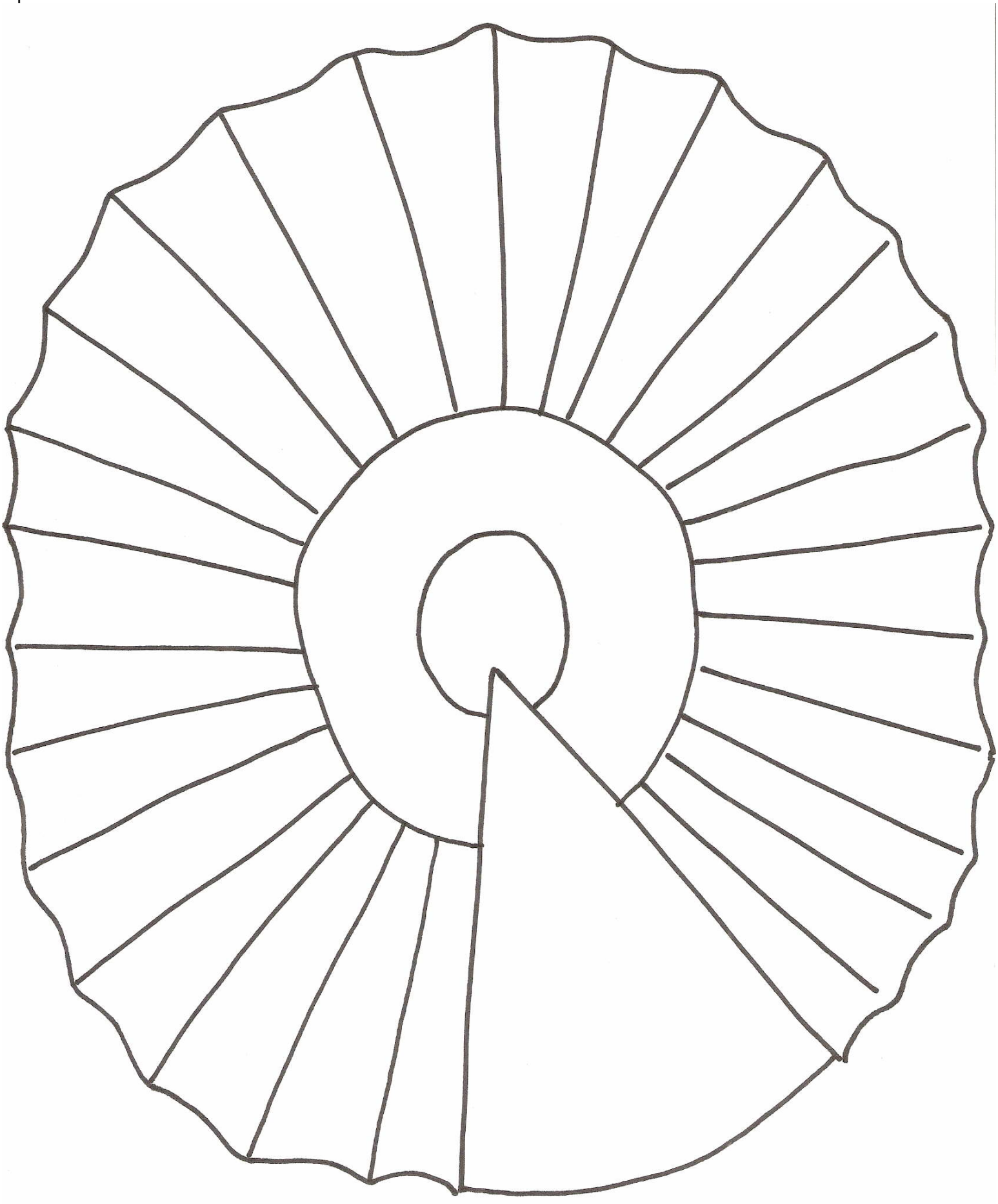
Grazer #2: limpet (opihi) templates on p.5 and 6.



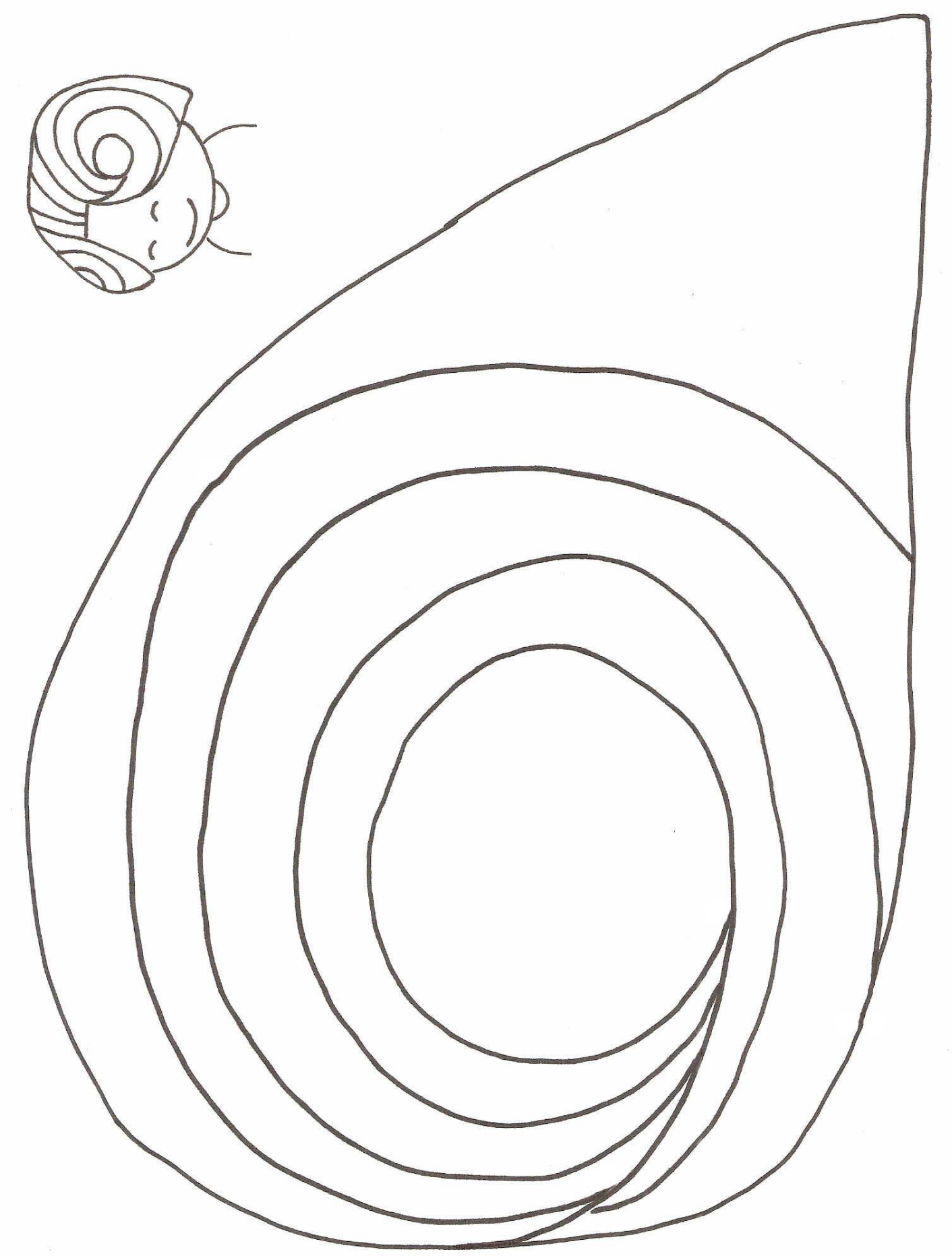




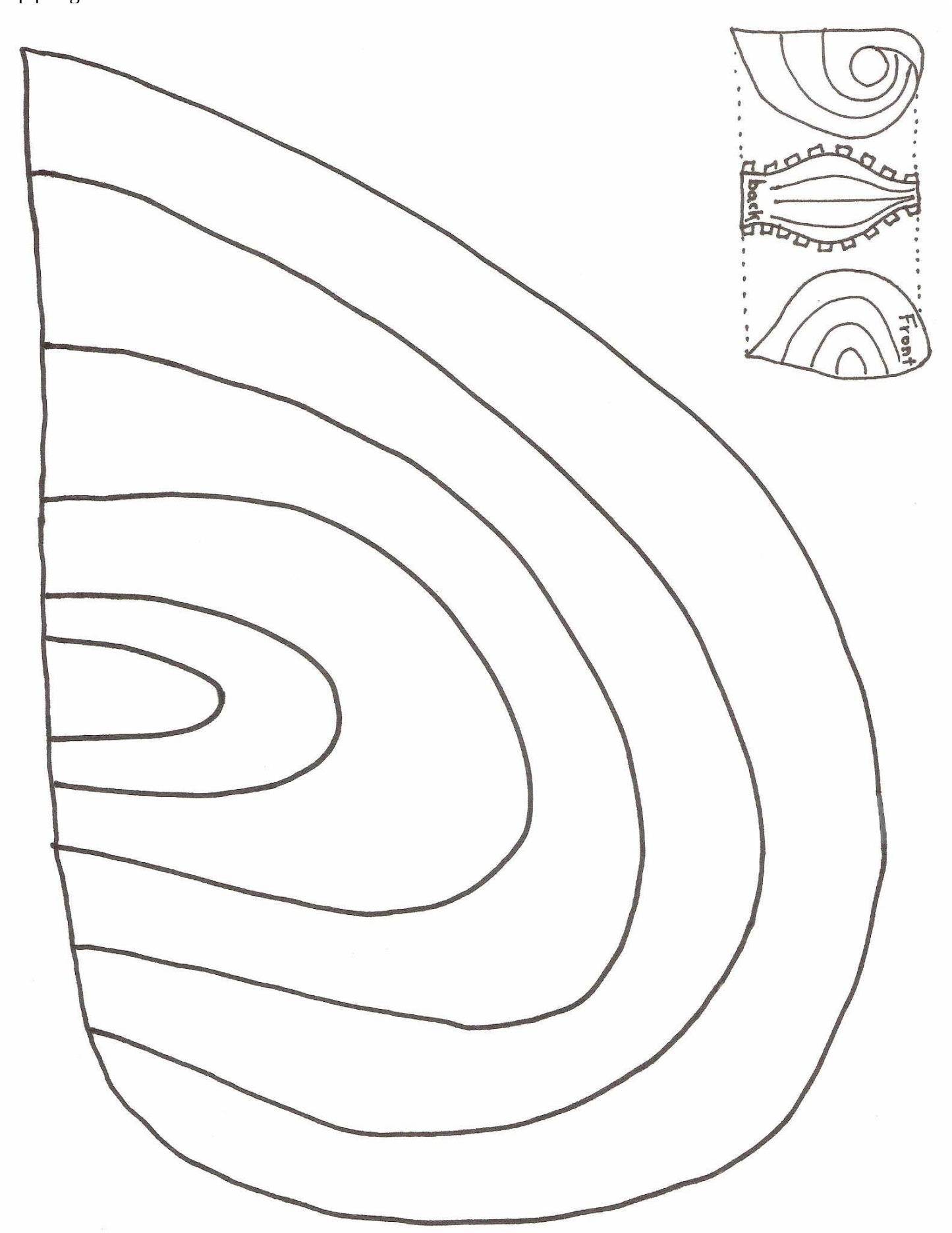
Opihi shell

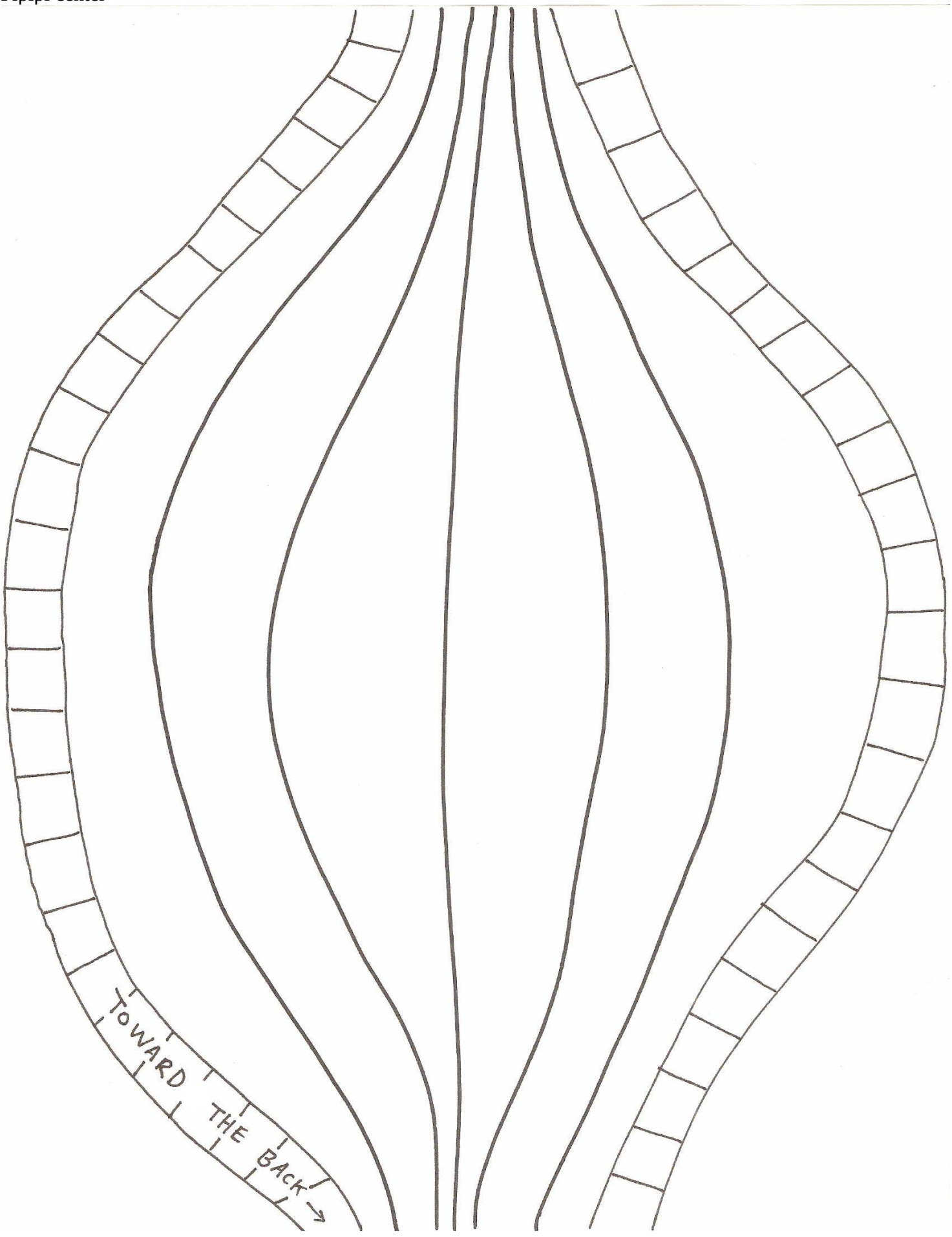


Grazer #3: black nerite (pipipi snail) templates on p. 7 (left side), 8 (right side), and 9 (center)



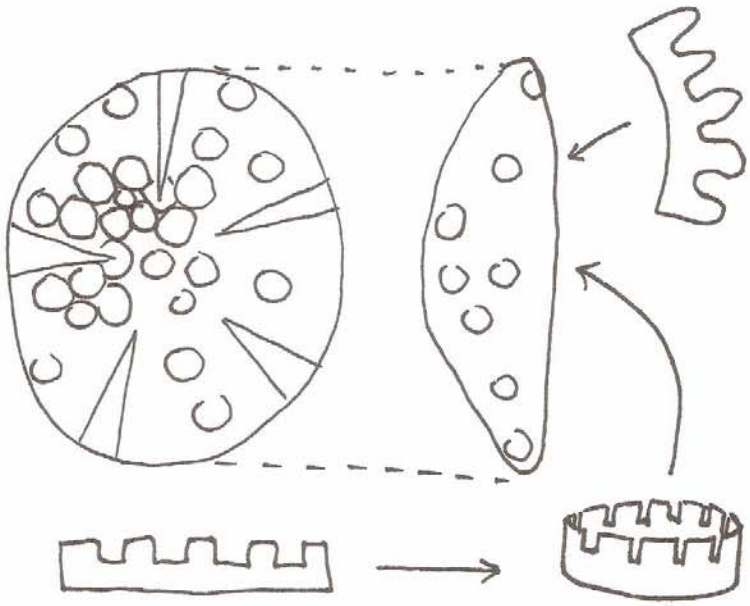
Pipipi right

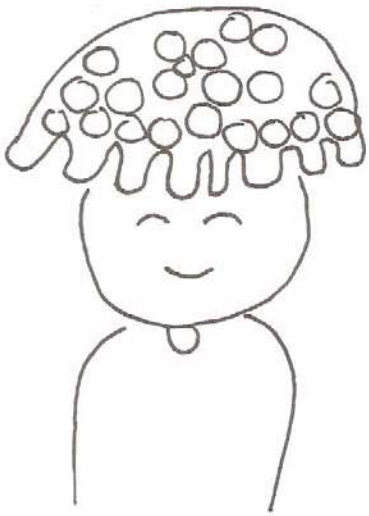


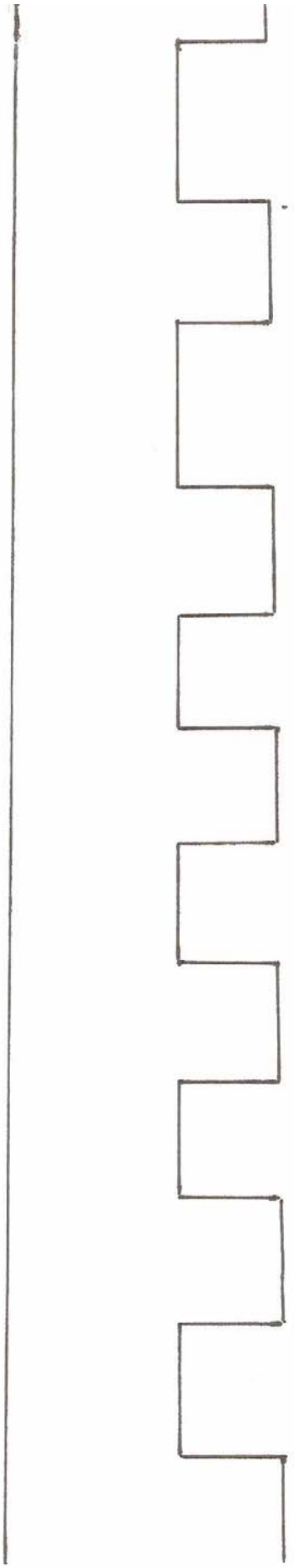


-Rocky shore food web 9 -

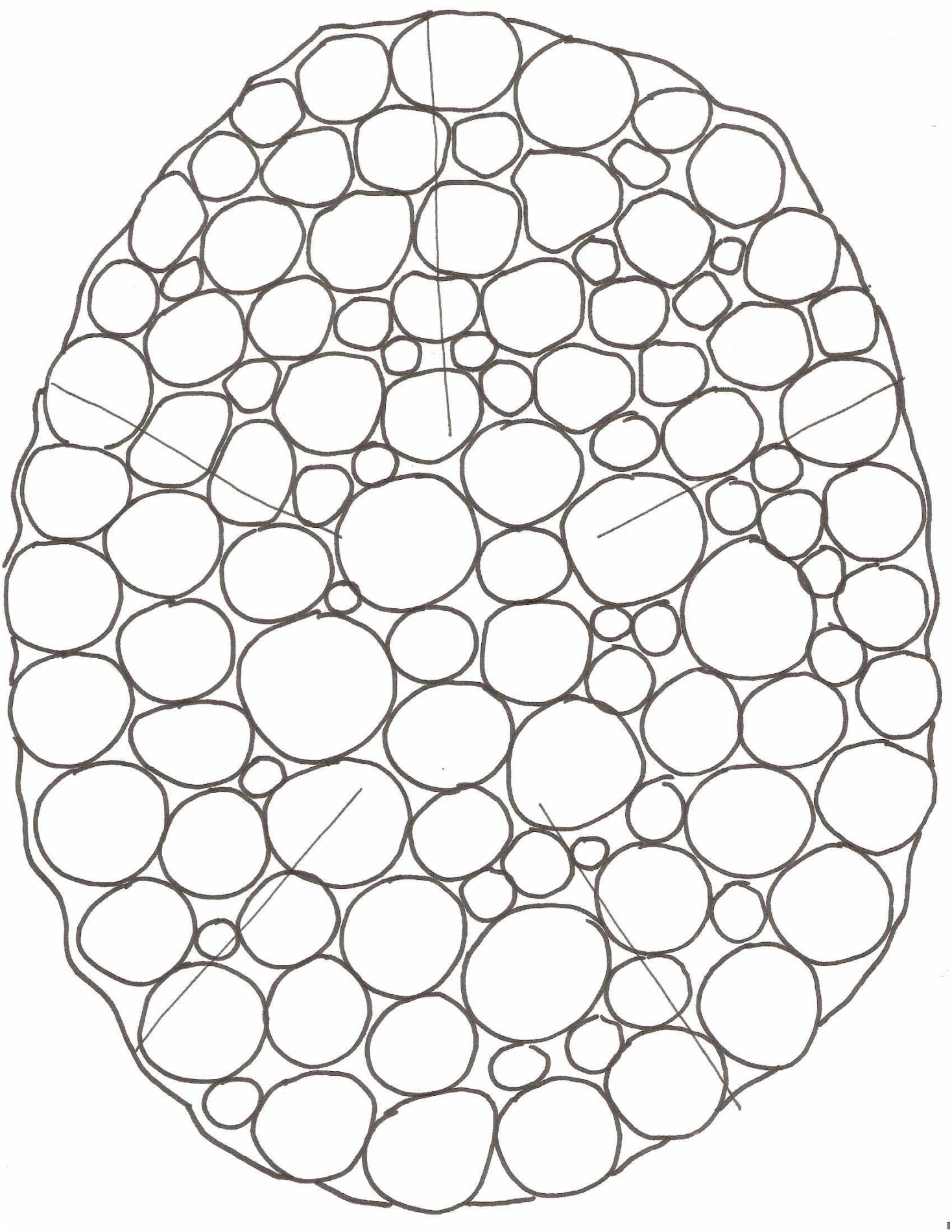
Grazer #4: helmet urchin (Hau'uke'uke) templates on p. 10-12



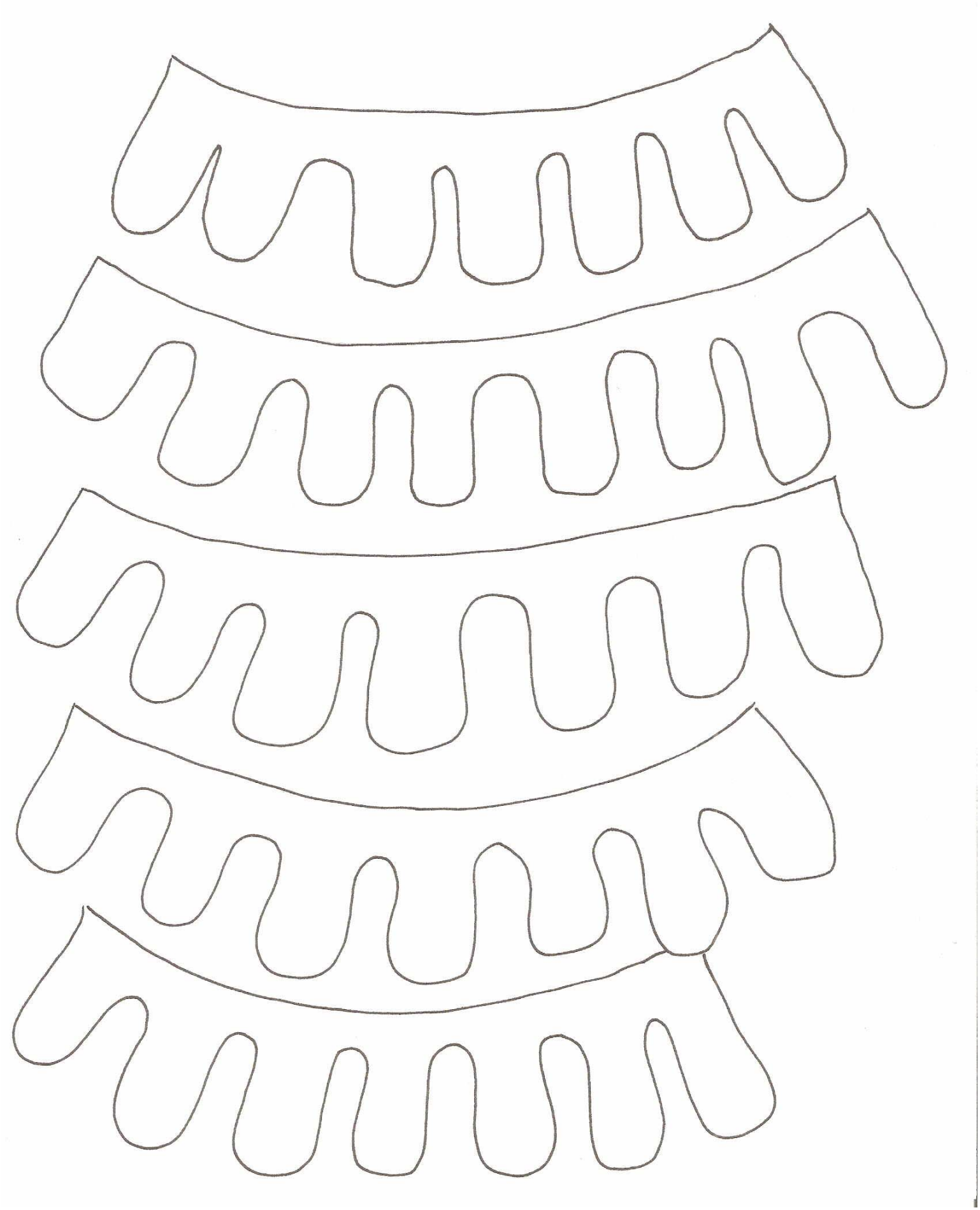




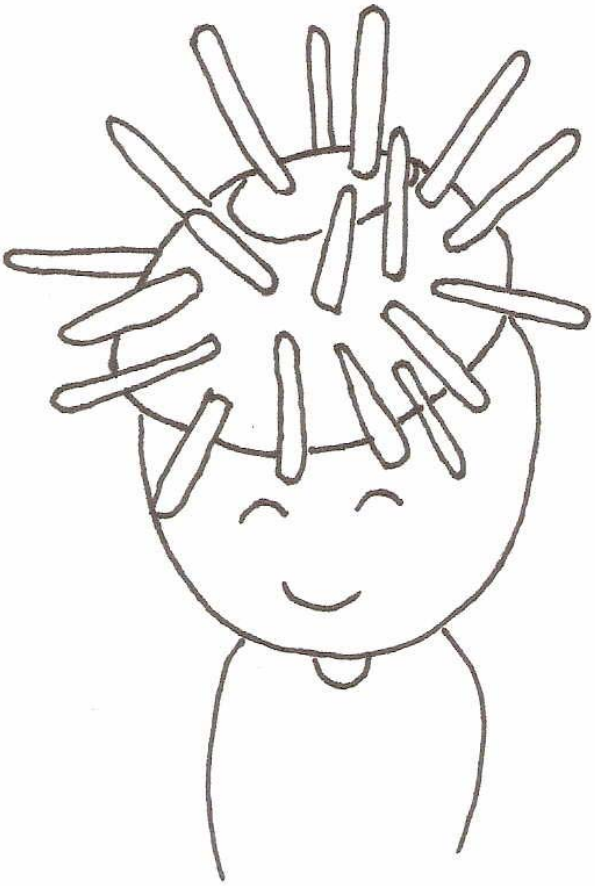
Helmet urchin

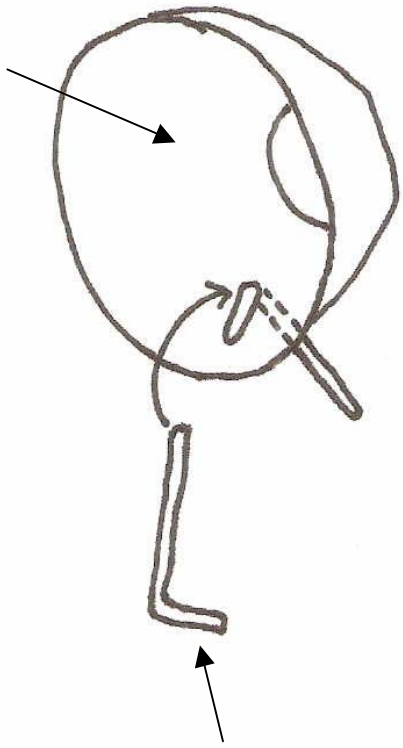


Helmet urchin “skirt”

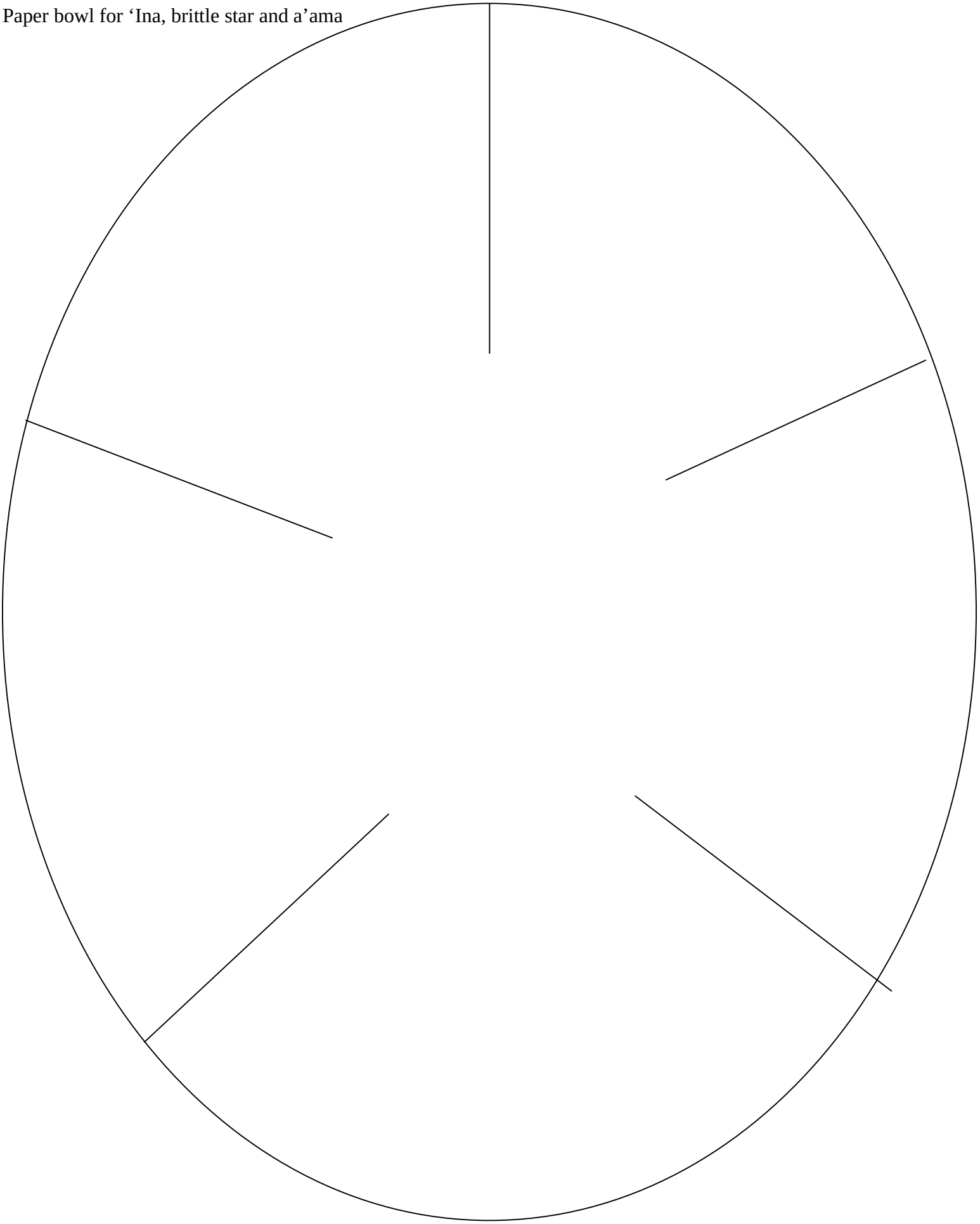


Grazer #5: rock-boring urchin (‘ina)

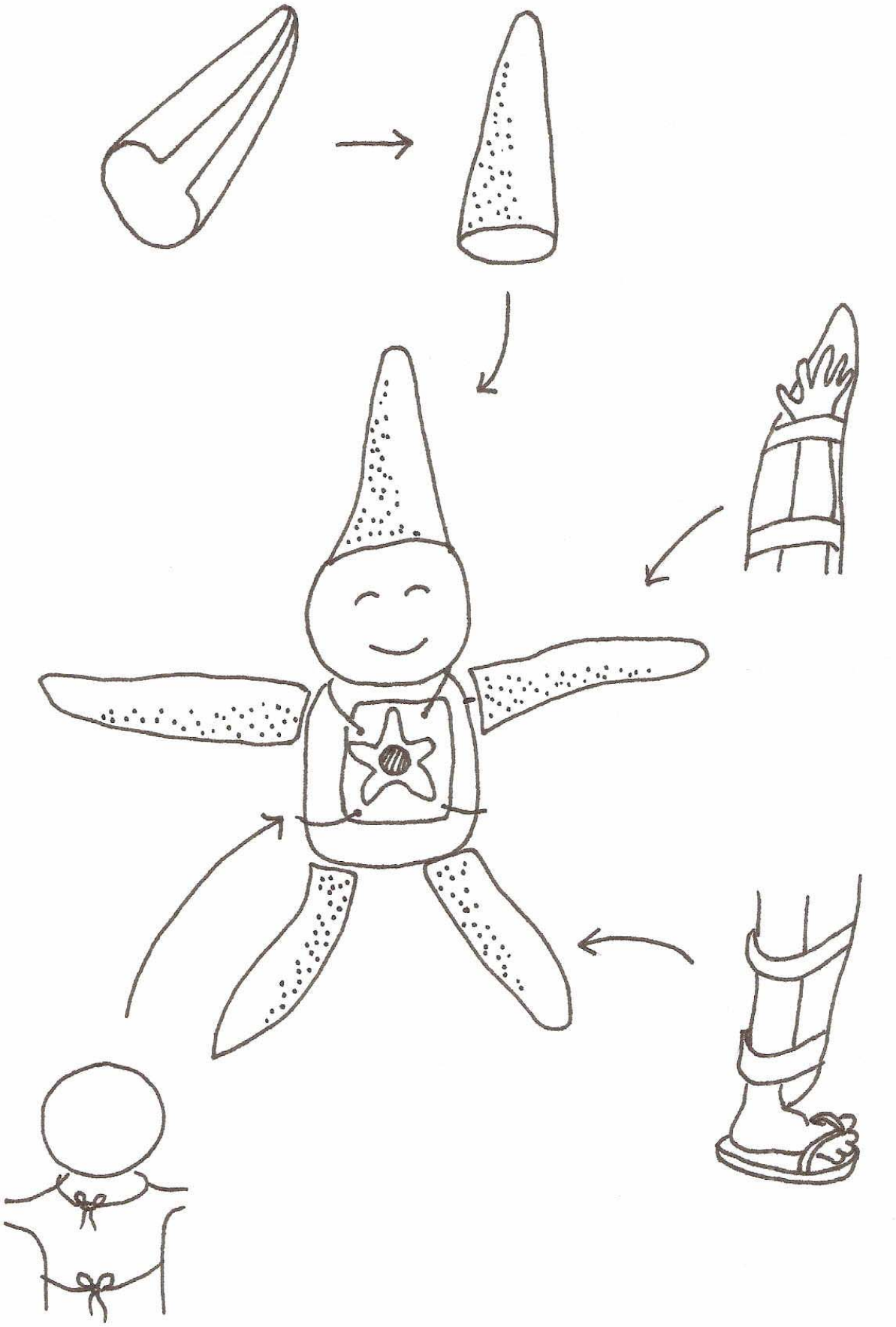




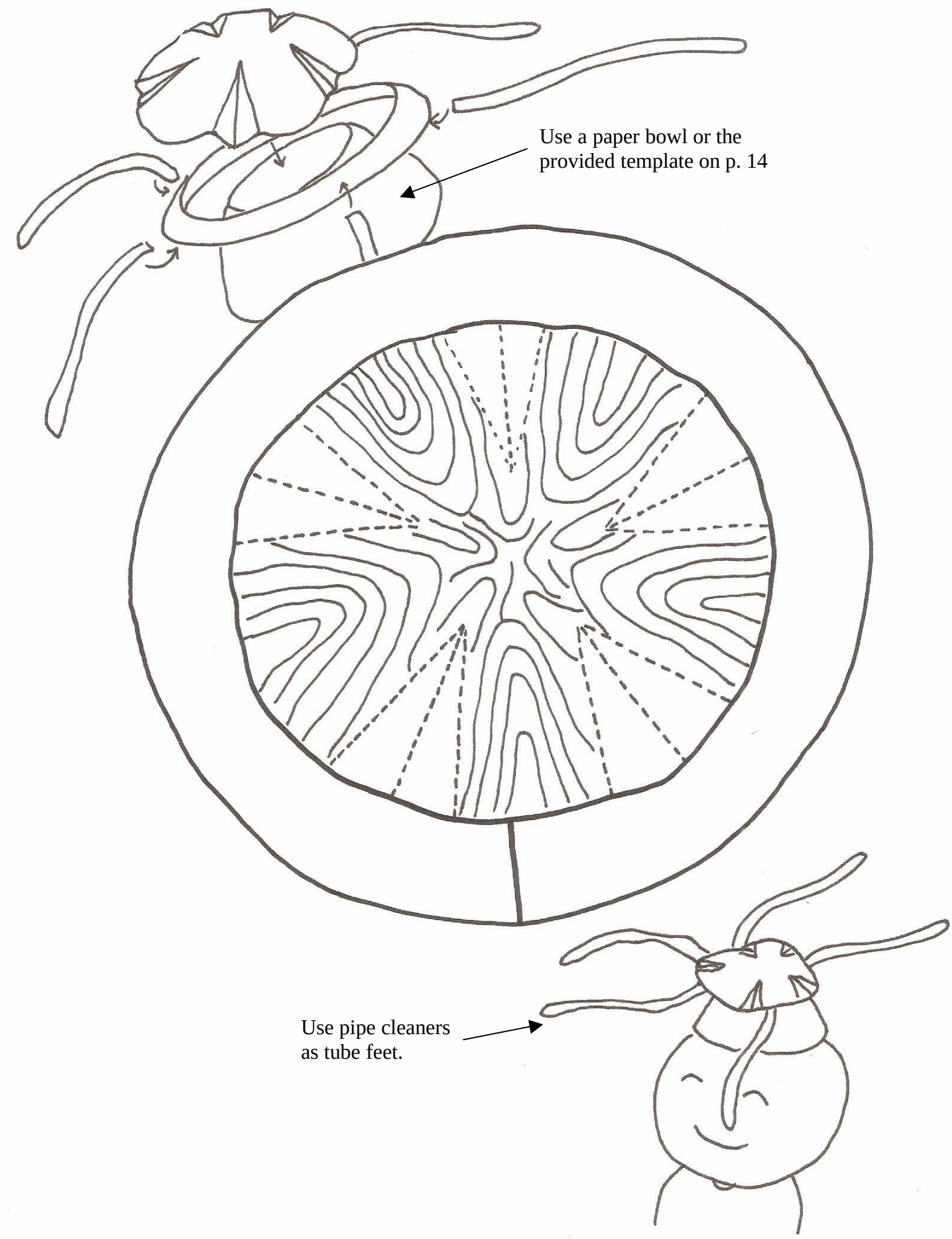
Paper bowl for ‘Ina, brittle star and a’ama



Predator/scavenger #1: sea star

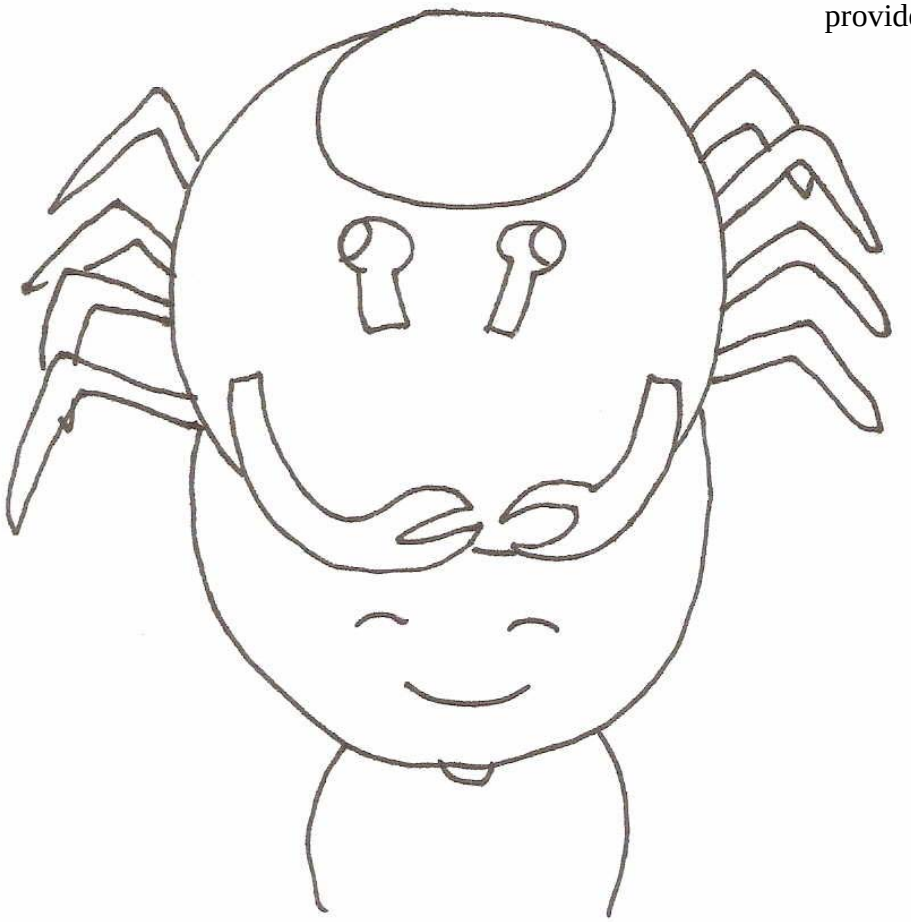


Predator/scavenger #2: brittle star

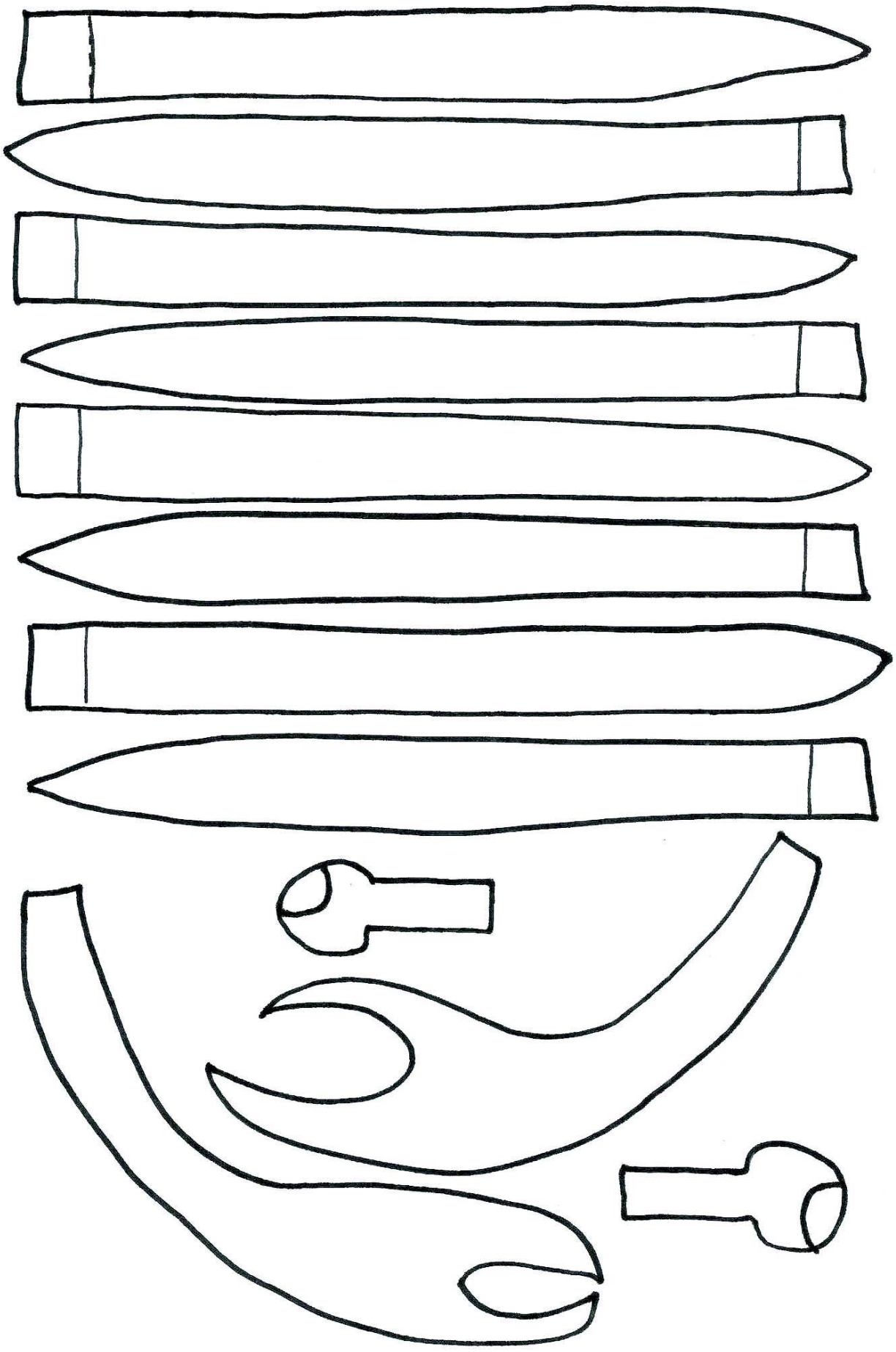


Predator/scavenger #3: rock crab (a'ama)

Use a paper bowl or the provided template on p. 14

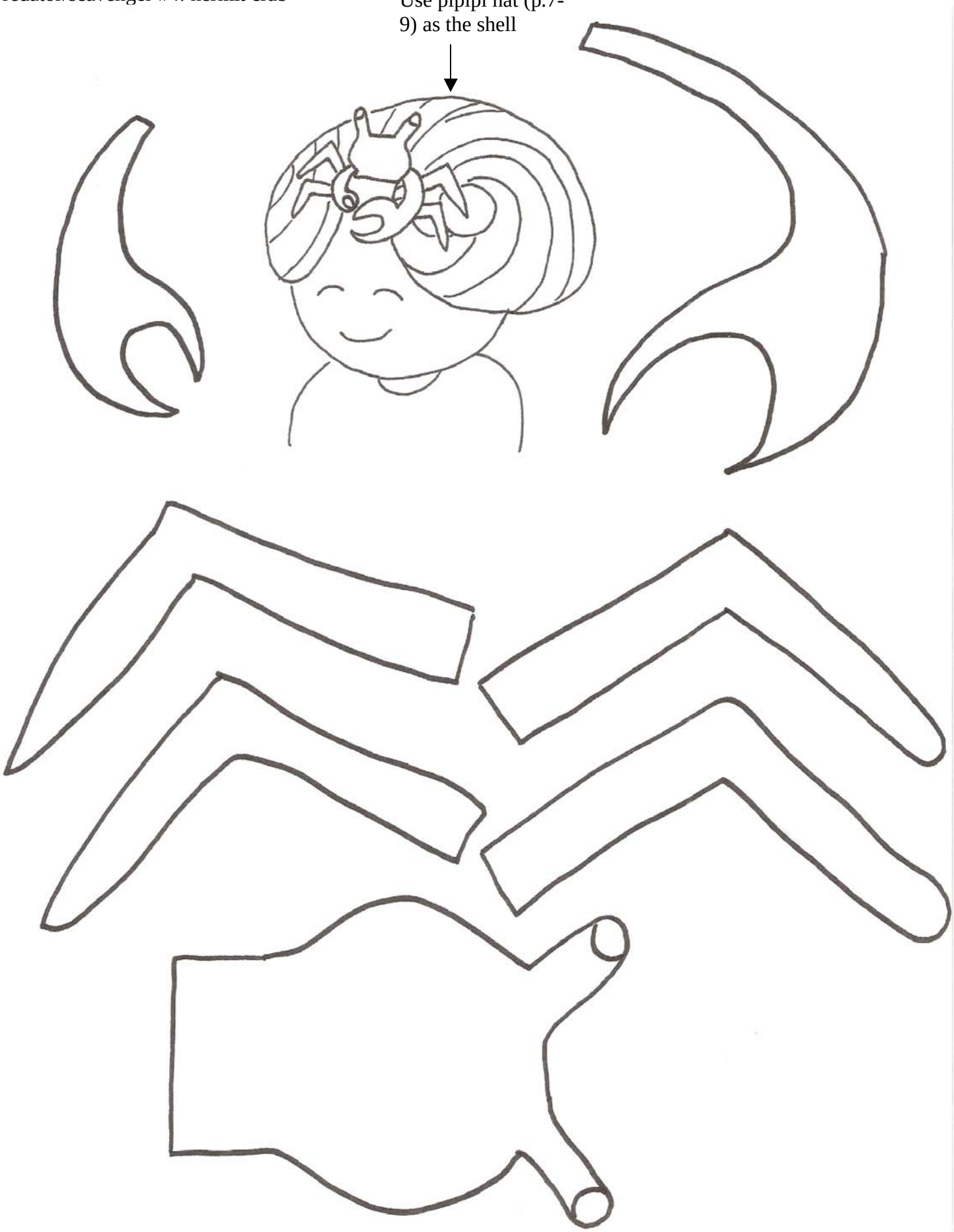


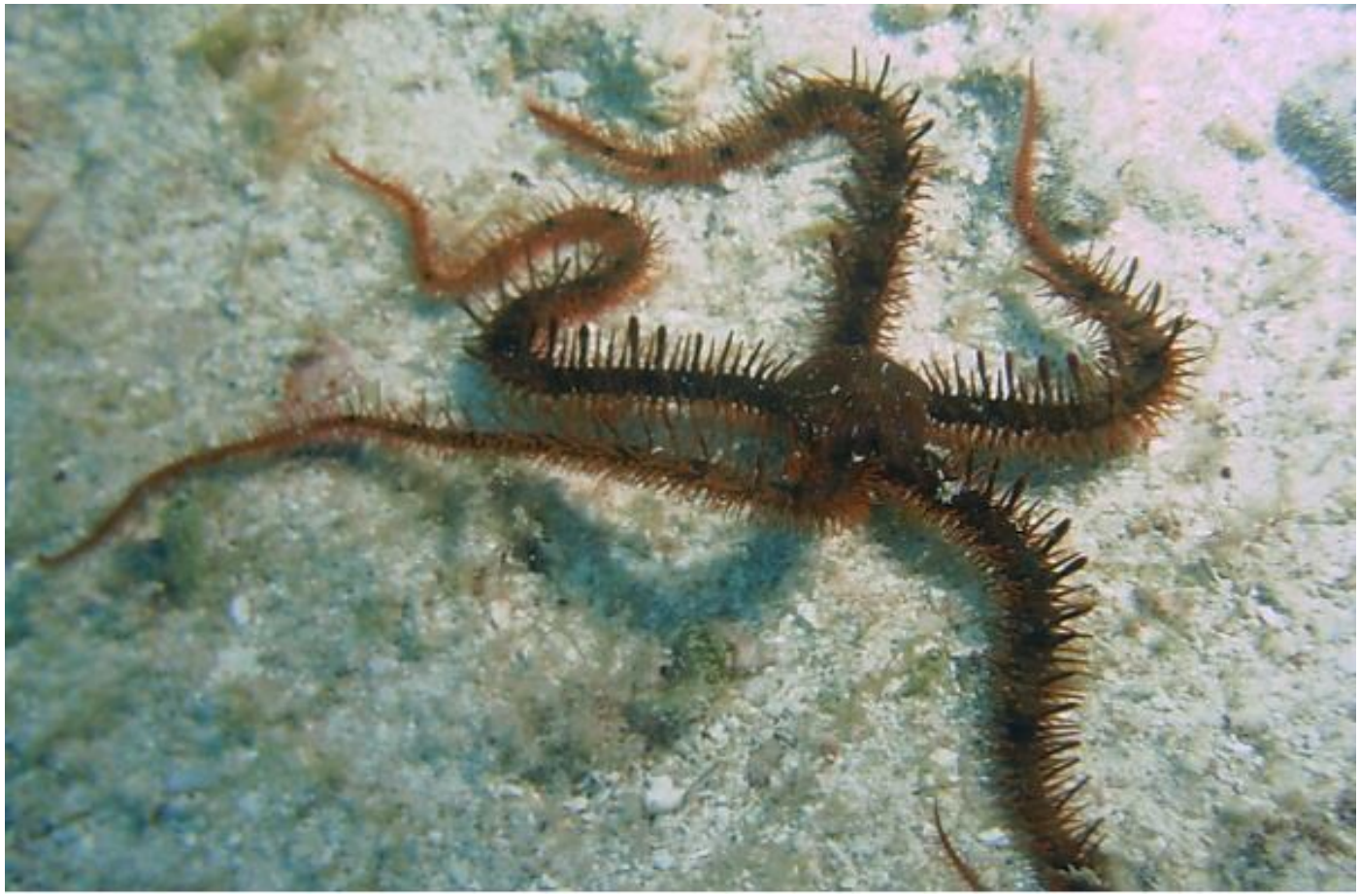
A’ama



Predator/scavenger #4: hermit crab

Use pipipi hat (p.7-9) as the shell



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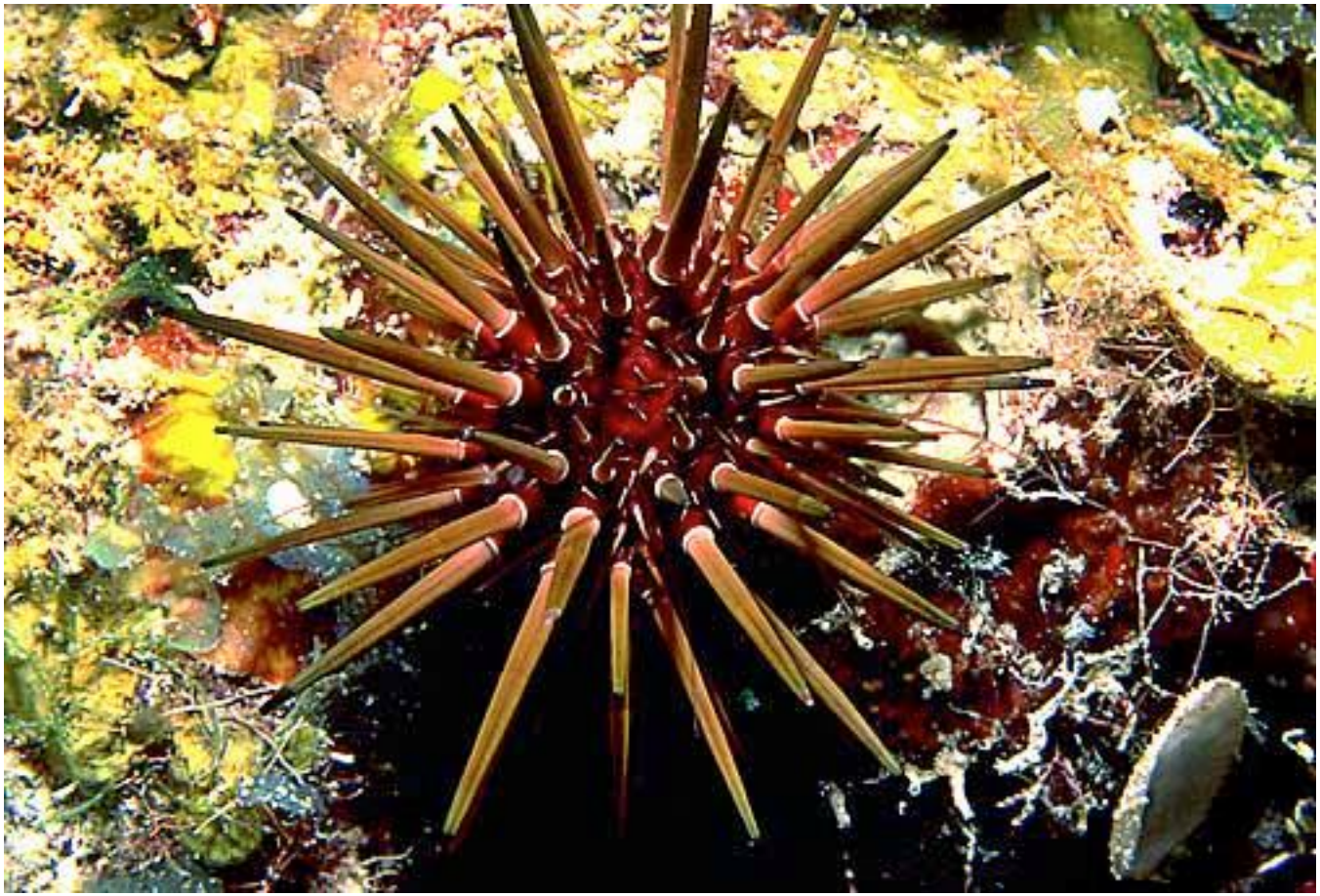


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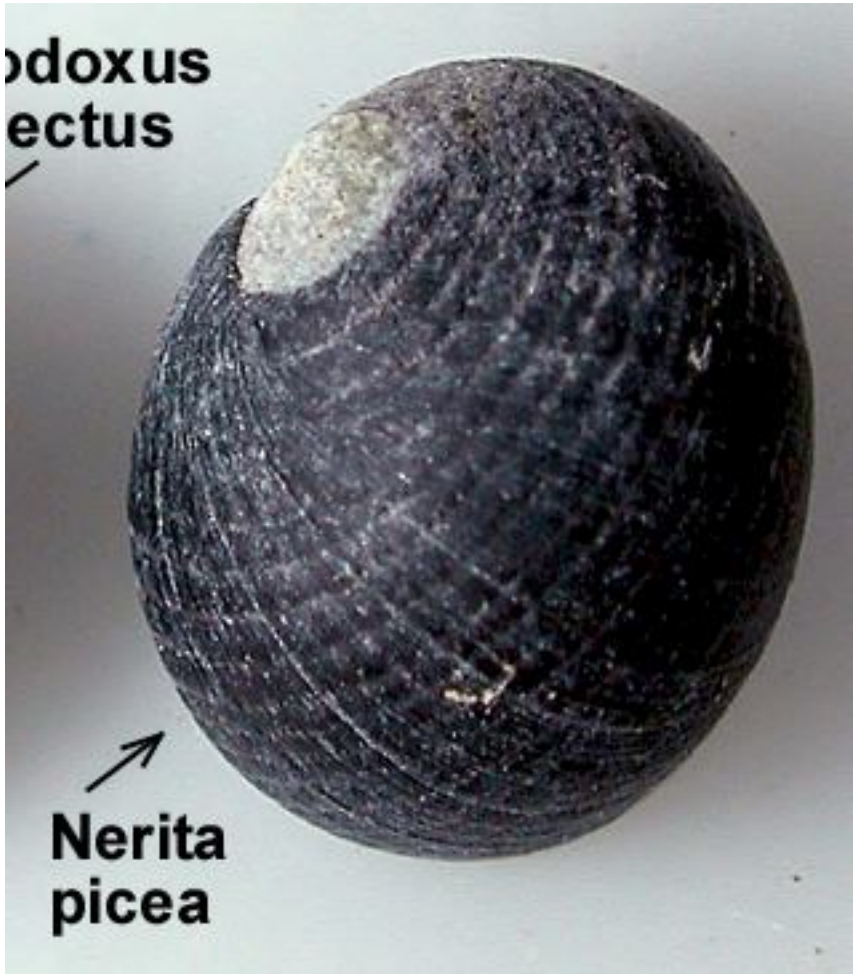
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