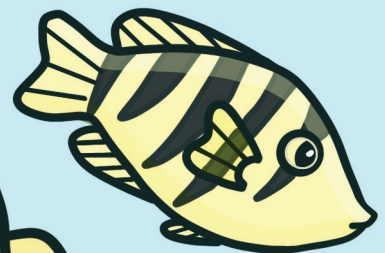
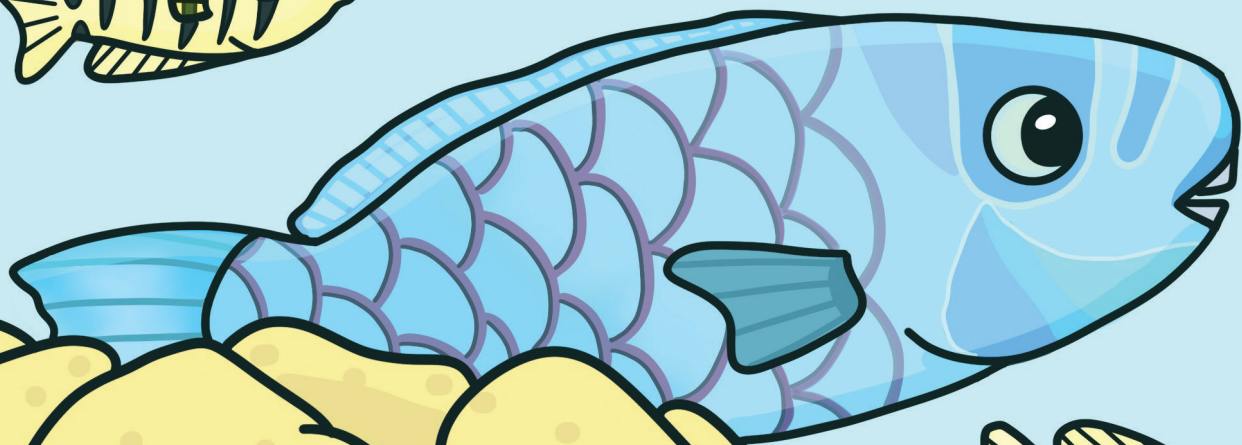


Herbivores: Gardeners of the Reef

E ola nā koʻa

Keiki Activity and Coloring Book



Illustrations by
Avery Williams

‘O ke kahua ma mua, ma hope ke kūkulu.
First the foundation, then the building.
Learn all you can, then practice.
- Mary Kawena Pukui,
‘Ōlelo No‘eau #2459

Hawai‘i
CORAL REEF
Initiative



Holomua
Marine Initiative

What are Corals?

Life cycle of Coral:

1. Larva
2. Settling
3. Polyp
4. Coral Colony

The first stage of a coral's life is spent as a **larva**, which is known as a planula.

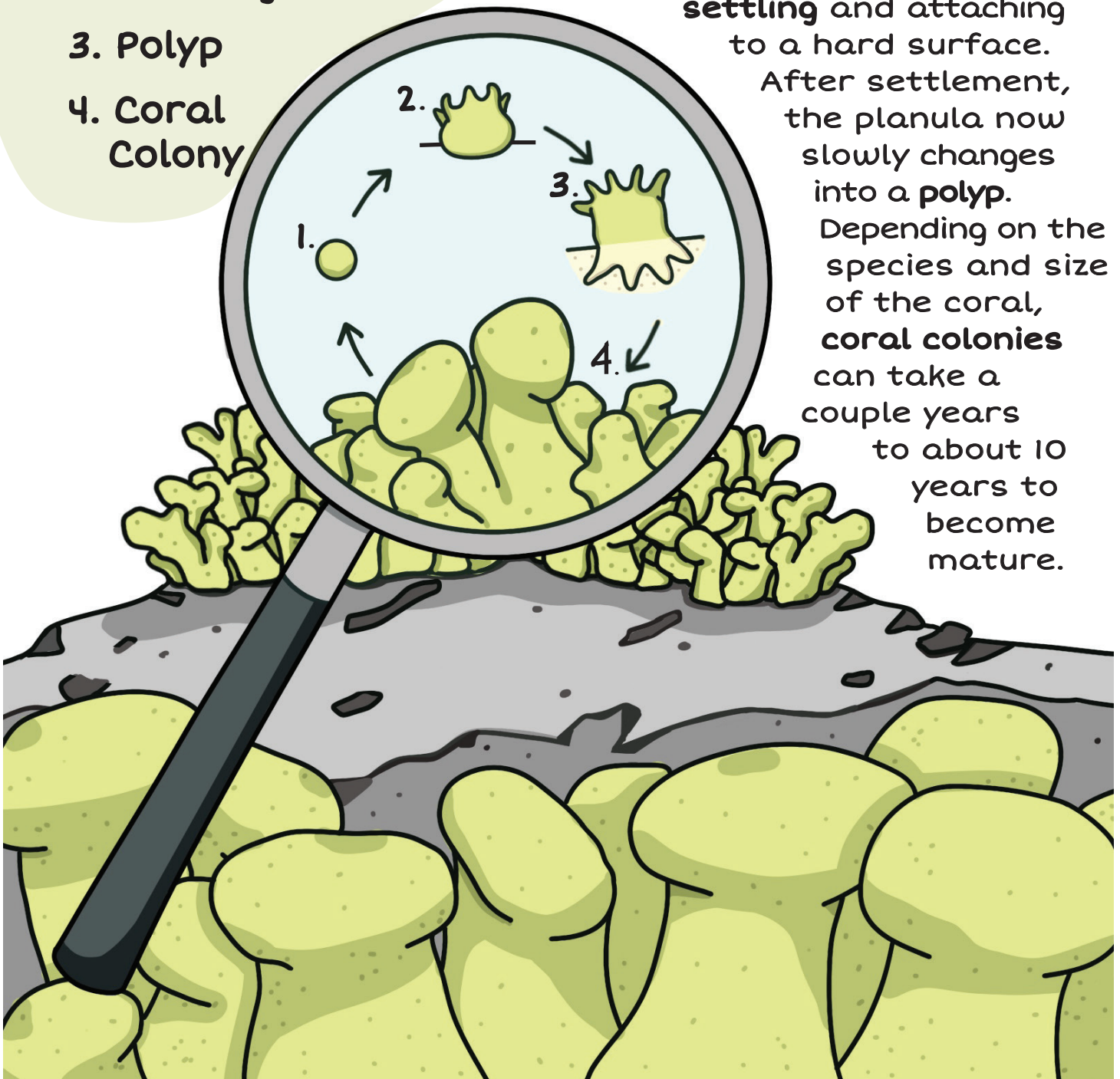
Coral planulae have to find the perfect home for

settling and attaching to a hard surface.

After settlement, the planula now slowly changes into a **polyp**.

Depending on the species and size of the coral, **coral colonies** can take a couple years

to about 10 years to become mature.



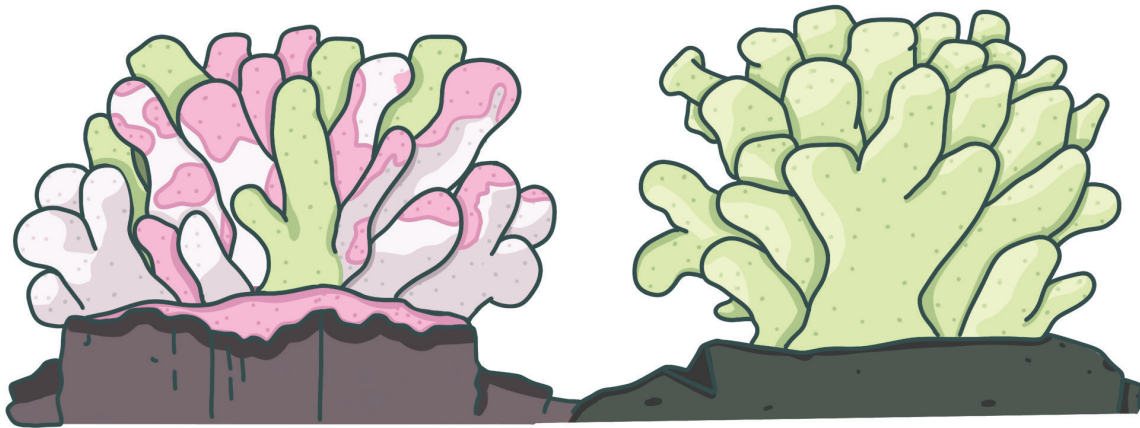
Crustose Coralline Algae

There is a special type of algae that helps coral reefs grow, called Crustose Coralline Algae (CCA). CCA has a hard surface for corals to land and grow. CCA can be pink, red, purple, or green!



How to Spot CCA:

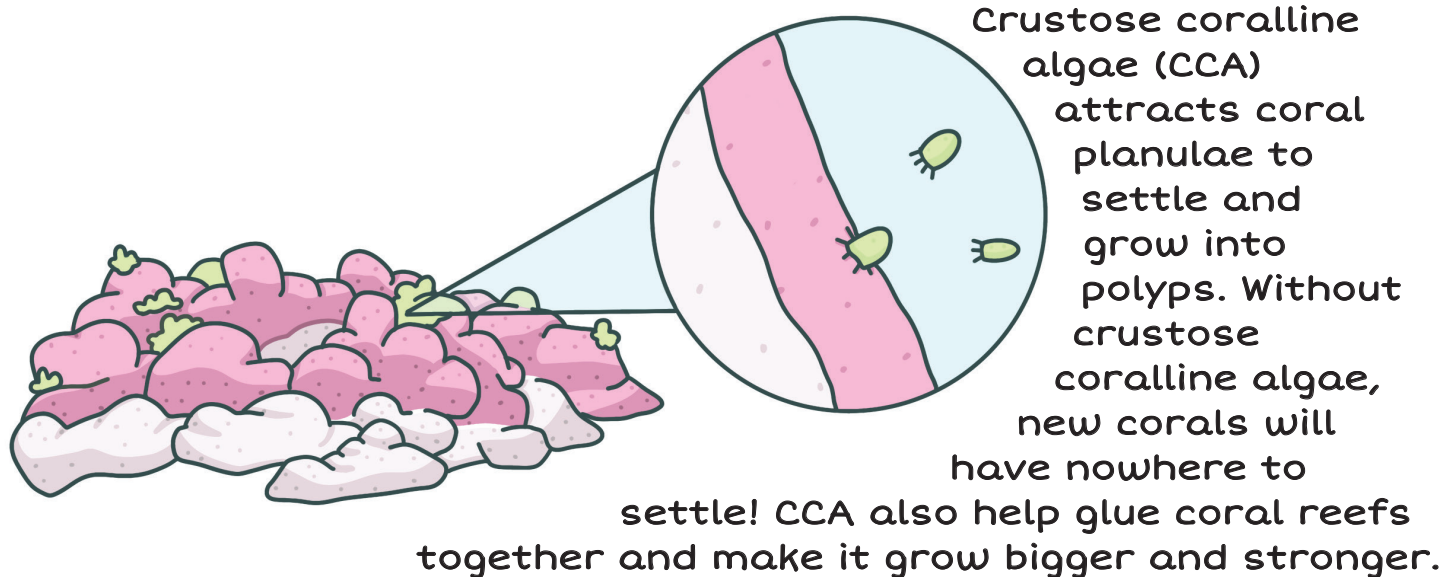
Look for firm, pink algae on the corals



With CCA

Without CCA

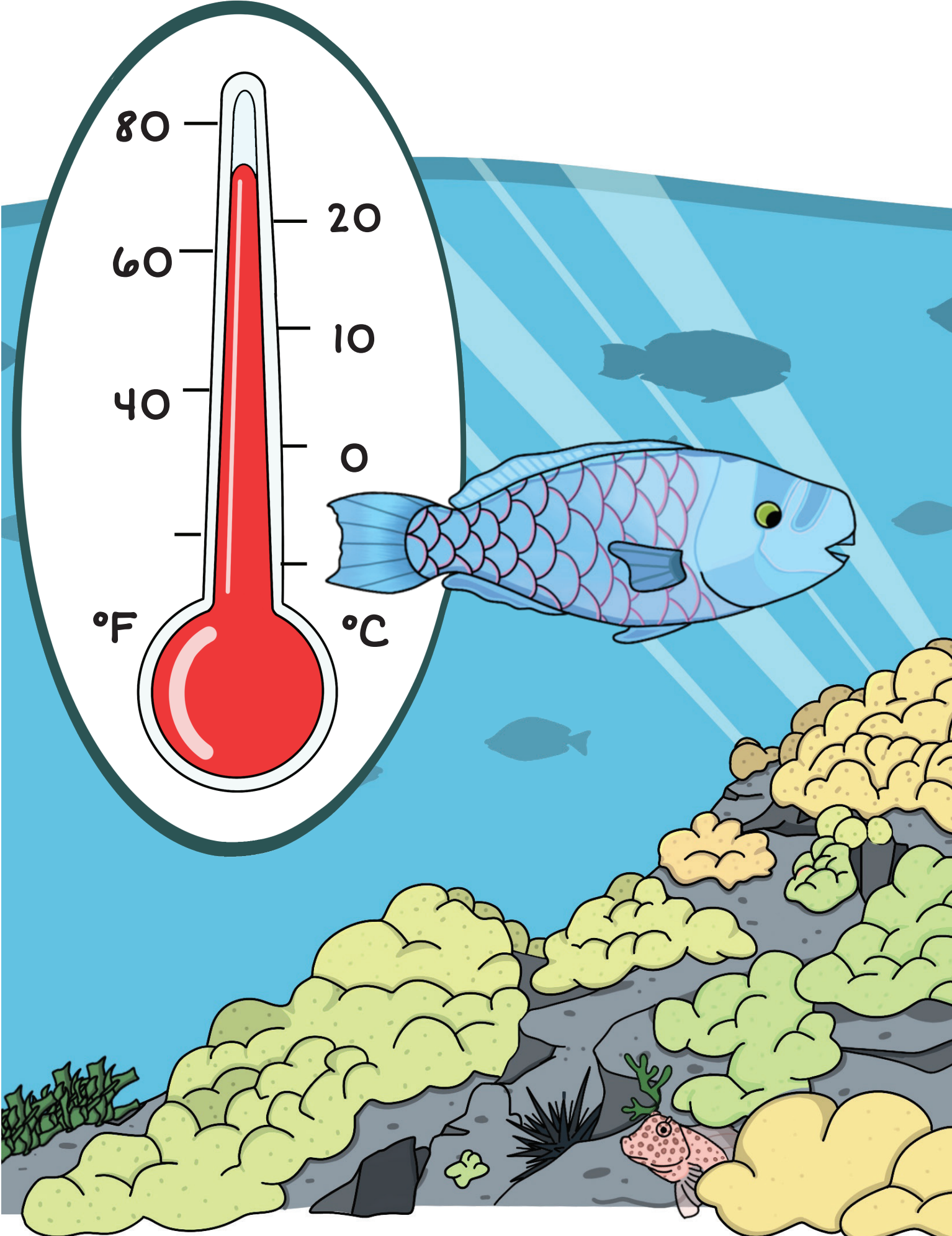
Why is CCA Important?



Crustose coralline algae (CCA) attracts coral planulae to settle and grow into polyps. Without crustose coralline algae, new corals will have nowhere to

settle! CCA also help glue coral reefs together and make it grow bigger and stronger.

Herbivores are important because they keep the surfaces of CCA clean to make room for new corals to grow on it. Look for the coral planulae attaching to the CCA under the microscope.



What Corals Need to Stay HEALTHY

- 
- An illustration of an underwater scene. At the top, a large light blue fish swims towards the left. Below it, two yellow fish with black stripes swim towards the left. In the bottom right, a dark purple fish with a yellow eye swims towards the right. The bottom of the image shows a coral reef with yellow, green, and pink corals. A white rounded rectangle with a dark blue border is positioned in the center-right, containing a list of requirements for coral health. The background is a gradient of light blue representing water.
- Clean Water
 - Ideal Temperature
 - Sunlight
 - Herbivores

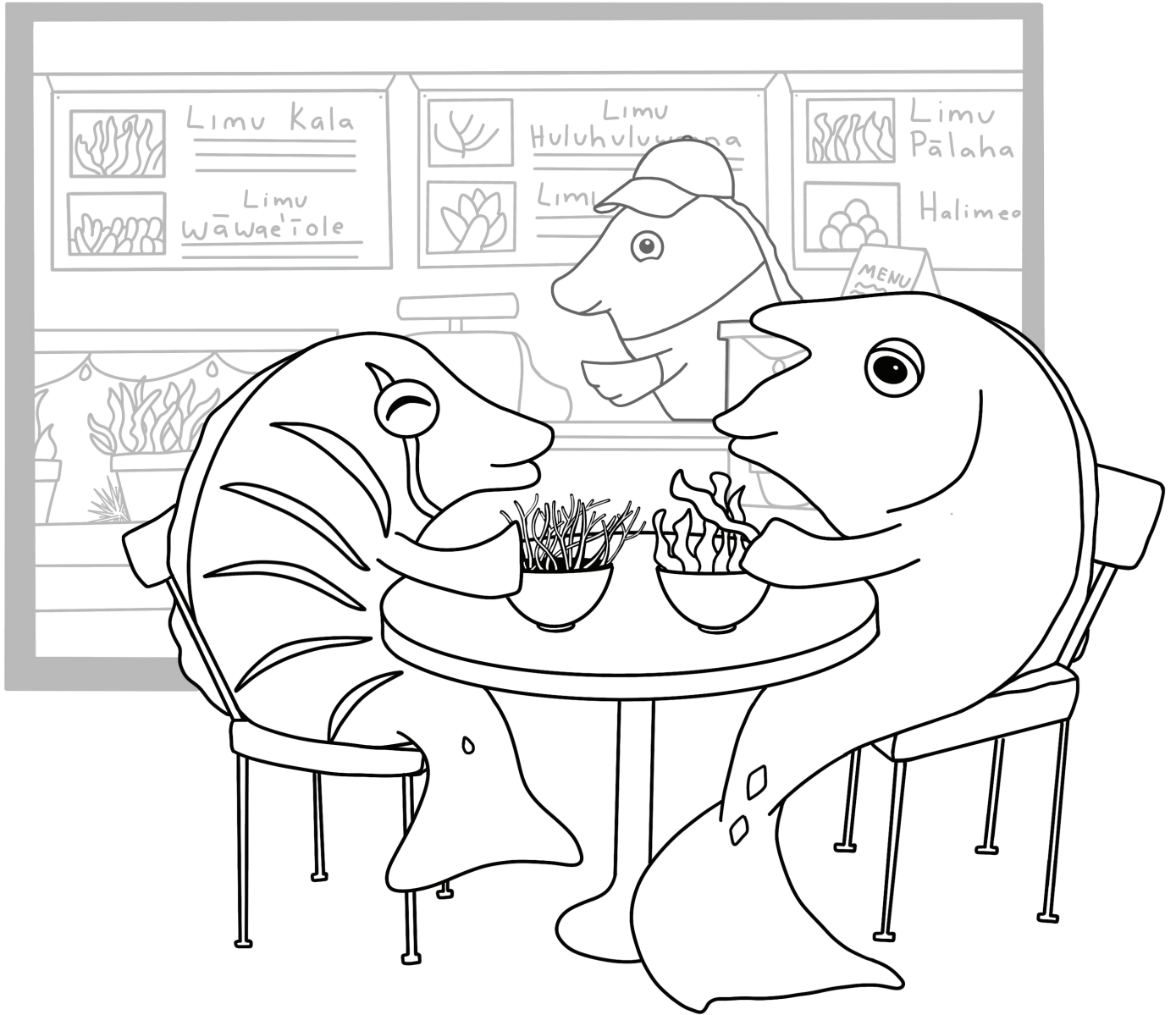
HERBIVORES

Herbivores feed on limu or algae, controlling and preventing limu from overgrowing and killing corals. Herbivores also keep surfaces clean and bare for corals to settle and grow on, which contributes to reef resilience. Surgeonfish are the most abundant herbivores in Hawaiian coral reefs, and we need healthy

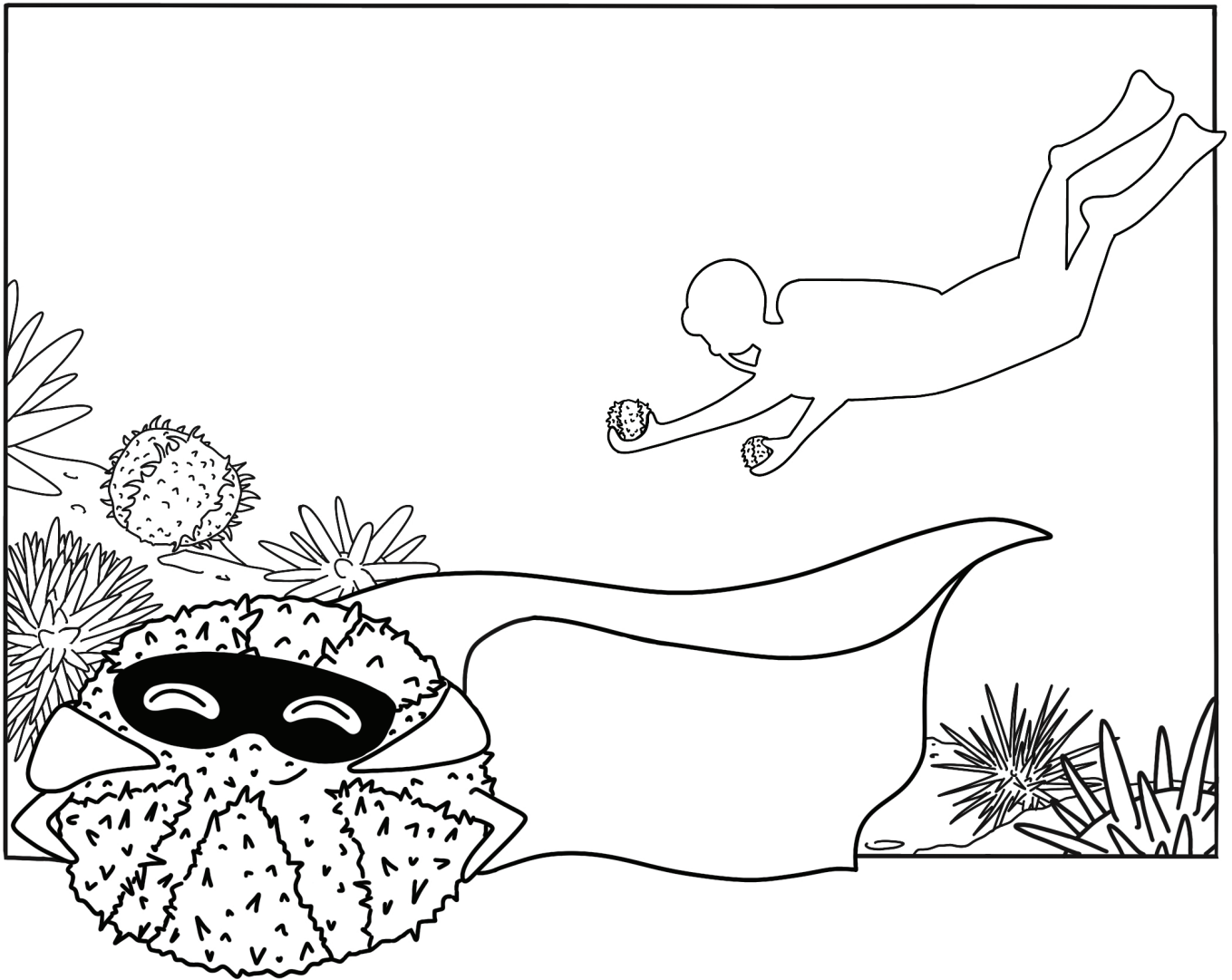
populations of herbivores to maintain healthy reefs. There are four types of herbivores:

- grazers,
- scrapers/
excavators,
- browsers,
- and detritivores.

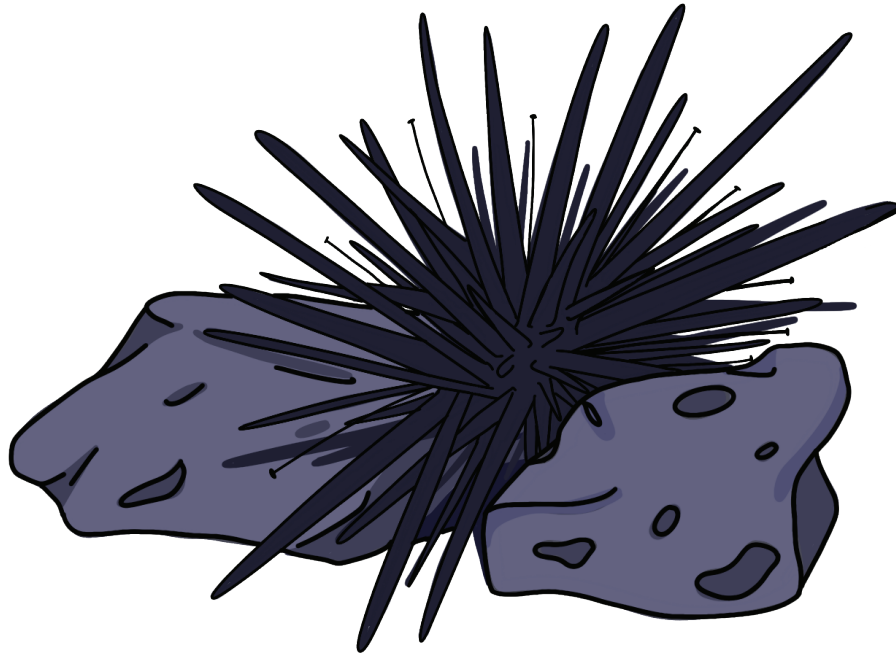




Hāwa'e, Wana, and 'Ina Sea Urchin



The superheroes
of coral reefs



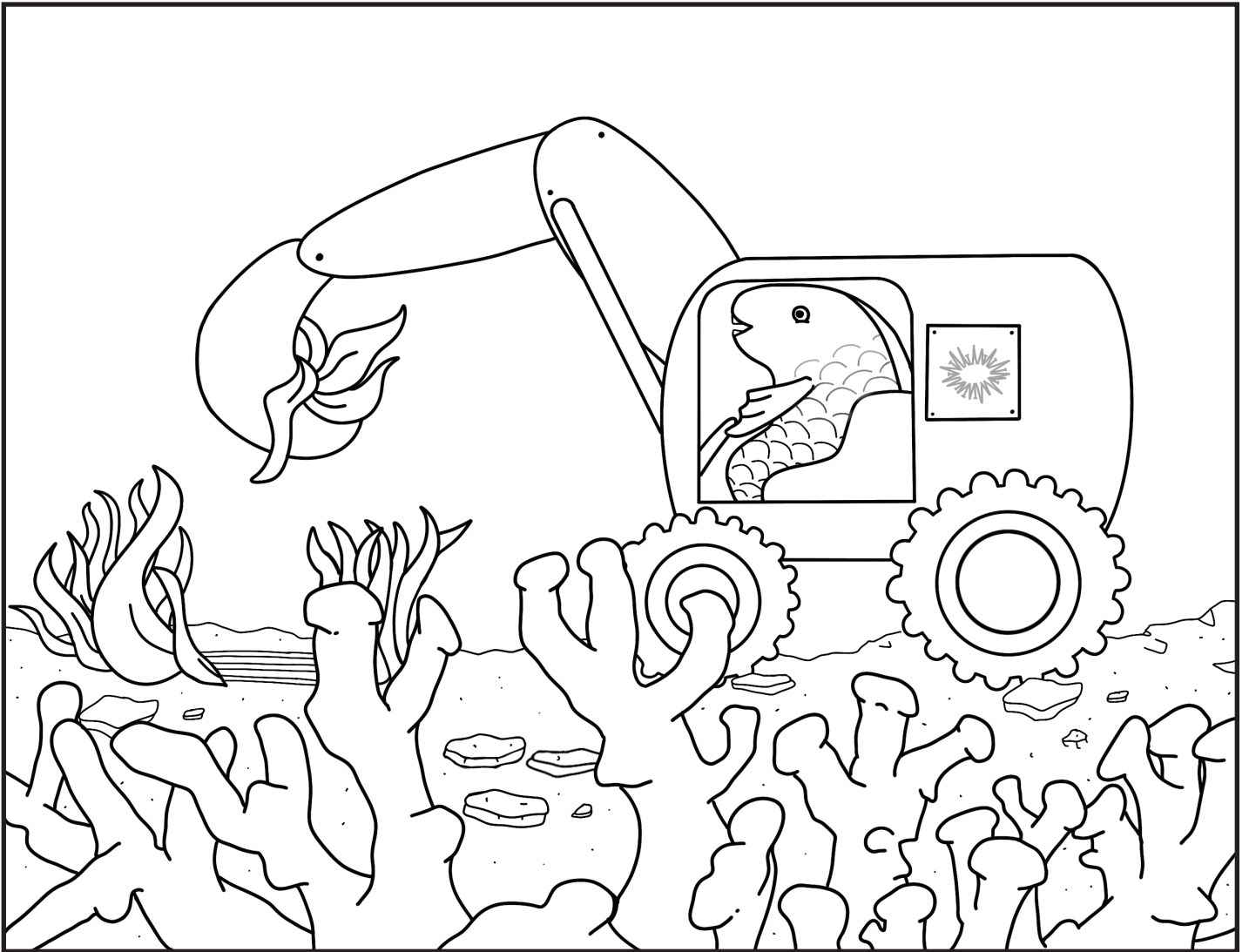
Hāwa'e, wana, and 'ina, also known as sea urchins, are spiky herbivores! They have spines that can be long or short, and some are sharp and venomous, so be careful not to step on them! They graze on algae using their hard, beak-like mouth that is made up of 5 plates, scraping rocks and other hard surfaces clean so that coral can settle on them.

Did
you
know?

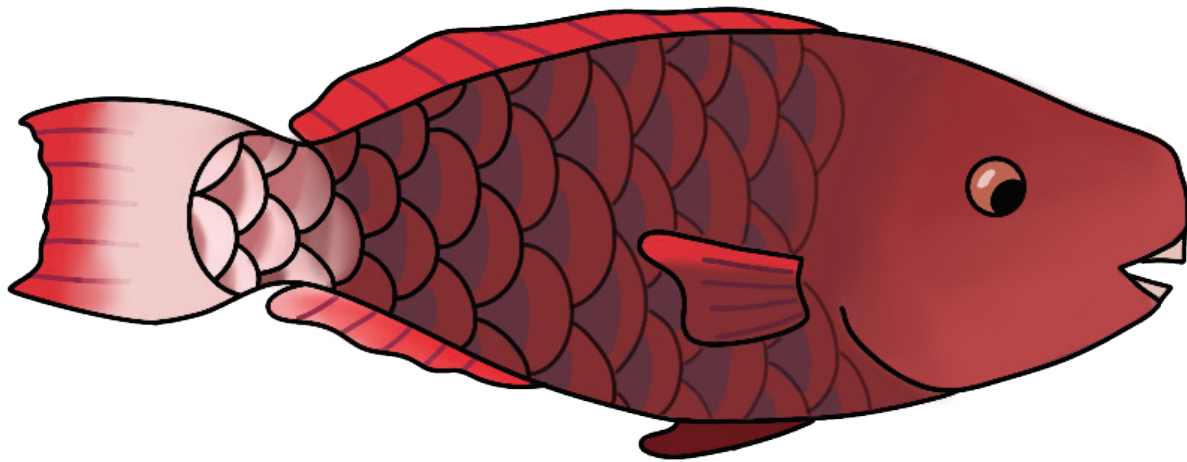
Scientists can actually use hāwa'e to help save coral reefs! On O'ahu, baby urchins are raised in a laboratory and then planted out onto reefs that are dying and being covered by invasive algae. The baby urchins have a new home, and they help protect the corals by eating all the invasive limu!

Uhu

Parrotfish



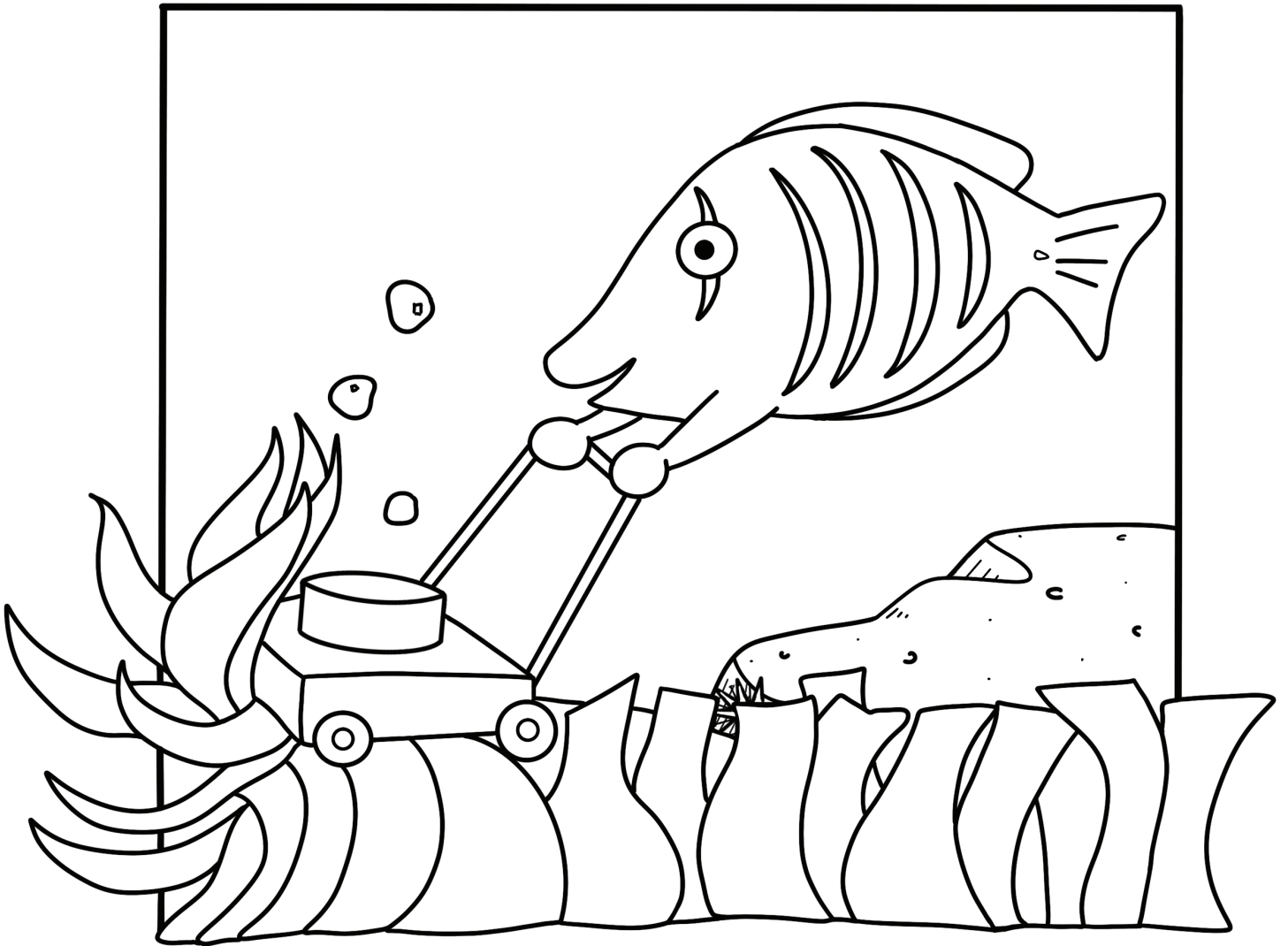
The scrapers of
coral reefs



Uhu is the general name for parrotfish. Large-bodied uhu are excavators and scrapers on the reef. They take big bites off rock and coral, pulling off top layers of seaweed and exposing new area. This is important so that baby corals have space to start growing. Uhu come in two main colors which represent the different reproductive life phases. In the first phase, they are often smaller and red/ grey in color. These are mainly females. The large, mostly blue individuals are males.

Manini

Convict Tang



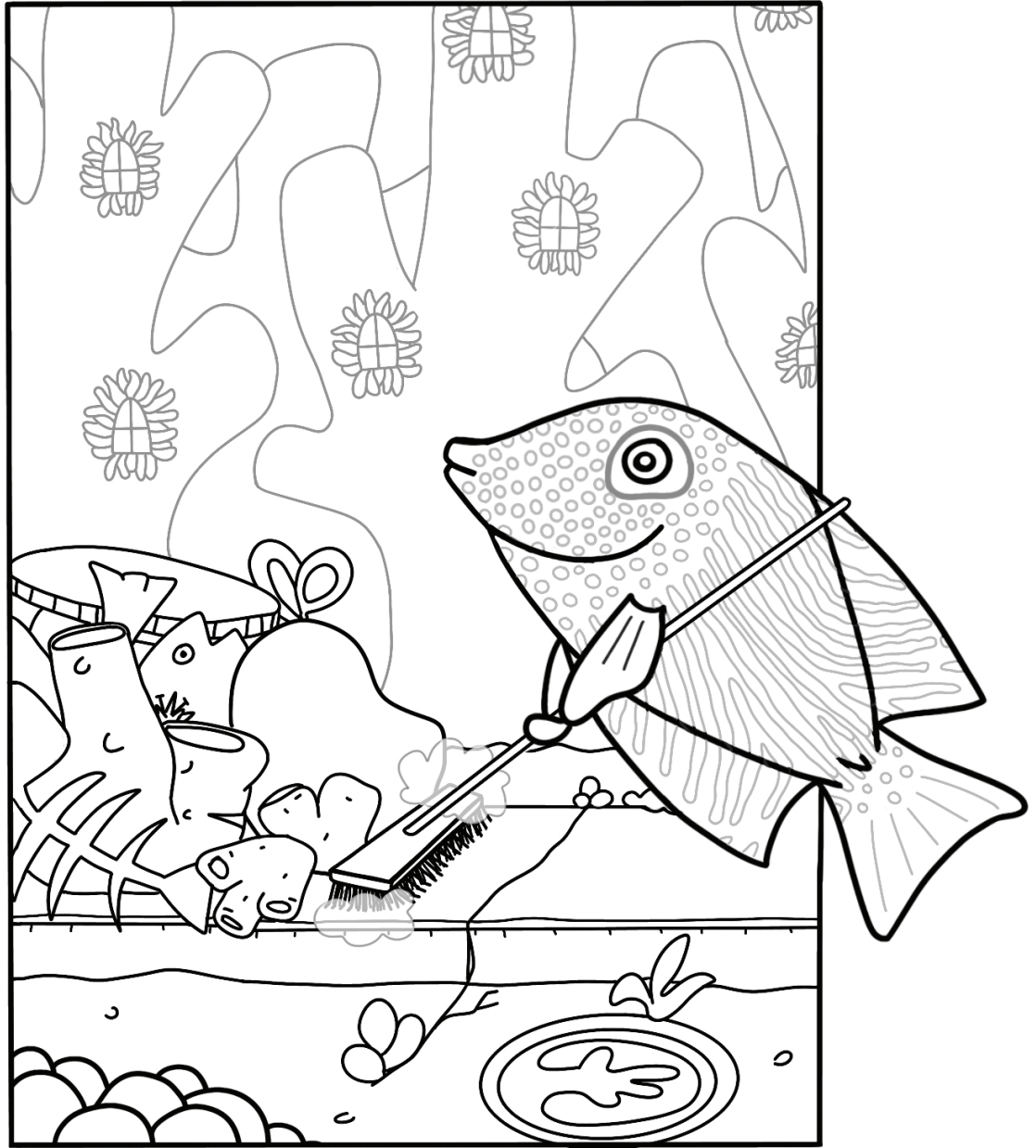
The grazers of
coral reefs



Manini are also known as Convict Tang. In Hawaiian, manini means "small" or "stingy," which refers to a mo'olelo (story) that highlights the small size of the manini as being inadequate for hosting a meal. Manini are grazers as they feed on low-lying turf seaweeds and keep them cropped down, similar to mowing the lawn. This prevents turf algae from overgrowing space where new corals can grow. Manini can live up to 4 years or longer and can reach a maximum size of about 12 inches.

Kole

Goldring Surgeonfish



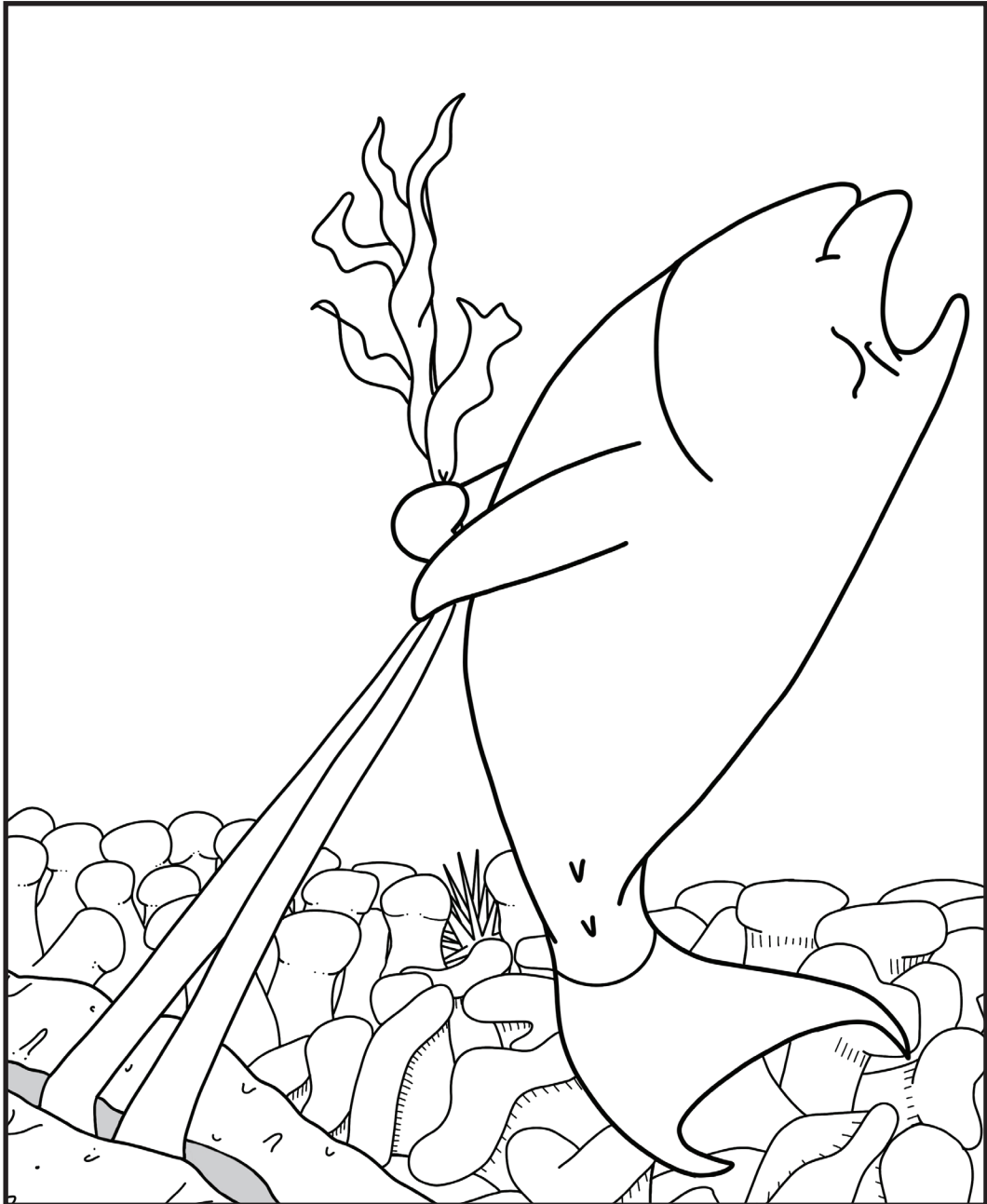
The cleaners of
coral reefs



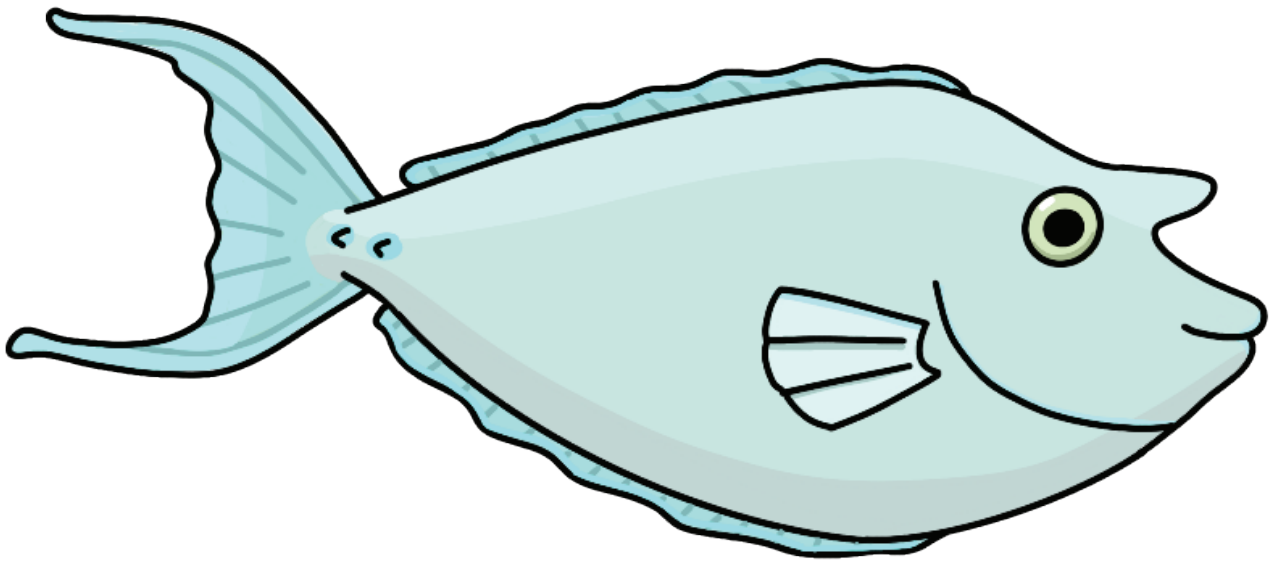
Kole are one of the most common fish to see while snorkeling in coral reefs in Hawai'i. Kole are endemic to Hawai'i, found nowhere else in the world! Kole are detritivores, meaning they comb through the bits of sand and decomposing material looking for algae to eat. They are important in breaking apart fish waste and preventing it from piling up on the bottom. Kole can live up to 18 years and will reach a maximum size of about 7 inches.

Kala

Unicornfish

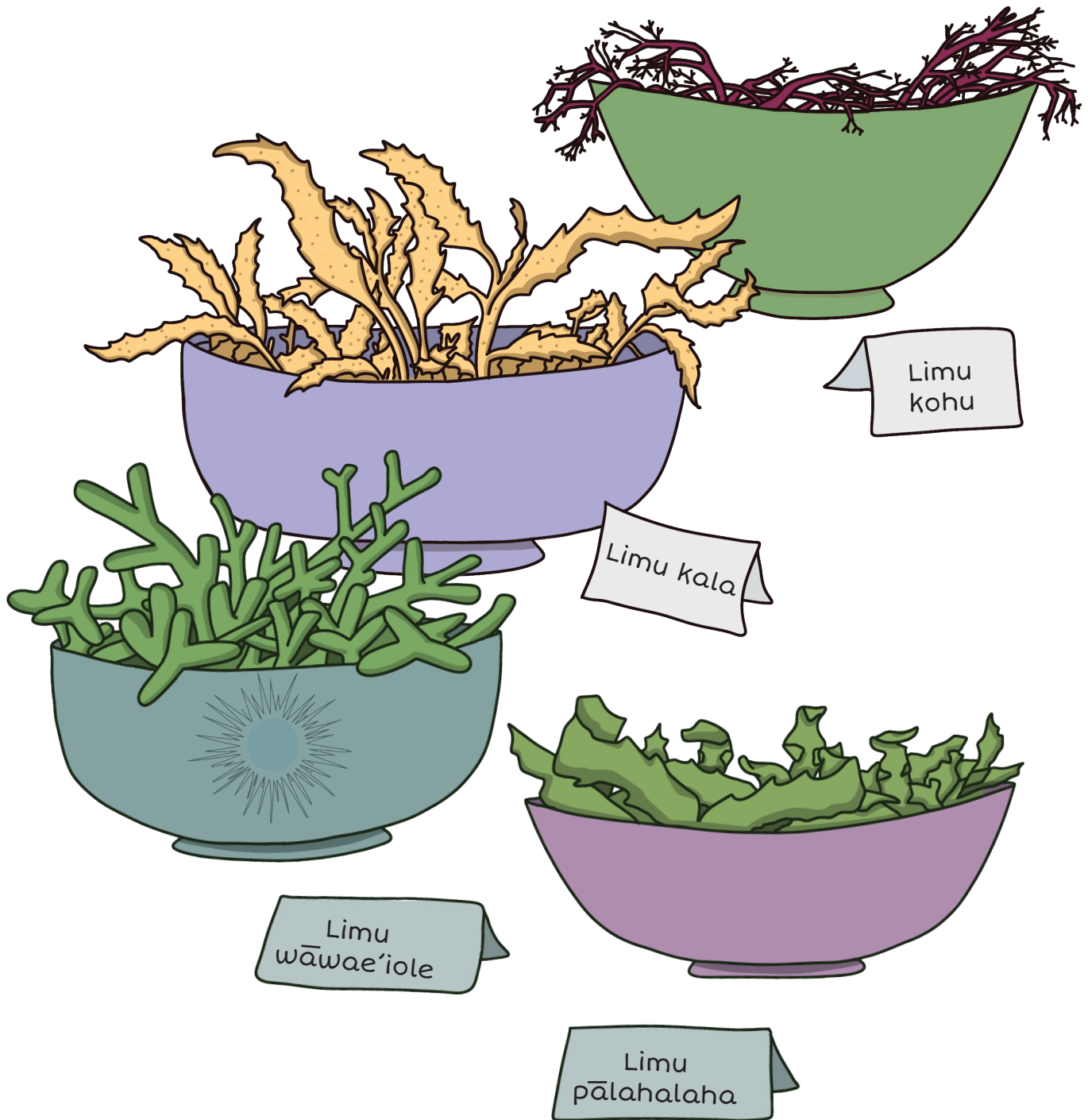


The browsers of
coral reefs

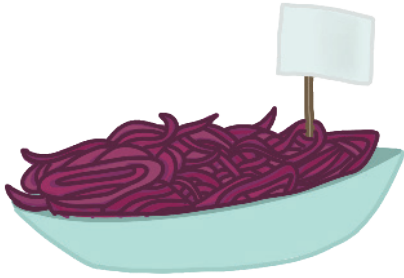


Kala are commonly known as Unicornfish. Kala are often found in schools on shallow reef habitats and rocky shores, but larger adults may be spotted alone. Kala are browsers, weeding leafy seaweeds from the reef. A common snack for kala is limu kala. Kala can live up to 50 years and will reach a maximum size of about 24 inches.

Limu Favorites



Limu Recipe for You!



1 lb Fresh
Limu manauaea



Boiling Water



1 chopped
onion



1 cloved of
garlic, minced



2 tbs rice vinegar
3/4 cup soy sauce
1 tsp sesame



1 tsp sugar
1/4 tsp black
pepper
chili pepper
to taste

Step 1: Place limu in colander in your sink, and pour boiling water to blanch the ogo

Step 2: Quickly run the limu under cold water to avoid overcooking

Step 3: Cut limu into 2" pieces

Step 4: Marinate the limu with remaining ingredients

Step 5: Refrigerate overnight and serve with poke



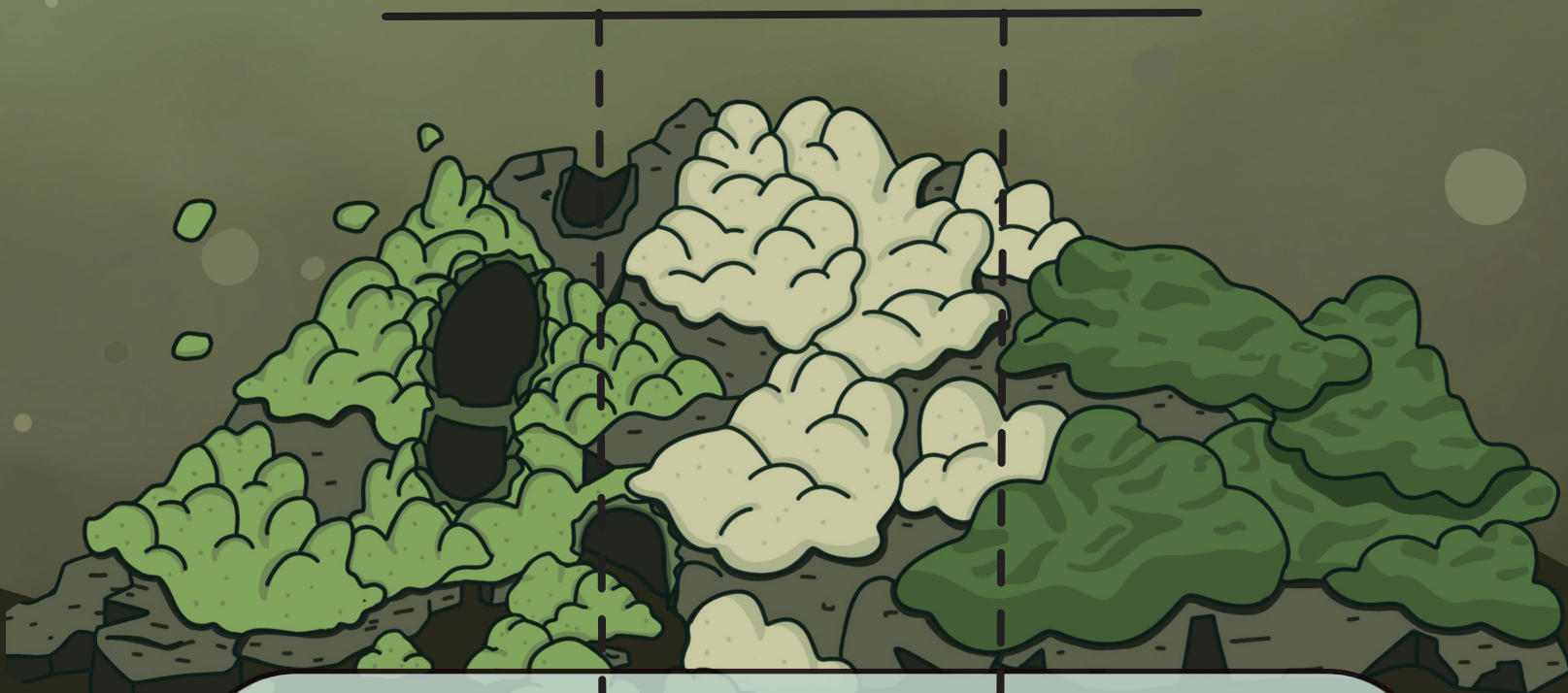
Without Herbivores
coral reefs will become
UNHEALTHY



Causes of an Unhealthy Reef:

- Dirty Water
- Rubbish
- Warming Oceans
- Overfishing

Other coral bullies:



Humans

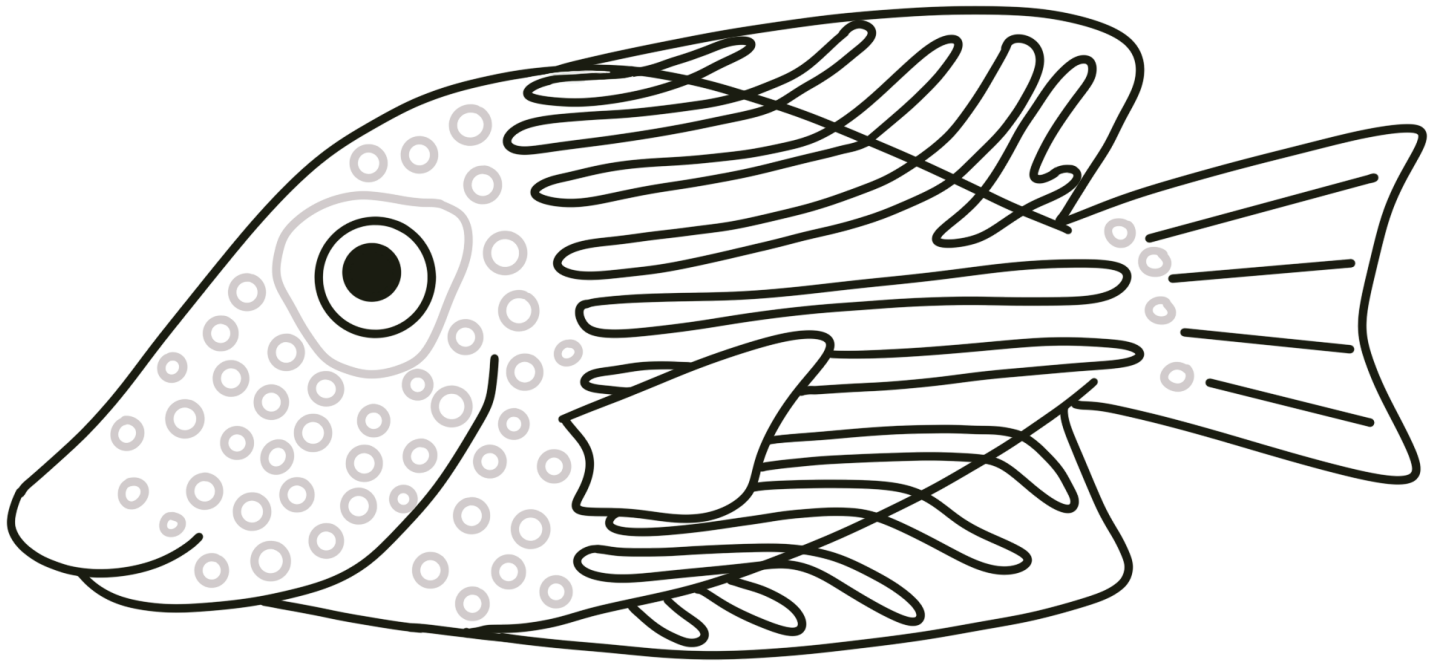
Climate
Change

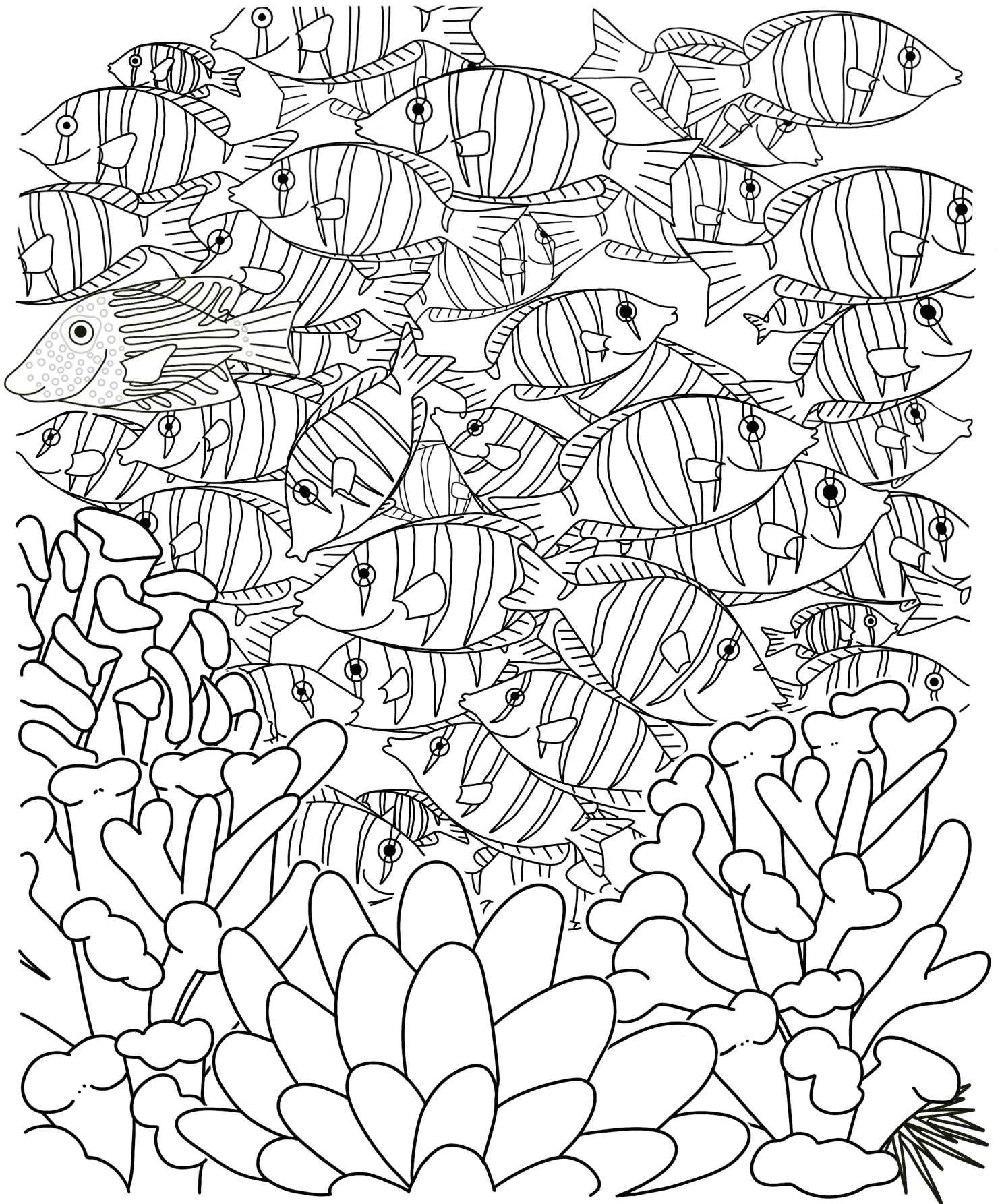
Invasive
Algae

Find the

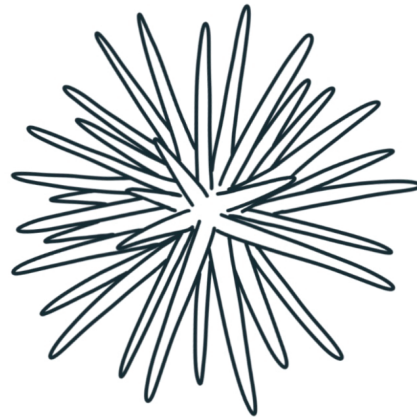
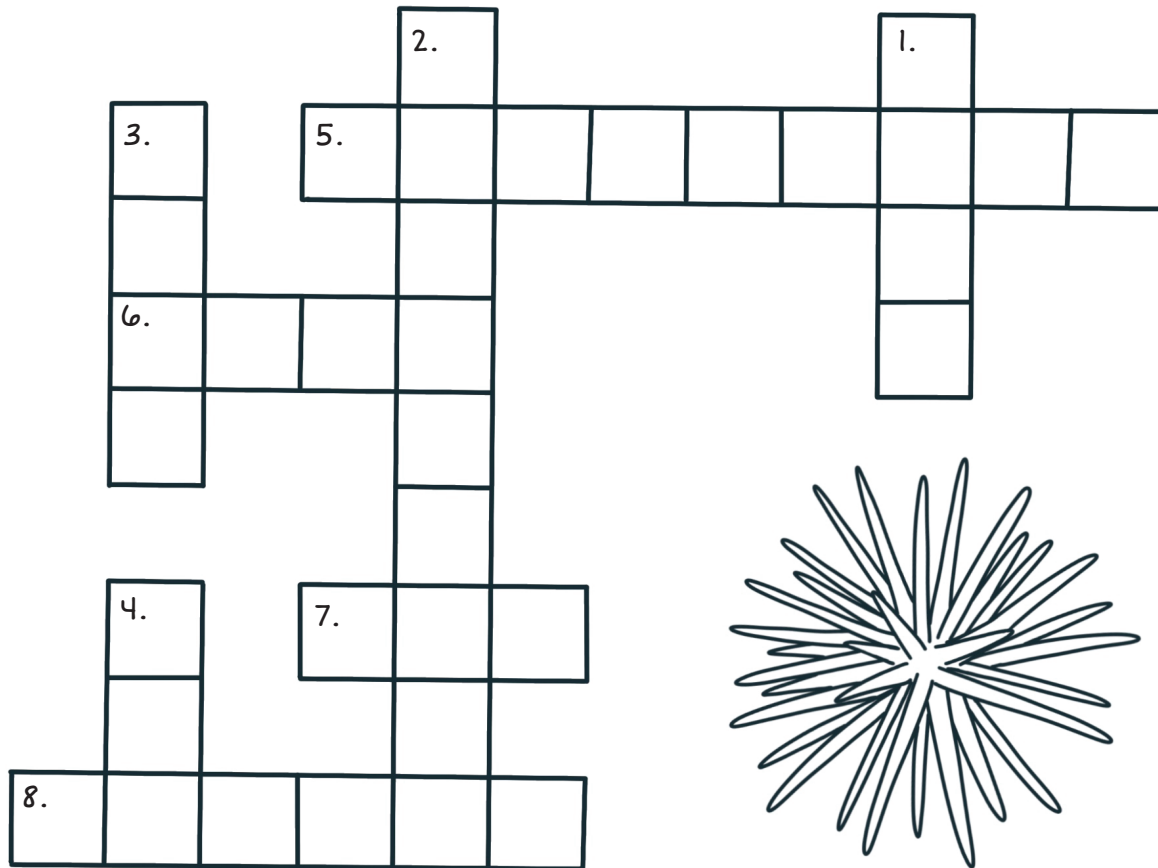
Kole

Goldring Surgeonfish





Crossword Search



DOWN

1. A detritivore
2. A sea creature with many spikes on their body
3. A unicorn of the reef
4. Solid algae that is often pink

ACROSS

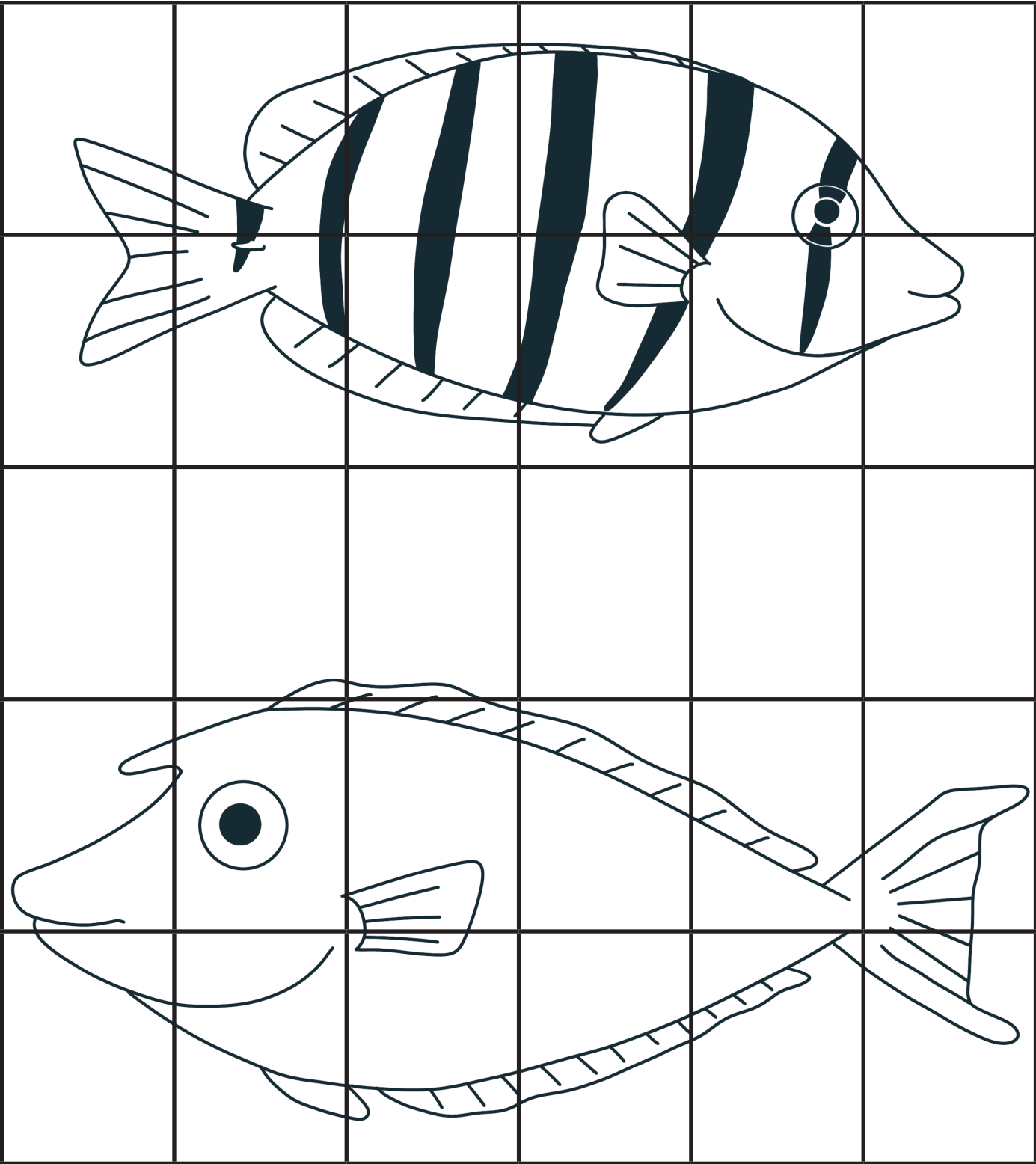
5. Creatures who do not eat meat but eat veggies such as algae
6. Hawaiian word for seaweed
7. Large ___ are known as excavators of the coral reef
8. Convict Tang

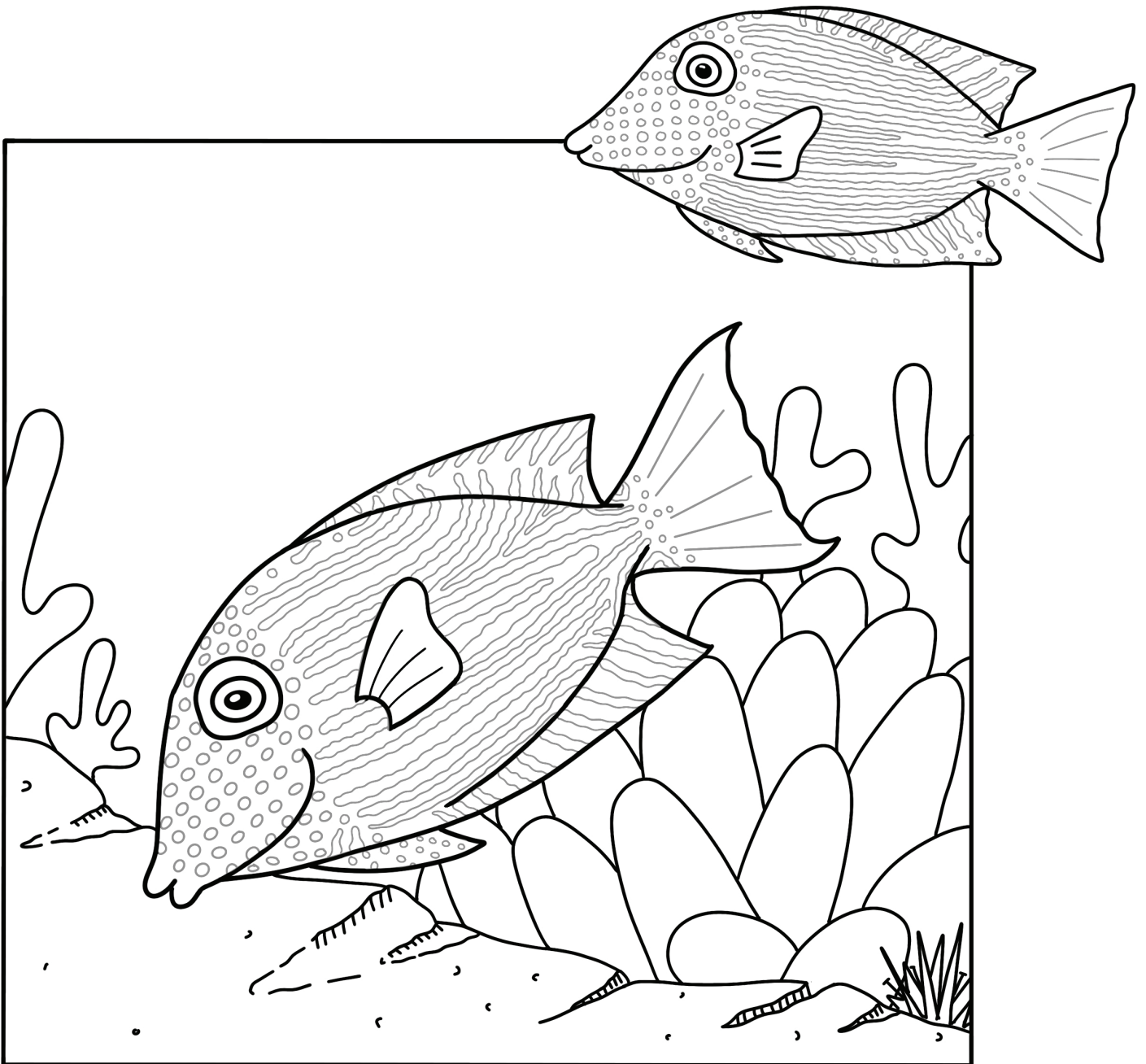
Word Search

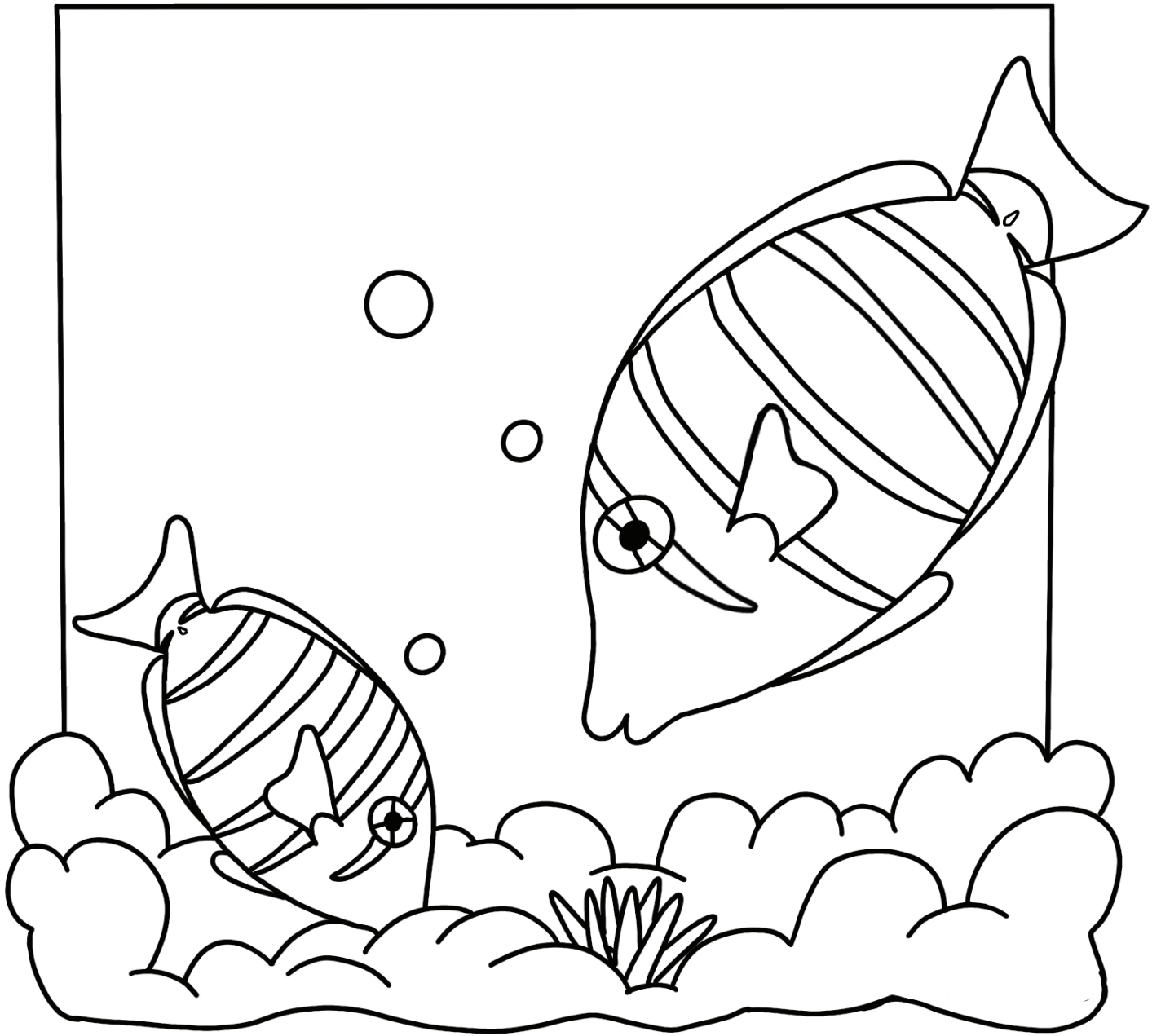
w	a	c	o	s	e	r	l	i	m	u	k	a	l	a	n
e	l	o	o	w	b	t	r	o	u	a	e	n	u	h	u
p	i	r	a	n	e	h	k	y	f	i	s	h	w	e	m
l	o	a	v	a	v	s	c	b	n	j	u	w	r	s	c
i	r	l	e	b	o	i	s	w	u	h	n	a	l	a	k
m	e	r	a	h	y	f	c	o	n	v	i	k	s	e	o
u	h	e	e	f	i	n	o	t	o	e	c	a	e	m	l
k	o	e	h	n	s	o	n	o	t	r	o	l	a	i	e
o	r	f	i	c	h	e	k	r	l	a	r	o	w	l	l
h	r	n	a	c	a	g	a	a	n	i	n	i	e	i	e
u	a	r	c	p	a	r	r	o	w	i	f	g	e	m	a
m	i	r	e	e	l	u	o	u	i	n	i	n	d	e	v
f	n	a	g	r	u	s	c	a	c	a	s	e	c	c	a
a	e	p	a	r	r	o	t	f	i	s	h	u	h	n	c

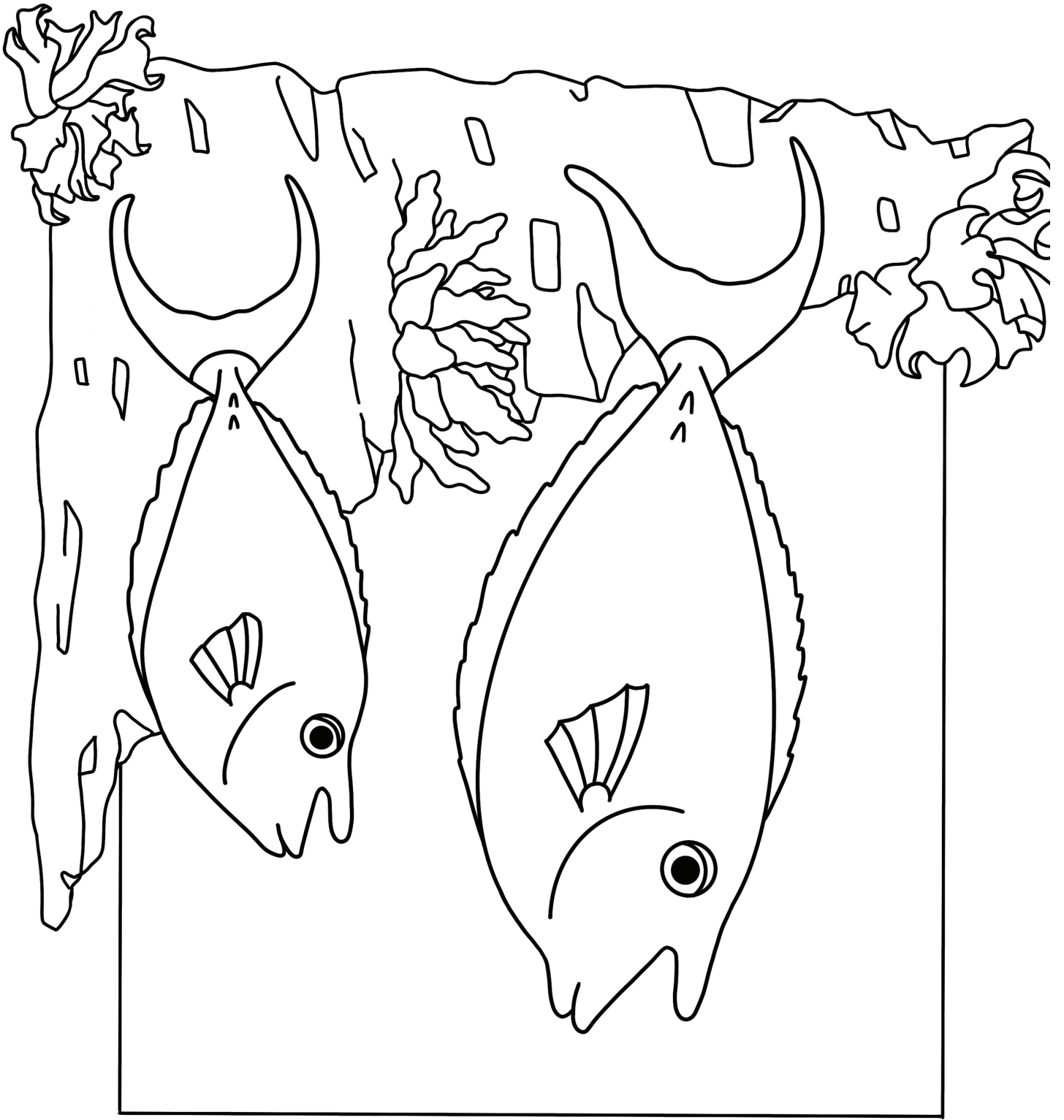
- | | | |
|--------------|-----------|-------------|
| CCA | Kole | Parrotfish |
| Convict Tang | Limu kala | Surgeonfish |
| Coral Reef | Limu kohu | Uhu |
| Kala | Manini | Unicornfish |

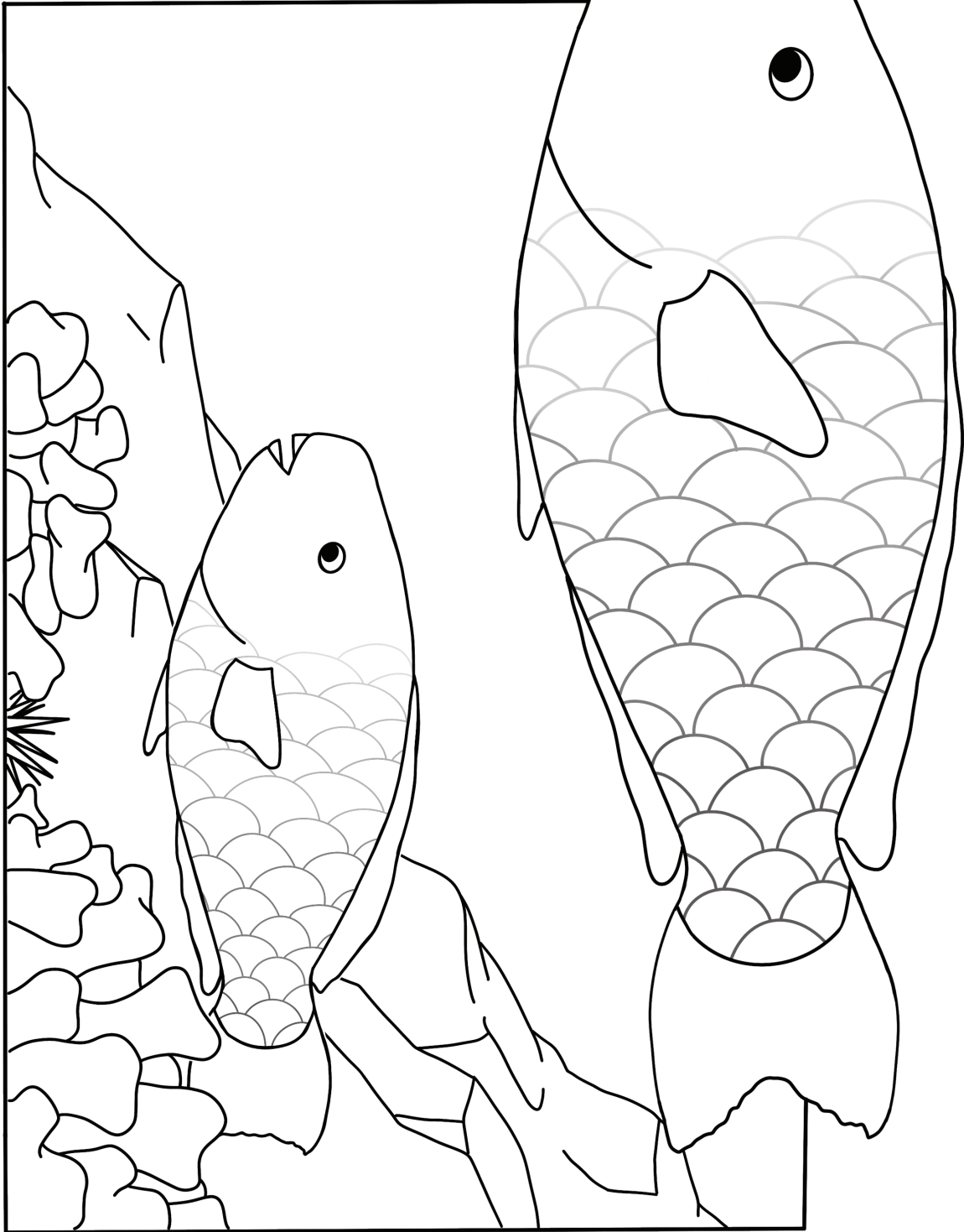
Learn to draw a manini and a kala. Use the lines in the grids on the left side of the page to help you draw these fish on the right side of the page

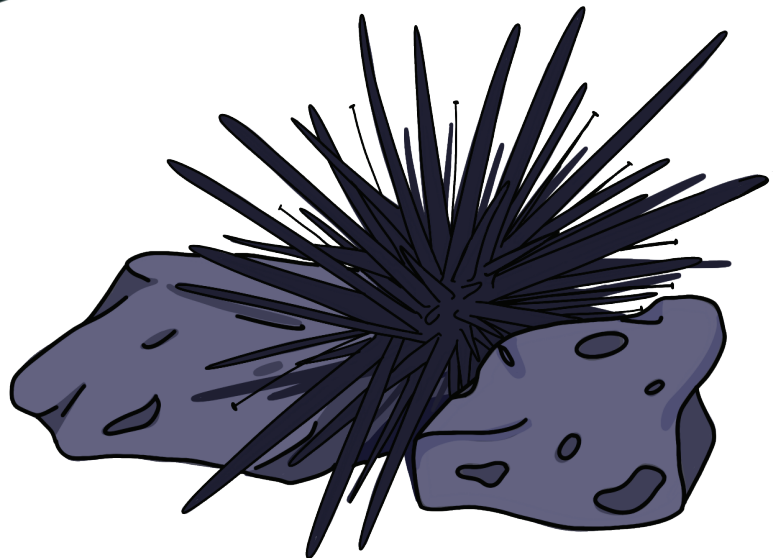
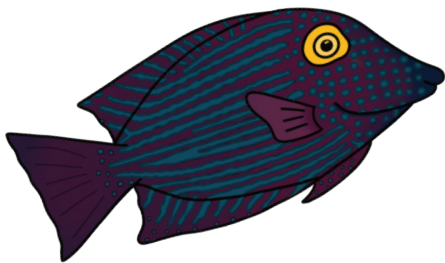
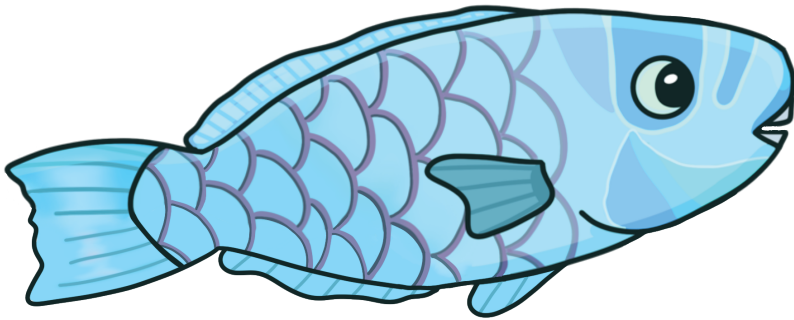
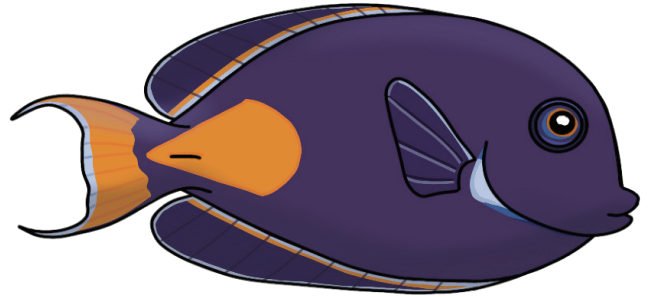
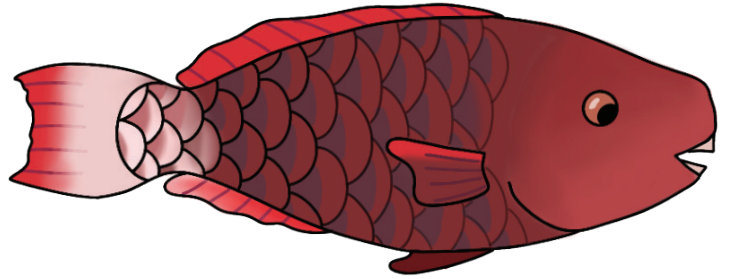
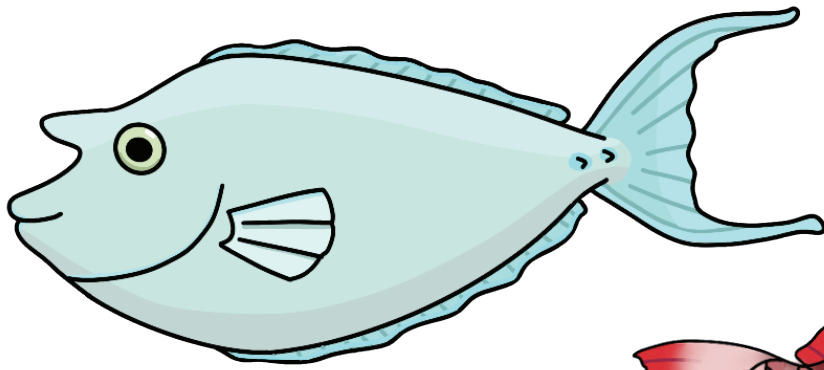












This coloring book is dedicated to our keiki, the next generation of fishers and stewards of our nearshore waters. You are the inspiration for the Holomua Marine Initiative, we are managing our nearshore resources today so that you and all the keiki after you have plenty of fish.



Hawai'i
CORAL REEF
Initiative

Herbivores: Gardeners of the Reef

Keiki Activity and Coloring Book

