



Activity #1

Adaptation Concentration

● ● ● Class Period One *Adaptation Concentration Game*

Materials & Setup

- *Far from the Cradle* video by Waikiki Aquarium (included with this curriculum)
- VCR

For each group of four to six students

- One set of 20 “Adaptation Concentration” cards (laminated cards included with this curriculum, master, pp. 8-13)
- One “Adaptation Concentration Instructions and Scoring Sheet” (master, pp. 14-15)

For each student

- Student Page “What Good Is It?” (pp. 16-17)

Instructions

- 1) Show the video, *Far from the Cradle* (20 minutes). Tell students to pay careful attention because they will be playing a game about how marine animals are adapted to their environment using the information from the video.
- 2) Divide the class into groups of four to six students. Hand out the Adaptation Concentration game materials and have groups play the game according to the instructions given.
- 3) Play as many rounds as time permits.
- 4) Play options:
 - Instead of having students fill in the scoring grid, incorporate a simpler assessment component by having students track how many cards they collect in each game.
 - Play the game with teams. Have tournaments by pairing winning teams against each other until a champion emerges. You can structure “double-elimination” tournaments, or use any other tournament structure that makes sense, such as a round robin.
 - If students are playing as individuals, try mixing up the groups for subsequent rounds by placing all of the first-round winners in a new group, second-placers in another group, and so on.
- 5) Assign the Student Page “What Good Is It?” as homework.



Journal Ideas

- Think about a fish or another marine animal you've seen. Using what you've learned in this activity, describe how it seems to be adapted to its environment.
- Some adaptations, such as the leaf scorpionfish's swaying motions, are called "behavioral adaptations." Instead of being a structural feature such as body shape or eye placement, these adaptations are exhibited in what the animal does. Describe some things that you do that, like behavioral adaptations, help you fit into different physical or social environments.

Assessment Tools

- Student Page "What Good Is It?" (teacher version, p. 7)
- Participation and conduct during the game
- Adaptation Concentration Scoring Grids
- Journal entries



Teacher Version

What Good Is It?

Fill in this grid. Use what you learned about how marine organisms are behaviorally and physically adapted to their environment to spark your thinking.

Fill in the advantage you think each characteristic gives to the marine organisms pictured. Explain your reasoning.

Note: Well-reasoned responses are acceptable, even if they do not match the answers given on this key.

ADAPTATION	ADVANTAGE	EXAMPLE
Upturned mouth & eyes close to mouth	Pick out plankton swimming freely in the water	Hawaiian dascyllus <i>‘Ālo‘ilo‘i</i>
Many fang-like teeth	Grasp fish and other prey	Viper moray <i>Pūhi kauila</i>
Thin, elongate body shape	Makes the fish hard to see	Trumpetfish <i>Nūnū</i>
Light coloration all over	Provides camouflage in sand or surf	Hawaiian flagtail <i>Āholehole</i>
Light-colored belly	Makes the fish hard to see from from below (especially by prey)	Whitetip reef shark <i>Manō lālā kea</i>
Brooding eggs in mouth	Keeps the eggs protected	Cardinalfishes <i>‘Upāpalu</i>



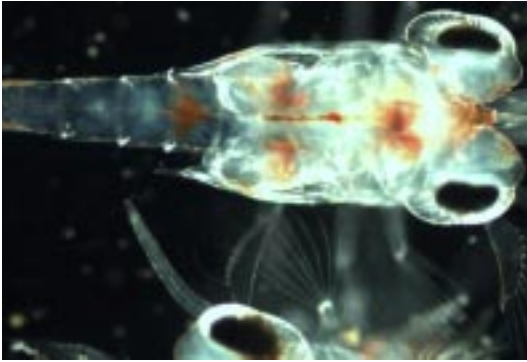
Adaptation Concentration Cards

Cut on solid lines, fold on dashes

Larvae in plankton

Makes the larvae difficult to see floating in the water, reduces chance of predation

Photo: Karl Embleton, Sir Alister Hardy Foundation for Ocean Science



Transparency

Juvenile convict tang - *Manini*

(*Acanthurus triostegus*)

Protects from predators, provides abundance of algae and small invertebrates for food

Photo: Waikiki Aquarium



Seeking out sheltered backwater areas or tidepools

Zebra blenny - *Pāo'o*

(*Istiblennius zebra*)

Reduces predation by birds and land animals while feeding on algae in tidepools

Photo: Marjorie L. Avai in John P. Hoover Hawaii's Fishes, Mutual Publishing



Quick, darting movements, constant movement

Zebra blenny - *Pāo'o*

(*Istiblennius zebra*)

Reduces predation by birds and land animals by blending in with the dark rock and shadowy holes and crevices in the lava rock of tidepools

Photo: Marjorie L. Avai in John P. Hoover Hawaii's Fishes, Mutual Publishing



Dark color



Adaptation Concentration Cards

Cut on solid lines, fold on dashes

Parrotfish - *Uhu*

(*Scarus perspicillatus* pictured)

Scrape algae from the surface of coral reef



Photo: John P. Hoover
Hawaii's Fishes, Mutual Publishing

Teeth fused into strong, beaklike plates

Moorish idol - *Kihikihi*

(*Zanclus cornutus*)

Reaches sponges and similar invertebrates living in crevices and holes



Photo: John P. Hoover
Hawaii's Fishes, Mutual Publishing

Elongated, tubular mouth

Convict tang - *Manini*

(*Acanthurus triostegus*)

Makes the fish more difficult to drive off than a single fish feeding on algae



Photo: John P. Hoover, A Pocket Guide to
Hawaii's Underwater Paradise, Mutual Publishing

Schooling

Bird wrasse - *Hinālea 'i'iwi*

(*Gomphosus varius* - terminal phase pictured)

Reaches small crabs and other prey in crevices and holes



Photo: John P. Hoover
Hawaii's Fishes, Mutual Publishing

Tubular snout



Adaptation Concentration Cards

Cut on solid lines, fold on dashes

Forcepsfish (or Common Longnose Butterflyfish)
Lau wiliwili nukunuku oi'oi
(*Forcipiger flavissimus*)

Reaches small worms and other invertebrates in crevices and holes



Photo: John P. Hoover
Hawaii's Fishes, Mutual Publishing

Long, tubular snout

Goatfish - Weke
(*Parupeneus porphyreus* pictured)

Help to detect food in sand



Photo: John P. Hoover
Hawaii's Fishes, Mutual Publishing

Whisker-like barbels

Goatfish - Weke
(*Parupeneus porphyreus* pictured)

Helps fish swim close to the bottom, to use barbels better in the sand



Photo: John P. Hoover
Hawaii's Fishes, Mutual Publishing

Flat underside

Jack - Ulua
(*Caranx ignobilis* pictured)

Helps fish swim swiftly, moving in on small fishes and invertebrates before they can escape



Photo: David R. Schriebe in John P. Hoover,
Hawaii's Fishes, Mutual Publishing

Deep, narrow, streamlined body; scythe-like tail



Adaptation Concentration Cards

Cut on solid lines, fold on dashes

Dragon Moray - *Pūhi kauila*

Enchelycore pardalis

Helps to maneuver easily in crevices, an advantage in stalking prey; provides quickness, an advantage in striking at prey

Photo: David R. Schrichte in John P. Hoover, Hawaii's Fishes, Mutual Publishing



Muscular, serpentine body

Devil scorpionfish

Nohu 'omakaha

Scorpaenopsis diabolus

Conceal the fish from prey, which may swim very close to it

Photo: John P. Hoover
Hawaii's Fishes, Mutual Publishing



Humped, irregular body shape; coral- and rock-colored camouflage

Devil scorpionfish

Nohu 'omakaha

Scorpaenopsis diabolus

Defend against predators

Photo: John P. Hoover
Hawaii's Fishes, Mutual Publishing



Venomous spines along the back

Leaf scorpionfish

Nohu

Taenianotus triacanthus

Camouflages and allows the fish to closely approach prey

Photo: Marjorie L. Awai in John P. Hoover, Hawaii's Fishes, Mutual Publishing



Swaying from side to side like a piece of seaweed in the current



Adaptation Concentration Cards

Cut on solid lines, fold on dashes

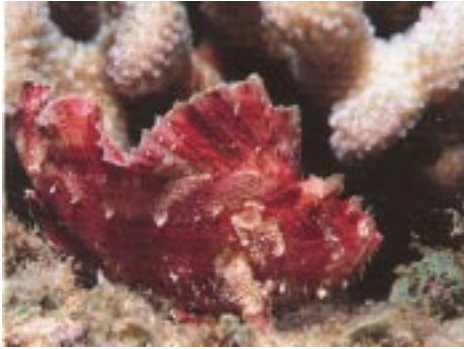
Leaf scorpionfish

Nohu

(Taenianotus triacanthus)

Allows the fish to strike quickly at prey

Photo: Marjorie L. Awai in John P. Hoover, Hawaii's Fishes, Mutual Publishing



Streamlined body

Spotted trunkfish or boxfish

Moa

(Ostracion meleagris - male pictured)

Defends against predators

Photo: John P. Hoover, Hawaii's Fishes, Mutual Publishing



Body armored with rigid scales

Spotted trunkfish or boxfish

Moa

(Ostracion meleagris - male pictured)

Defends against predators

Photo: John P. Hoover, Hawaii's Fishes, Mutual Publishing



Secreting toxin through skin

Hawaiian sergeant

Mamo

(Abudefduf abdominalis)

Allows male to protect eggs against predators

Photo: John P. Hoover, Hawaii's Fishes, Mutual Publishing



Attaching eggs to rocks



Adaptation Concentration Cards

Cut on solid lines, fold on dashes

Spotted coral blenny (or shortbodied blenny)
Pāo'o kauila
(*Exallias brevis*)

Allows male to protect eggs against predators



Photo: John P. Hoover
Hawaii's Fishes, Mutual Publishing

Attaching eggs to rocks

Butterfly fish (Butterfly fish are variously called *lau hau*, *lau wiliwili*, and *kikākapu*)
(*Chaetodon lunula*)

Helps fish sprint quickly for refuge from predators with additional thrust, like foot fins on humans



Photo: John P. Hoover
Hawaii's Fishes, Mutual Publishing

Placement of dorsal and anal fins back on the body

Wrasses - *Hinālea*
(*Coris gaimard* - initial phase pictured)

Helps the fish disperse eggs in high numbers, instead of concentrating them where predators can easily find them



Photo: John P. Hoover
Hawaii's Fishes, Mutual Publishing

Broadcasting eggs and sperm into the water



Adaptation Concentration

Game Instructions

Object

To collect cards from the table by correctly identifying:

- The common or Hawaiian species name AND
- The “advantage” conferred by the adaptation listed on the front of the card.

How to Play

Groups of four to six

- 1) Deal the cards, photo side up, in a grid on the table. All of the cards should be fully visible.
- 2) Play begins with the player to the left of the dealer and continues clockwise around the table.
- 3) Point to a card on the table and state the species name (either common or Hawaiian) and the advantage conferred to the species by the characteristic on the front of the card. Then turn over the card in its spot on the table so everyone can see it. If you correctly stated both the species name and the advantage, take the card and begin a collection pile on the table.

Continue in this way until you have an incorrect answer. Turn the incorrectly identified card back over, and continue play with the next player to your left.

- 4) The next player cannot begin his or her turn by pointing to the card that was just incorrectly identified. He or she must correctly identify at least one card before being allowed to select that card.
- 5) Play ends when all cards have been collected from the table OR when the play goes all the way around the table twice without any player collecting a card. If the latter happens, take turns turning over one card at a time and reviewing the species names and adaptive advantages so the whole group can hear them.
- 6) At the end of the game, fill out the Adaptation Concentration Scoring Grid by writing your name in the box that corresponds to each card you collected.
- 7) The player with the most cards wins!



Adaptation Concentration Scoring Grid

Adaptation	Round 1	Round 2	Round 3
Transparency			
Seeking out sheltered backwater areas or tidepools			
Quick, darting movements; constant movement			
Dark color			
Teeth fused into strong, beaklike plates			
Schooling			
Elongated, tubular mouth			
Tubular snout			
Long, tubular snout			
Whisker-like barbels			
Flat underside			
Deep, narrow, streamlined body; scythe-like tail			
Muscular, serpentine body			
Venomous spines along the back			
Humped, irregular body shape; coral- and rock-colored camouflage			
Swaying from side to side like a piece of seaweed			
Streamlined body			
Body armored with rigid scales			
Secreting toxin through skin			
Attaching eggs to rocks			
Attaching eggs to rocks			
Broadcasting eggs and sperm into the water			
Placement of dorsal and anal fins back on the body			