
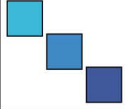


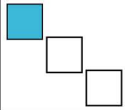

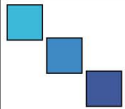

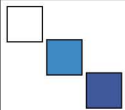


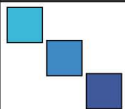


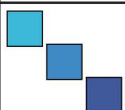


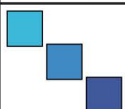


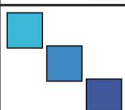


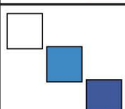

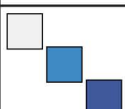



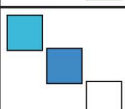




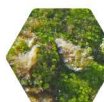
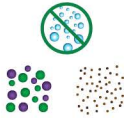


# REEF SURVIVOR CHEAT SHEET

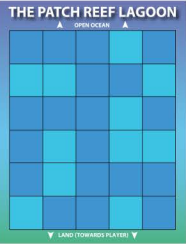

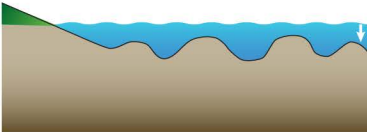
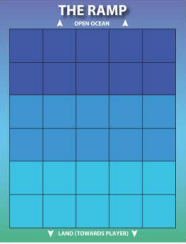

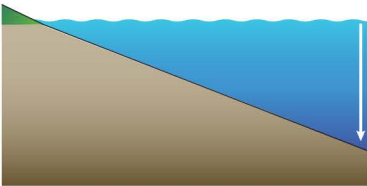
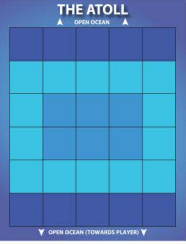
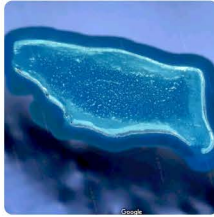
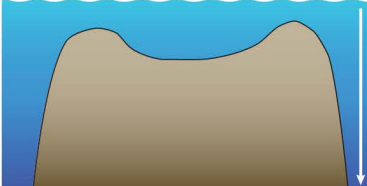
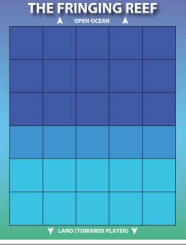

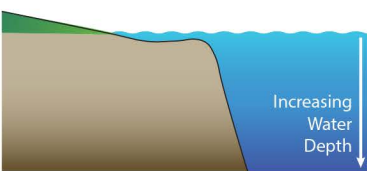
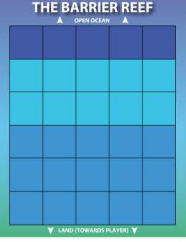
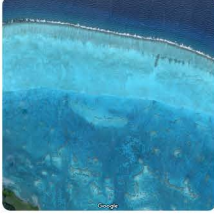
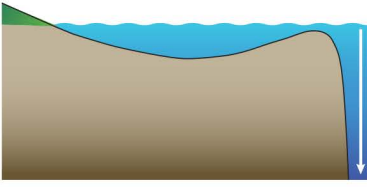
Reef Builder	Depth Range	Characteristics/Traits (+ = Recruits Dwellers)	
<b>Boulder Coral</b> 		<b>+</b>  Carbonate Skeleton	Colony of hundreds of individuals Zooxanthellae live inside coral tissue & photosynthesize.
<b>Branching Coral</b> 		<b>+</b> Carbonate Skeleton	Colony of hundreds of individuals Zooxanthellae live inside coral tissue & photosynthesize.
<b>Finger Coral</b> 		<b>+</b> Carbonate Skeleton	Colony of hundreds of individuals Zooxanthellae live inside coral tissue & photosynthesize.
<b>Platy Coral</b> 		<b>+</b>  Carbonate Skeleton	Colony of hundreds of individuals Zooxanthellae live inside coral tissue & photosynthesize.
<b>Soft Sponge</b> 		Network of tiny glass spicules or fibers/tissues like chitin	
<b>Carbonate Sponge</b> 		 Carbonate Skeleton or Spicules	
<b>Encrusting Sponge</b> 		 Carbonate Skeleton	Encruster
<b>Carbonate Alga</b> 		<b>+</b>  Carbonate Skeleton	Encruster
<b>Bivalve</b> 		<b>+</b> Carbonate Skeleton	Zooxanthellae live inside soft tissue & photosynthesize.
<b>Bryozoan</b> 		 Carbonate Skeleton	Colony of hundreds of individuals 
<b>Microbialite</b> 		Colonies of microscopic organisms form sticky mats that trap carbonate sediment	

## Reef Organisms















Reef Dweller	Characteristics/Traits
<b>Sea Urchin</b> 	Closely related to starfish, these urchins hang out on reefs munching away on the reef carbonate and fleshy algae. Too many urchins (>5) can be a problem, they will start to eat your juvenile reef builders!
<b>Fish</b> 	The fish swim around the reef cleaning off the fleshy algae as they graze.
<b>Snail</b> 	These spiraling reef dwellers have a long history of success in geological time but have a strong carbonate skeleton meaning they might get hit by some disasters.
<p><i>For every 2 corals, bivalves, &amp; calcareous algae on your board, collect one fish, urchin, or snail (dwellers MUST EACH BE SUSTAINED at all times)</i>  <i>Each reef dweller can eat one token of fleshy algae per round!</i>  <i>Reef dwellers can move between and stack on the reef builders, they do not mutate or reproduce in gameplay.</i></p>	

Reef Coverer	Characteristics/Traits
<b>Fleshy Alga</b> 	<p>These soft green algae grow quickly. If there are no empty spaces, the fleshy algae will grow over your reef builders meaning they cannot reproduce, evolve, or recruit and are not worth any points.</p> 
<p><i>Fleshy algae take over any unoccupied space in your ecosystem.</i>  <i>They are worth NEGATIVE one point and do not mutate or reproduce in gameplay.</i></p>	

# Reef Environment Game Boards

Game Board (Map View)	Natural Example (from Google Maps)	Cross Section View
<b>THE PATCH REEF LAGOON</b> 		
<b>THE RAMP</b> 		
<b>THE ATOLL</b> 		
<b>THE FRINGING REEF</b> 		 <p>Increasing Water Depth ↓</p>
<b>THE BARRIER REEF</b> 		

# Possible Mutations

Roll Result	Description of Genetic Mutation	Token(s) to Add
1	A mutation occurred and now your reef builder <b>builds a stronger skeleton</b> able to withstand strong waves and stormy weather. This token cancels out a weak skeleton or mutation.	
2	Your reef builder is now <b>resistant to lower pH (acidic) waters BUT it builds a weaker skeleton</b> and can no longer withstand strong waves. This token cancels out a strong skeleton or mutation.	 
3	A mutation occurred and now your reef builder <b>produces MORE offspring (2 offspring instead of 1)</b> . This token cancels out a mutation for fewer offspring.	
4	A mutation occurred and now your reef builder <b>produces FEWER offspring (0 offspring or "steady state" population)</b> . This token cancels out a mutation for more offspring.	
5	A mutation occurred and now your reef builder can <b>tolerate cooler climate</b> , so colder waters or seasons don't damage this organism!	
6	A mutation occurred and now your reef builder can <b>tolerate warmer climate</b> , so hotter waters or seasons don't damage this organism!	
7	A mutation occurred and now your reef builder can <b>tolerate lower oxygen levels</b> in the water (i.e., dysoxia, hypoxia, or anoxia).	
8	Your reef builder can now <b>tolerate warmer climate</b> (i.e., hotter waters) <b>BUT it builds a weaker skeleton</b> . This token cancels out a strong skeleton or mutation.	 
9	A mutation occurred and now your reef builder can <b>tolerate high nutrient levels</b> in the water (i.e., nutrification).	
10	A mutation occurred and now your reef builder can <b>tolerate high sediment loads</b> in the water.	
11	Your reef builder can now <b>tolerate lower oxygen levels</b> in the water <b>BUT produces FEWER offspring (0 offspring, "steady state" population)</b> . This token cancels out mutations for more offspring.	 
12	A mutation occurred but it doesn't change any characteristic expressed by the organism ( <b>no change in the organism's traits</b> ).	<b>NONE</b>