Visit **ecochainsgame.com** for lesson plans and to obtain the official game (printed on Forest Stewardship Council cardstock).

Educator discounts available for classroom bundles and packs!

Ages: 8+

Time: 15 min

Players: 2

ECOCHAINS Arctic Life RULES

For teacher guides, videos, and more resources, visit:
ecochainsgame.com

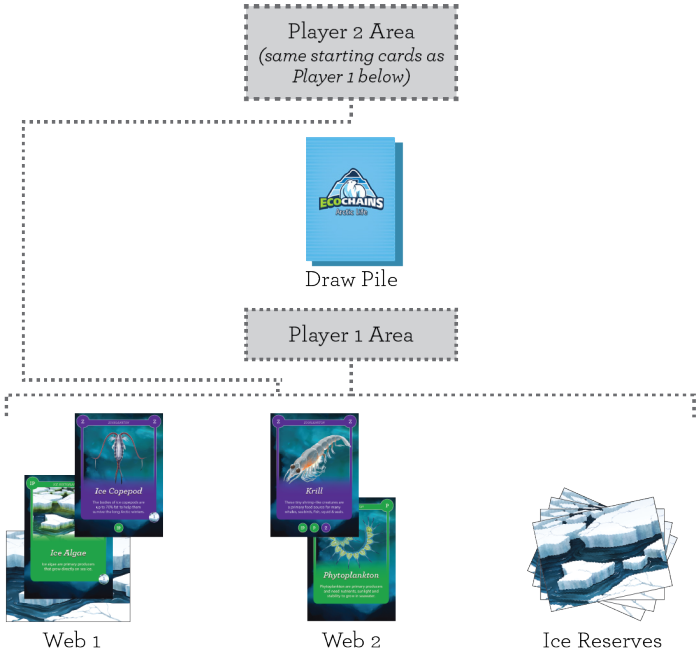
IN THE BOX

10 Sea Ice, 3 Krill, 3 Ice Copepod, 3 Clam, 2 of each remaining 14 Species, 4 Actions, 3 Events.

SETUP

Give 5 Sea Ice to each player along with 4 starter Species cards: Ice Algae, Phytoplankton, Krill, and Ice Copepod. Use them to build the two starting food webs ***(see Setup Diagram)***. As indicated by the Sea Ice icon on the bottom corner of their cards, Ice Algae and Ice Copepod require 1 Sea Ice at the base of their web.

Shuffle all remaining cards into a Draw Pile and place it face down in the center. Deal 5 cards from the Draw Pile to each player to form their starting hands. If any player receives a Carbon Pollution Event card, shuffle that card back into the Draw Pile and deal that player a new card.



SETUP DIAGRAM

GAMEPLAY

Players alternate turns. On your turn, you first draw a card from the Draw Pile, and then play one card from your hand. Play a Species card to build your food web, or play an Action card to gain points and Sea Ice (note that Action cards cannot create new Sea Ice - they only restore melted Sea Ice). Up to two predators can feed on any one prey source. If a Species card requires Sea Ice, make sure you have enough to play it. Each cluster of sea ice can only support one food web.

CARBON POLLUTION EVENTS

If a player draws a card from the Draw Pile and it is a Carbon Pollution event card, each player must immediately melt two Sea Ice cards. The melting of the Sea Ice cards resolves the event. The player who drew the event can now play a card from their hand.

MIGRATION AND THREATENED SPECIES

If at any time a card does not have a valid food source or enough Sea Ice at the base of the chain to support it, it must move to a valid position nearby to survive. If the card cannot survive in a player's webs, it moves to the next player. If it cannot be placed then it dies.

END OF GAME AND SCORING

The game ends when there are no more cards in the Draw Pile. Each living Species card in a food web is 1 point. Each Action card played is 2 points. Any card that has a Sea Ice icon in the bottom corner adds additional points equal to the number of Sea Ice required (for example, a Ringed Seal has a 2 Sea Ice icon, which gives the player 2 additional points). The player with the most points wins.

Developed by Jogolabs / Games Research Lab. This material is based upon work supported by the National Science Foundation under Grants DUE-1239783. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

For any questions or comments please email:
contact@EcoChainsGame.com.

To learn more about the *EcoChains: Arctic Life™* game and other projects developed by the Polar Learning and Responding: PoLAR Climate Change Education Partnership, please visit: ***thepolarhub.org.***

CREDITS

EcoChains: Arctic Life™: A game by Joey J. Lee, and Stephanie Pfirman.
Games Research Lab at Teachers College, Columbia University / Jogolabs LLC

Game Design Tom Toynton, Jessica Brunacini, Will Jordan-Cooley, Jonathan Ng, Ryan Courtney

Card Design Eduard Matamoros

Illustration Bree Westphal

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Rev.#072517

C CEPHALOPOD C

Squid

Squid chase down their prey and capture them using suckers on their tentacles.

F Z

F FISH F

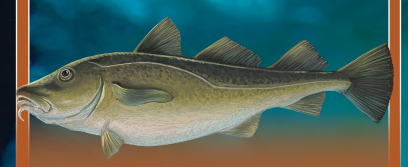
Arctic Cod

Sea ice contains nooks and crannies that provide the Arctic Cod refuge from predators.

1

Z

F FISH F



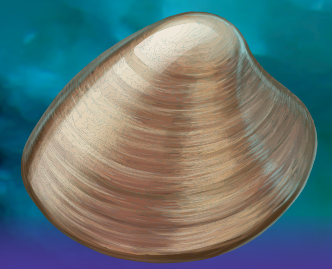
Arctic Cod

Sea ice contains nooks and crannies that provide the Arctic Cod refuge from predators.

1

Z

BI BENTHIC INVERTEBRATE BI



Clam

Clams live in sea floor sediment, remaining connected to the water through snorkel-like siphons.

P IP

Z ZOOPLANKTON Z

Ice Copepod

The bodies of ice copepods are up to 70% fat to help them survive the long Arctic winters.

1

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1

IP

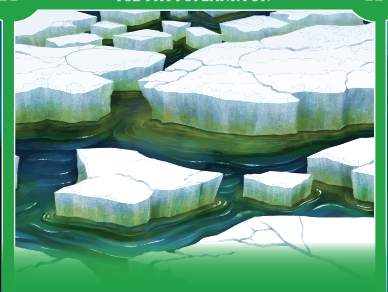
Z ZOOPLANKTON Z

Krill

These tiny shrimp-like creatures are a primary food source for many whales, seabirds, fish, squid & seals.

IP P Z

IP ICE PHYTOPLANKTON IP

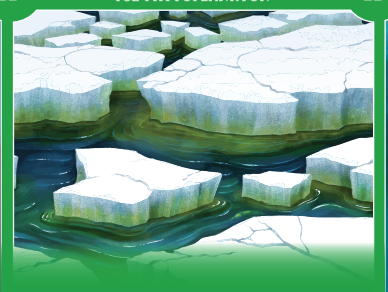


Ice Algae

Ice algae are primary producers that grow directly on sea ice.

1

IP ICE PHYTOPLANKTON IP



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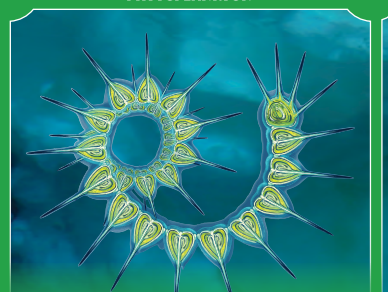
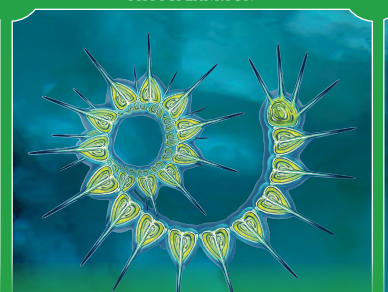


Phytoplankton

Phytoplankton are primary producers and need nutrients, sunlight and stability to grow in seawater.

P PHYTOPLANKTON P



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These tiny shrimp-like creatures are a primary food source for many whales, seabirds, fish, squid & seals.

IP P Z

Z ZOOPLANKTON Z

Krill

These tiny shrimp-like creatures are a primary food source for many whales, seabirds, fish, squid & seals.

IP P Z

S SEAL S

Bearded Seal

Bearded seals use prominent whiskers to feel along the soft bottom sediment for prey.

2

F BI

S SEAL S

Bearded Seal

Bearded seals use prominent whiskers to feel along the soft bottom sediment for prey.

2

F BI

S SEAL S

Ringed Seal

Ringed seals spend much of their lives on sea ice, giving birth and raising pups in dens under the snow.

2

C F Z

S SEAL S

Ringed Seal

Ringed seals spend much of their lives on sea ice, giving birth and raising pups in dens under the snow.

2

C F Z

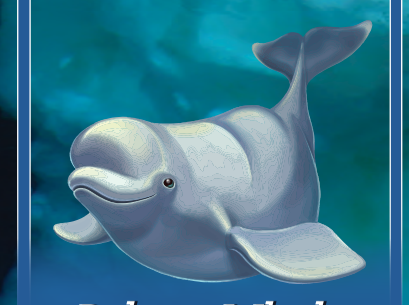
TW TOOTHED WHALE TW

Beluga Whale

Belugas are social creatures that can live, hunt, and migrate in groups of up to several hundred.

F C

TW TOOTHED WHALE TW



Beluga Whale

Belugas are social creatures that can live, hunt, and migrate in groups of up to several hundred.

F C

TW TOOTHED WHALE TW

Narwhal

Male Narwhals have a long ivory tusk that spirals counter-clockwise from their head.

F C

TW TOOTHED WHALE TW

Narwhal

Male Narwhals have a long ivory tusk that spirals counter-clockwise from their head.

F C

BW BALEEN WHALE BW

Bowhead Whale

If trapped under the ice and in need of air, Bowhead whales can break through up to 61 cm of ice.

Z

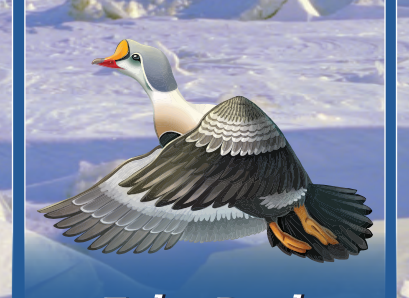
BW BALEEN WHALE BW

Bowhead Whale

If trapped under the ice and in need of air, Bowhead whales can break through up to 61 cm of ice.

Z

SD SEA DUCK SD

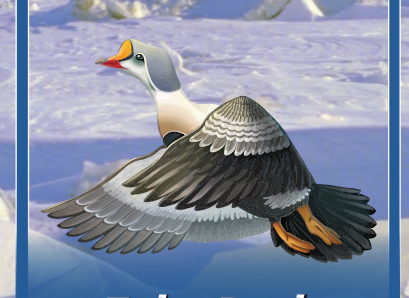


Eider Duck

Eider down is highly valued as one of the lightest and most effective insulators known.

BI

SD SEA DUCK SD



Eider Duck

Eider down is highly valued as one of the lightest and most effective insulators known.

BI

AS ARCTIC SEABIRD AS

Ivory Gull

Closely associated with sea ice, the Ivory Gull spends the entire year in the Arctic.

2

F Z

AS ARCTIC SEABIRD AS

Ivory Gull

Closely associated with sea ice, the Ivory Gull spends the entire year in the Arctic.

2

F Z

BM BOTTOM-FEEDING MAMMAL BM

Walrus

Walruses heft their large bodies, up to 1,900 kg, on to sea ice to rest and drift to new feeding grounds.

2

BI

BM BOTTOM-FEEDING MAMMAL BM

Walrus

Walruses heft their large bodies, up to 1,900 kg, on to sea ice to rest and drift to new feeding grounds.

2

BI

PM PREDATORY MAMMAL PM

Polar Bear

Polar bears, highly dependent on sea ice, are threatened by global warming due to loss of habitat and prey.

3

S

PM PREDATORY MAMMAL PM

Polar Bear

Polar bears, highly dependent on sea ice, are threatened by global warming due to loss of habitat and prey.

3

S

ACTION

Alternative Energy

Solar, wind, and geothermal energy sources are used to produce clean energy and electricity that helps prevent global warming.

Each player restores 1 Sea Ice

ACTION

Energy Efficiency

Homes and businesses use less energy when they improve building insulation and use energy efficient appliances and products.

Each player restores 1 Sea Ice

ACTION

Green Transportation

Walking, biking, carpooling, and using public transportation help combat global warming by cutting down on carbon pollution.

Each player restores 1 Sea Ice

ACTION

Sea Ice Restoration

Trapping and storing carbon pollution reduces gloabl warming, allowing for increased amounts of sea ice to regrow.

Each player restores 2 Sea Ice

PM — PREDATORY MAMMAL — PM

Human Being

Subsistence hunting and fishing play a key role in the way of life for many Arctic Indigenous peoples.

1

F SD BW TW S BM

PM — PREDATORY MAMMAL — PM

Human Being

Subsistence hunting and fishing play a key role in the way of life for many Arctic Indigenous peoples.

1

F SD BW TW S BM

EVENT

Carbon Pollution

Homes and businesses use large amounts of fossil fuel energy for heating, cooling, and lighting needs.

Each player melts 2 Sea Ice

EVENT

Carbon Pollution

When coal, oil, and gas are burned to produce energy and electricity, they release carbon pollution that contributes to global warming.

Each player melts 2 Sea Ice

EVENT

Carbon Pollution

Carbon pollution from cars, trucks, SUV's, and other passenger vehicles rapidly increases as more people choose to drive.

Each player melts 2 Sea Ice

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