SOUTHERN OCEAN CARD GAMES

The Southern Ocean is the ocean around Antarctica. It extends out far enough to take in several groups of "sub-antarctic islands such as South Georgia Island, the South Sandwich Islands, Kerguelen Islands, and the South Orkney Islands. This game focuses as much as possible on the species that live on or very near to the continent of Antarctica itself. For examples, the penguins listed here are the only species that live on the continent year round.

VERY IMPORTANT NOTES:

1) These cards do not represent a complete survey of all animals found in Antarctic waters. For example, salps, urchins and clams do not appear in the game. For a complete field guide to what lives in and around the Ross Ice Shelf, try this website: **http://www.peterbrueggeman.com/nsf/fguide/index.html** Another very good site is: **http://www.antarctica.gov.au/about-antarctica/wildlife/animals**

2) Please don't use these cards as the last word on the Antarctic food web. This is especially true for the animals that eat a lot of things. If they are not picky eaters, it's hard to list everything they will eat. (This is especially true for anemones, worms, jellies and sea spiders.) Also, some of these animals have subspecies that differ in what they eat. This is especially true for the fish, sea cucumbers, sea stars, and crustaceans. Even within a species you might find some in one area eating a slightly different diet than those in another area. Also, diets can vary at different times of the year or during years when a particular type of food is scarce. Think of these as guidelines, not hard and fast rules.

3) It is not possible to list the different species of diatoms, dinoflagellates and micro-crustaceans. Different species would be found in different areas, so the dinoflagellates and diatoms that are being eaten up near the surface would probably not the be same species as the ones being eaten by the sea cucumber as it eats its way through the debris and mud at the bottom. We are lumping them all together in this game and just using one little icon to represent all of them. Nature is more "finely tuned" than this game!

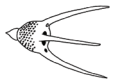
4) Larvae and eggs are another common food source for many creatures, but are not listed separately. For example, a creature that eats fish eggs might not eat the baby fish after they hatch. (Maybe they would not be able to catch them!) The exclusion of larvae is one of the over-simplifications that had to be used in order to make the game work. The larvae add a layer of complexity that would make the game confusing. For example, sea star larvae can swim around and go up to the surface. So we might actually be able to say that some sea stars (in larval form) get eaten by a baleen whale along with its krill. However, sea stars don't ever show up on whale dietary lists because mature sea stars never leave the bottom; they are "benthic."

Having said all that, a lot of research went into this game and it hopefully gives a very good overview of the Antarctic food web. Dozens of websites were consulted, many of them the websites of professional Antarctic researchers. The "eating" and "predator" lists are compilations of information from various sites. There isn't one place you can get all this info (except here!).

Here is a list of the icons and what they mean. Most are self-explanatory.


green algae


diatoms


dinoflagellates (all species)


"zooplankton" (copepod shown)


krill


isopod (small crustaceans)


sea spider (unique arthropods)


scallop


jellyfish


comb jelly (ctenophores)


anemones


sponges


sea squirts (tunicates)


sea stars of all kinds


sea cucumbers


Nemertean worms


fish of all kinds


squid


octopus


albatross


petrel


tern


penguins


leopard seal


all other seals


killer whale (orca)


baleen whales (blue whales)


toothed whales (sperm whales)

GAME #1: "Getting to Know You"

Number of players: Any

This is more of an activity than a game. If you have not been studying Antarctica and you don't already know a lot about the Southern Ocean food web, take the time to do this activity before you play the other games. The other games won't seem so hard.

Put the cards out face up and let the players sort through them and look at them for a few minutes. Then ask them to listen to the following questions and try to find the appropriate cards. The questions will help to introduce some of the science represented on the cards. Read the question aloud to the players, then engage them in discussion about the answer.

QUESTION #1: Look at the red and white symbol with the plate, fork and knife. This represents eating. The creatures in the row or column with this symbol are what this animal eats. Can you find three cards that don't have this symbol? Why don't they have this symbol? *(Ice algae, diatoms and bacteria. Ice algae and diatoms use sunlight and carbon dioxide to do photosynthesis. They don't need to eat anything outside of themselves.)*

QUESTION #2: Look at the yellow triangle symbol. This is a warning symbol, so these are the animals they have to watch out for-- the predators. Can you find a card with no predators listed? *(The killer whale is at the top of the Antarctic food chain. This isn't to say that nothing ever attacks them, but as a general rule, they don't have to worry about anyone eating them.)*

QUESTION #3: Do different species of penguins eat different things? *(no)*

QUESTION #4: Which bird is the largest? *(the albatross)* Are you surprised at its size?

QUESTION #5: Which seal has a diet remarkably different from the others? *(The leopard seal is unlike all the others. It is a very dangerous predator!)*

QUESTION #6: Can you find all the animals that feed on nothing but microscopic organisms such as algae, diatoms, dinoflagellates and zooplankton? *(zooplankton, dinoflagellates, sponges, sea squirts, sea pigs, scallops) (Sponges and sea squirts are "filter feeders" as are many brittle stars and feather stars which do not appear in this game.)*

QUESTION #7: What does the Bald Notothen fish eat? Does it feed near the surface or does it stay close to the bottom? *(It more often feeds on the bottom.)* Why are birds not listed as probably predators? (*Birds can't dive deeply enough to catch bottom feeding fish. However, this does not mean that they are never caught by birds. Probably the fish sometimes swim higher.)*

QUESTION #8: Where do krill feed most of the time? Why? *(At or near the surface because their food is organisms that need sunlight.)*

QUESTION #9: Is the octopus restricted to eating things on the bottom? *(no)*

QUESTION #10: If jellyfish go too close to the bottom, they might get caught by what predator? *(anemone)*

QUESTION #11: Do comb jellies prey on bottom-dwellers? *(no)*

QUESTION #12: Which has a diet most like the earthworm, a Nemertean worm or a sea pig? *(sea pig)*

QUESTION #13: If birds can fly, how can a leopard seal or a killer whale eat them? *(When they come down to the water to feed. The predators can ambush them if they are not watching carefully.)*

QUESTION #14: How many cards can you find where the same symbol appears in both the "eating" list AND in the "predator" list? *(fish, sea star, sea spider, squid, octopus, anemone, jellyfish, comb jelly, Nemerteans, dinoflagellates)*

QUESTION #15: How many of these cards (from question 14) appear to be cannibalism where they are eating their own kind? Does this really happen? *(Yes. Size accounts for quite a few of these cases. For example, fish start out as babies and while they are tiny they are in danger of getting eaten by larger fish, even fish of the same species. Sometimes it is indeed cannibalism (species eating their own kind), such as jellyfish, squid and fish. However, in some cases the species are a bit different, which is more likely to be the case with sea stars, worms, and dinoflagellates.)*

QUESTION #16: Which animals are most likely to eat dead things? *(Petrel, isopods, sea stars)*

QUESTION #18: Can you find the organism that can both eat and do photosynthesis? *(dinoflagellates)*

QUESTION #19: Which animal has the largest number of predators listed? *(krill)*

QUESTION #20: Can you find 5 cards that will line up and make a food chain? Start with something that does photosynthesis and then end with a top predator. Can you find a 6-card food chain?

BONUS: The word "benthic" means "bottom dwellers." What would an Antarctic benthic community look like? Pull out all the cards of creatures that you might meet on the bottom? Put them in a long line to form a picture of a benthic community.

GAME #2: "Food Fight!"

Number of players: 2

This game is very simple so that instead of concentrating on complex rules, players can look at the cards and get to know them even better. It is similar to the card game "War" where you pit two cards against each other and the higher card wins. In this game, the predator/eater wins.

Each player draws three cards and lays them out in a line, face down. Each of the three cards will match up with one of the opponent's three cards, so that you've got three sets of opposing cards. Players turn over their first cards at the same time.

If one of these cards is a predator and the other card is a correct prey, the predator player wins that match and keeps both cards. **The goal is to win 2 out of 3 matches.**

If it is not a correct match (for example, a sponge and a leopard seal) or it is a tie (for example, a sea star and a sea spider), then no one wins those cards. If you only have one tie among the three sets of cards, it is still possible to get two out of three. If you have two ties amongst your pairs, then the whole match is scored as a tie and you start over again with a new match with six new cards. If each player has one win and pair was a tie, then the whole match is a tie. Just play again!

NOTE: You can have four players (two sets of players) using the same deck. Just make the deck available to both sets of players. Each set of players will only be using a small number of cards at a time, so if you keep shuffling used cards back into the deck there should be enough cards to go around.

GAME #3: "3 in a Row"

Number of players: 2-4 (If you need to have 5 or 6 players, use two decks shuffled together)
You will need: the cards, a coin, and the map page printed onto regular paper and trimmed into a square
Time needed to play: 5-20 minutes per game (depending on the "luck of the draw," so to speak)
Play multiple games.

Objective: The goal of the game is to make one or more 3-card food chains. The winner is the player with the most food chain sets. The game is over when the cards in the draw pile are gone.

How to set up:

Trim the map page into a square, and put it in the middle of your playing area. Notice that the red arrows represent the Circumpolar Current. The water in the Southern Ocean flows in this direction. The red arrows will help you remember which way the cards circulate during the game.

The coin will be used instead of dice. The "heads" side will mean "Circulate the cards with the current," and the "tails" side will mean "Draw and Discard." (If it would help the players remember, you can take a permanent marker and put arrows on the heads side and the letter D on the tails side.)

Shuffle the cards well, then distribute 5 cards to each player. The remaining deck will be placed (face down) on top of Antarctica. This is the draw pile.

Players look at their cards to see if they have 3 cards that will form a food chain. (For example: algae, krill, penguin. The algae are eaten by the krill which is then eaten by the penguin. So the middle card will have what it eats on one side and what eats it on the other.) Then each player decides on one card to discard, to get the discard piles started. Each player will have a discard pile in front of them, but these piles will rotate around, following the direction of the current arrows. The discarded cards are placed face up because they will be available for picking up on future turns.

So here is your pre-game check list:

1) Do you have any sets of 3 cards that form a food chain? If so, collect them and lay them aside.

2) Now look at the remaining cards (you might still have 5 cards) and decide on one to discard. Put it in front of you (face up) near the map.

3) Look at your remaining cards and think about what cards you might want to gain in order to make a food chain. Look at the cards in the discard piles around the map. These will rotate around and you might have a chance to pick one up. So bear this in mind.

4) NOTE: The maximum number of cards you have in your hand at any time is 4.

How to play:

In this game, everyone plays on every turn. However, players will take turns flipping the coin to decide the method of play for that round.

The first player flips the coin. If it lands on "Tails" then the method of play for this round will be "Draw and Discard." Everyone will play on this turn, but the player who flipped the coin will go first. The first player will decide whether he wants to take a card from the draw pile. He can "pass" if he is content with the cards he has. If he decides to draw, he takes a card from the draw pile on top of Antarctica. He may keep this card, but if he already has 4 cards in his hand he must decide on one to discard because the maximum number of cards you can have in your hand is 4. The discarded card goes (face up) on top of the discard pile in front of him.

Now each player also gets a turn to Draw and Discard, going in order following the direction of the arrows. If you have less than 4 cards in your hand, you don't need to discard.

After all players have had a chance to Draw or Discard, then it is the next player's turn to flip the coin.

If the next player flips "Heads" then the method of play will different for this round. Each player will take his discard pile and move it in the direction of the Circumpolar Current arrows until it reaches the player to his left. So everyone will end up with the discard pile that used to belong to the player on his right. (If you have four people playing, then this would be a 90 degree clockwise rotation for each discard pile.)

After all the piles have reached their new destination, the players can then decide whether they would like to pick up that card. If they have less than 4 cards, they can just pick up the card. If they have 4 cards in their hand, they can pick up the card as long as they put one of their other cards back down onto the discard pile.

GAME #3, con't.

Then the next player down the line gets a turn to flip the coin. Play proceeds like this, which each player getting a turn to be the coin flipper.

At any point in the game if a player gets a set of 3 cards that make a food chain, they can gather them together and lay them aside as a collected set. This will mean they might be left with only one card in their hand, but the next time that "Tails" is flipped, they will be able to pick up another card. In just a few turns they will probably be back to having 4 cards in their hand again.

Winning:

The game is over as soon as the last card is taken from the Antarctica draw pile. At that point, whoever has the most food chain sets wins the game. (But we all win if we had fun and learned a lot!)

Most games are pretty short so you can play it several times, hopefully with different winners.

NOTE: Ties are very likely.

GAME #4: "Looking for Lunch"

Number of players: 3 to 6 (This game is actually more interesting with 4 to 6 players.)

Choose one player to be "It." (All players will get a turn so it doesn't matter who goes first.) Shuffle the deck well and spread them out, face down. "It" will choose one card at random and look at it without letting anyone else see. If diatoms, algae or killer whale is drawn, put the card back into the deck. (You need to draw a card that both eats and is eaten to have the game work correctly.) Once a suitable card is drawn, then the other players draw three cards at random, NOT LOOKING AT THEM. They will not be able to look at their cards until part way into the game. Players put their cards out in front of them, face down.
(NOTE: If you are playing with just three or four players, you might want to increase the number of cards everyone draws to four instead of three.)

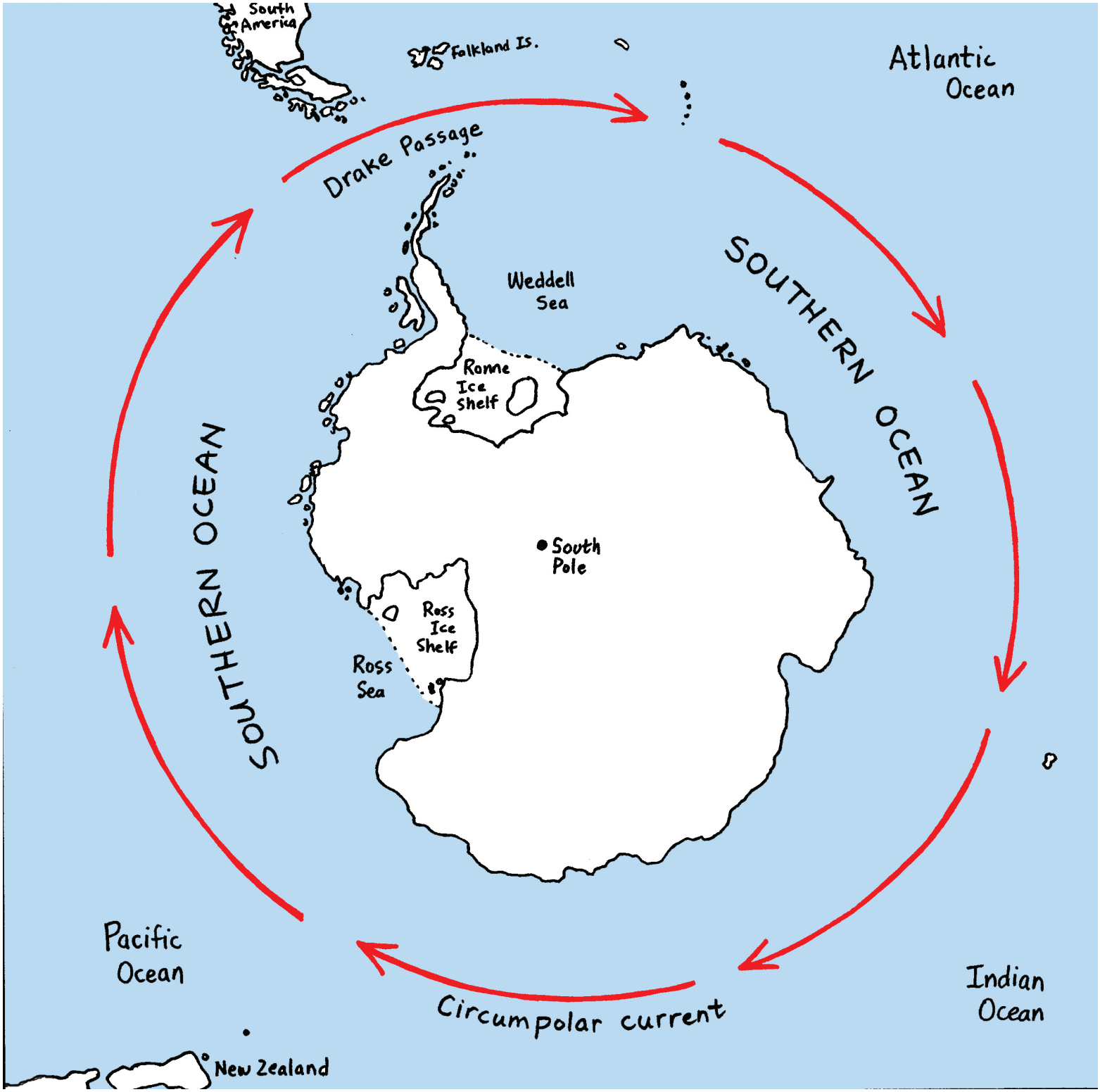
The goal of the game is to eat before you are eaten. "It" will try to choose a card that is something it can eat. For example, if "It" is holding a penguin card, the goal is to draw a fish or squid card and avoid drawing the leopard seal or killer whale. If "It" can draw a food card before drawing a predator card, "It" wins. "It" can also win simply by not getting eaten.

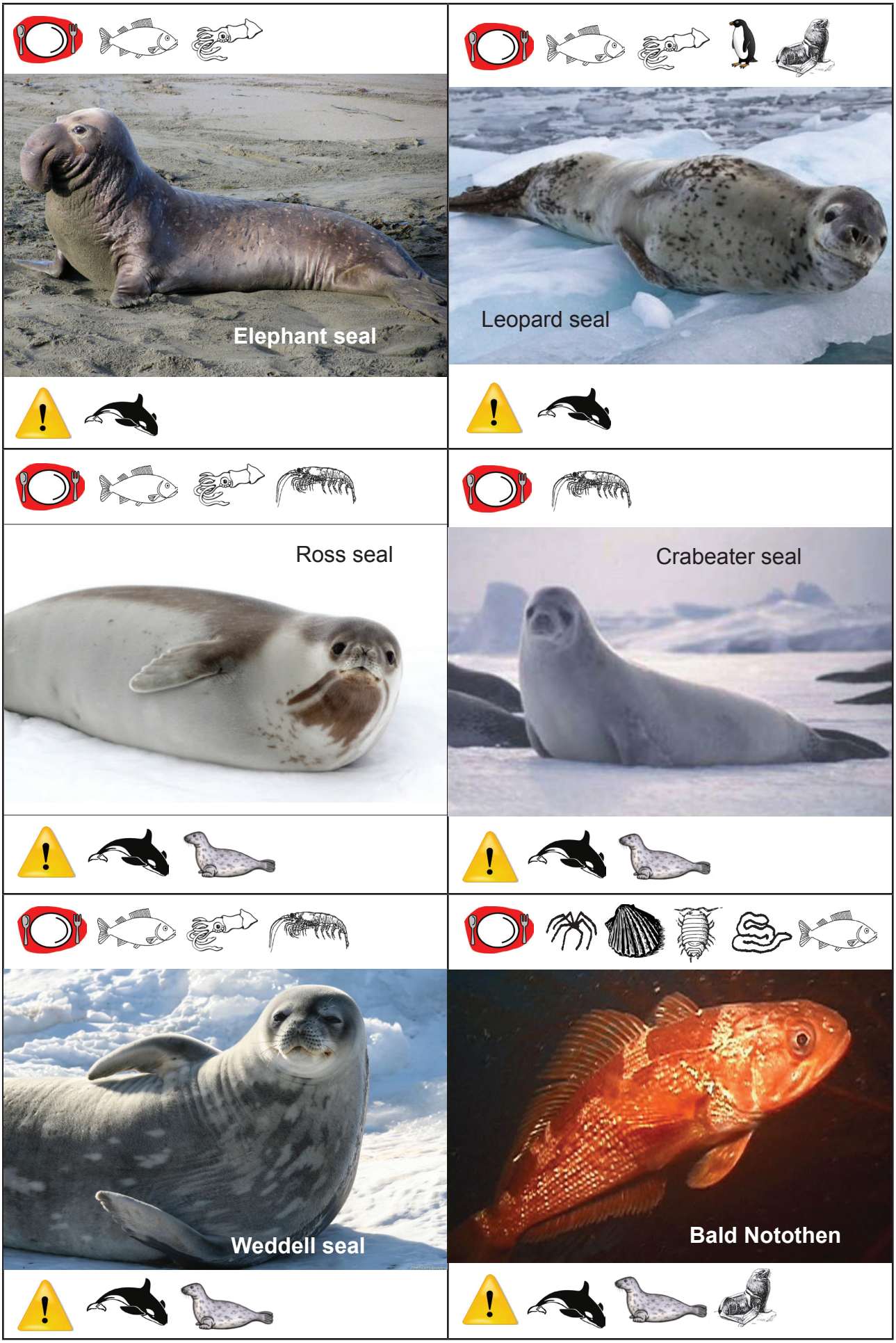
After the other players all have their three cards face down in front of them, "It" selects a player and turns over one of his/her cards. If this first card is a food or predator, start the game over again with a new card for "It" card and a replacement for the person whose card was chosen. Winning or losing in just one move is a very short turn, and "It" should be given a second turn.

Assuming the first card was not a food or a predator, "It" selects another player and chooses one of his/her cards to turn over. Again, if it is a food or predator, the game is over, but if not, "It" selects another player's card. This continues until "It" had chosen one card from each player. The players who are not "It" should be looking carefully at what is not being eaten and at what predators are not a threat. The fact that these cards did not affect "It" are clues as to what "It's" card might be. Now comes round two.

Before round two starts, pause and let the players peek at their remaining two cards (or remaining three cards, if you are playing with a total of four cards). The players might, by this time, have a guess as to what "It's" card might be. They will try to choose a predator if they can, or at least something that is not food. They will choose which card "It" must take when "It" chooses them.

For round two, "It" selects a player, then that player points to the card that "It" must choose. If it is a food, "It" wins. If it is a predator, "It" loses. If it is neutral, "It" goes on to select another player. This continues until all players have been selected once. If "It" has not been eaten by the end of round two, "It" wins. The cards are shuffled and a new "It" is chosen. (If you are playing with four cards per player, you can play a third round and "It" has to survive this third round.)


South America
Falkland Is.
Atlantic Ocean
Drake Passage
Weddell Sea
SOUTHERN OCEAN
Ronne Ice Shelf
SOUTHERN OCEAN
South Pole
Ross Ice Shelf
Ross Sea
Pacific Ocean
Circumpolar current
Indian Ocean
New Zealand



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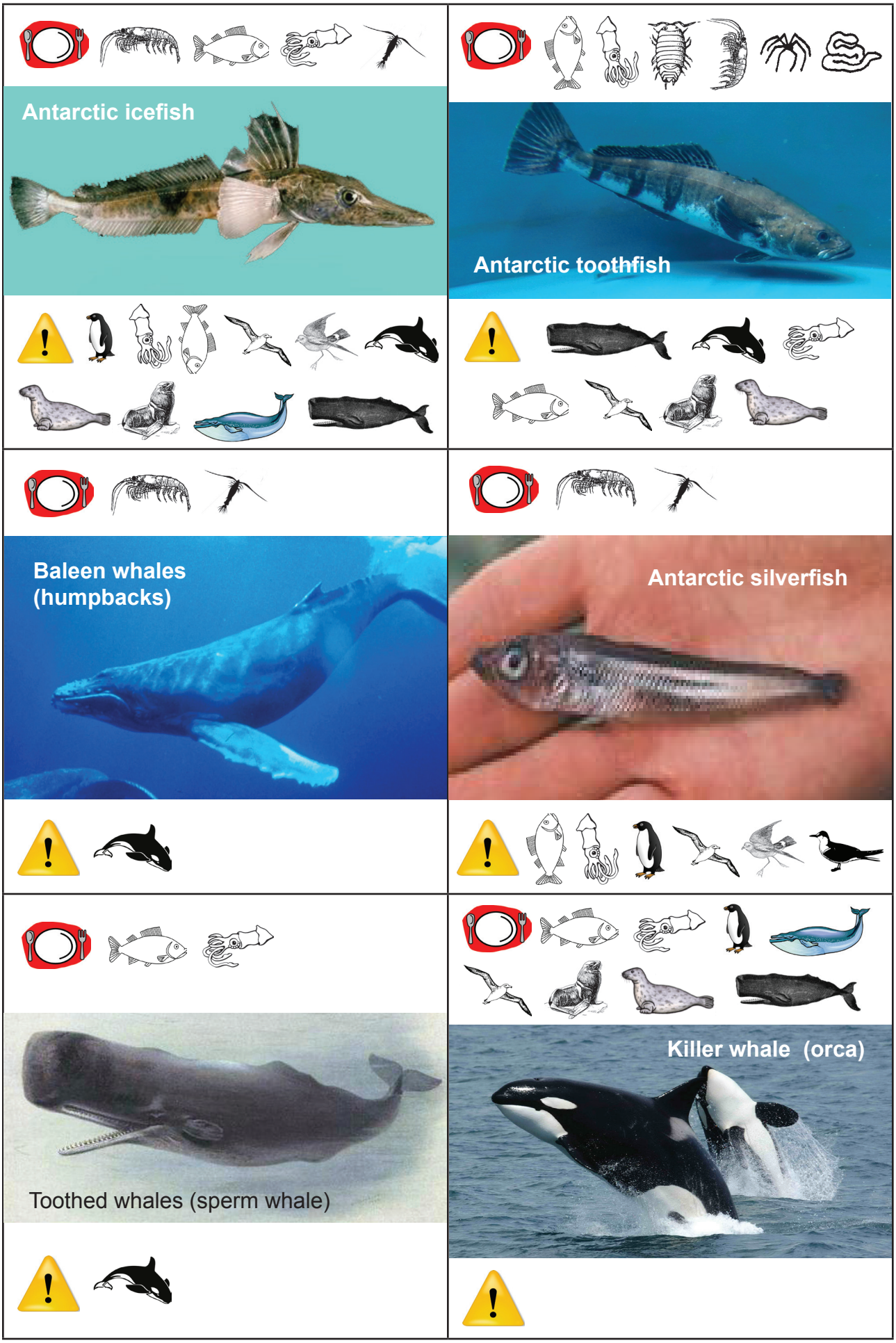
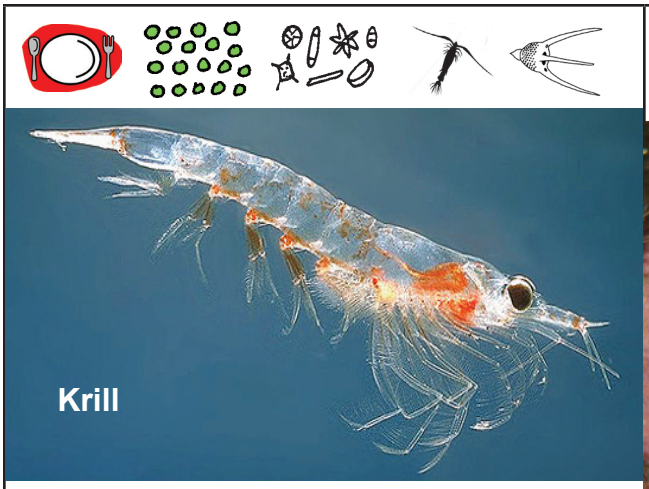
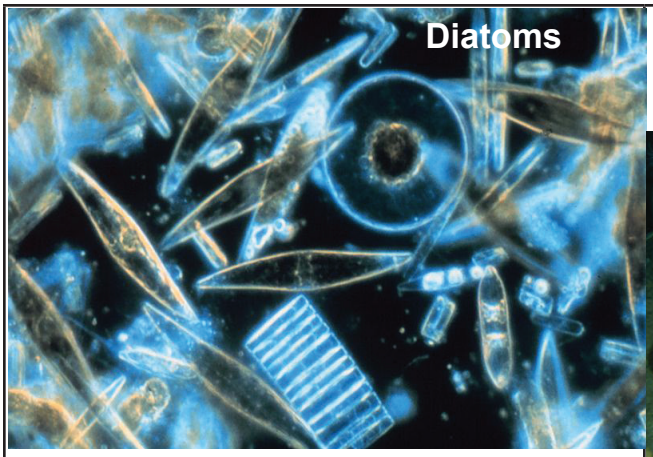
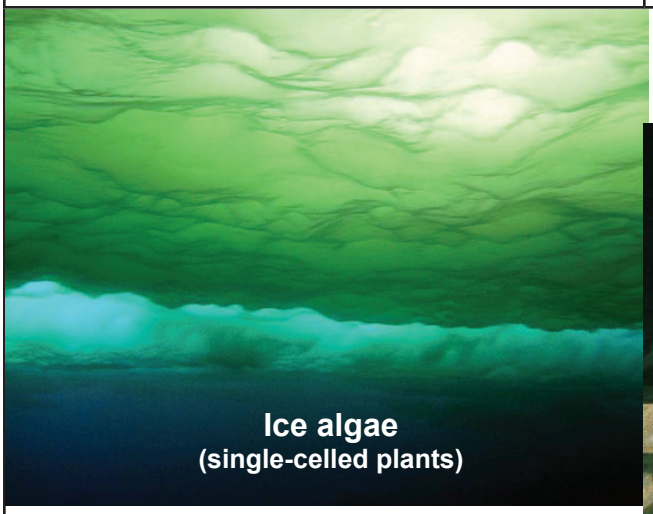


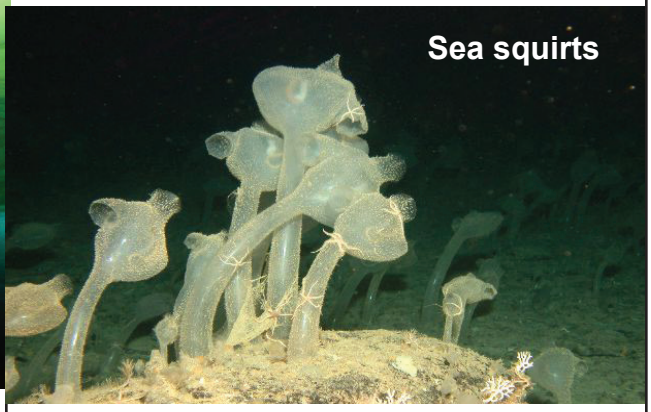
http://www.tampabay.com/specials/2010/reports/antarctic/food-web/



Will also eat dead things.



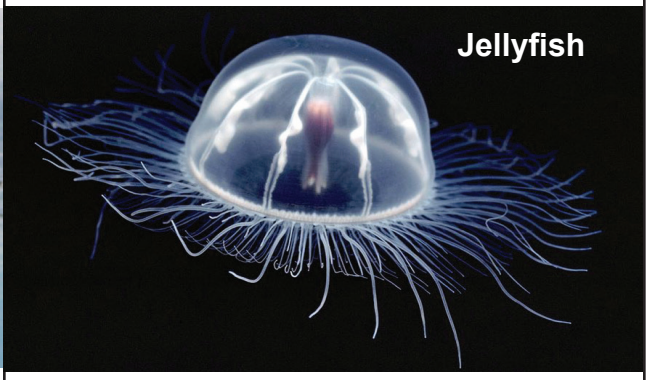


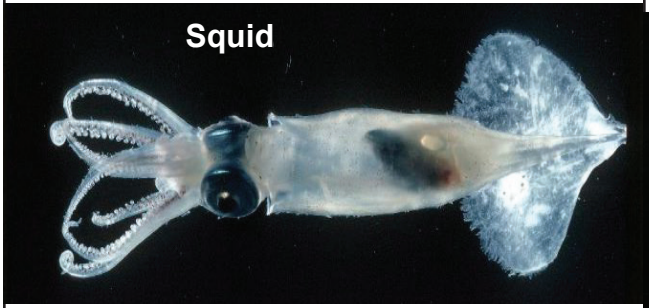


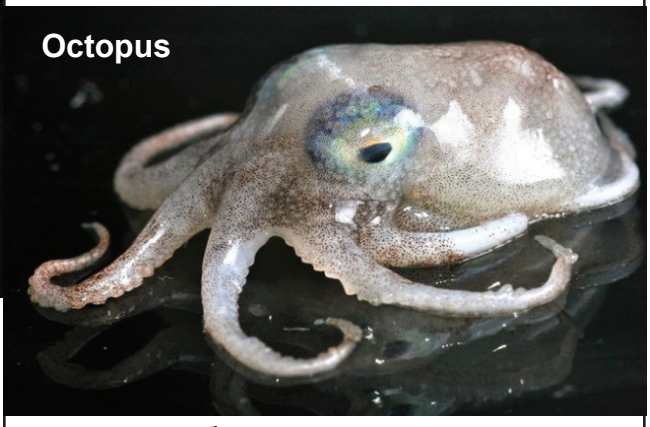
Also tiny bits of debris from things that rotted.

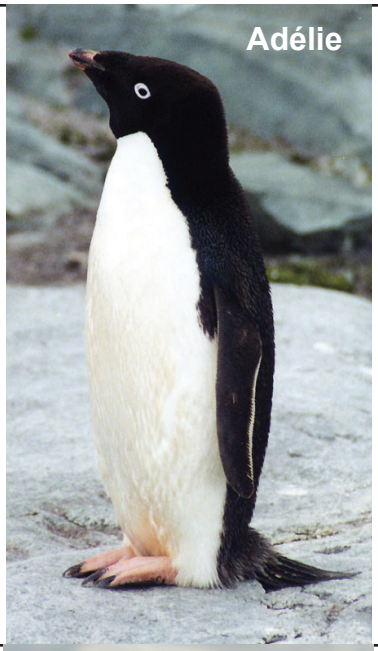
Mostly, isopods eat dead stuff that falls to the bottom.

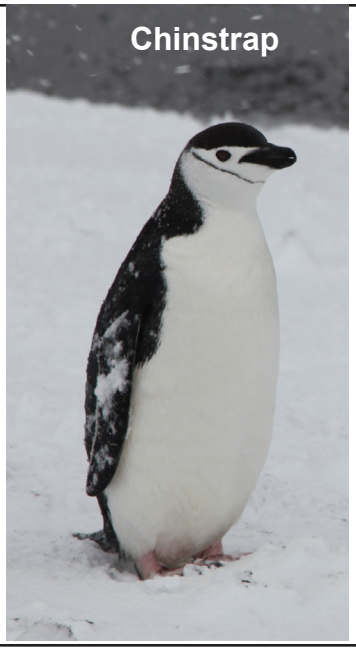
Petrels will also eat dead animals.





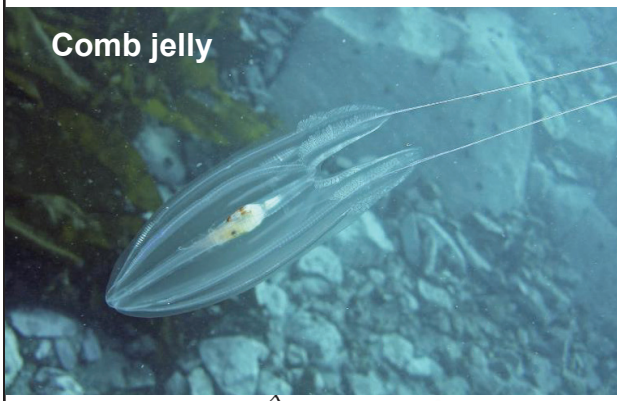


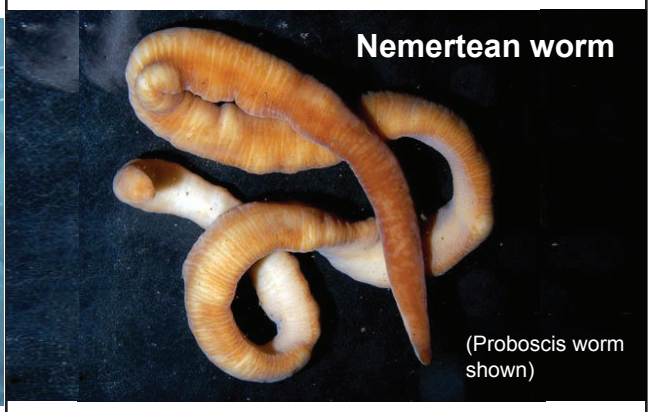

Adélie


Chinstrap


Emperor


Some dinoflagellates can do photosynthesis.
Dinoflagellates


Comb jelly


Nemertean worm
(Proboscis worm shown)