



Amazing
JELLIES

KIT GUIDE for TEACHERS

FUNDED BY  **National Science Foundation**

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THE TEACHER RESOURCE CENTER (TRC)

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Service To Teachers Is Our #1 Priority

Mission:

We offer a meeting place, free consultation appointments, research assistance and access to curriculum and loan materials for aquatic and environmental education for thousands of teachers each year. E-mail trc@neaq.org or call us at **617-973-6590**. Join our TRC Teacher Listserv to receive information about the latest professional development and project funding opportunities at www.neaq.org/special/teachers.html.

The Teacher Resource Center was founded in 1987 to help teachers meet their aquatic and ocean education needs, promoting an interdisciplinary approach to environmental and place-based education. Our collection builds on the contributions of teachers like you, and in particular has benefited from our longstanding association with the Massachusetts Marine Educators (MME, www.massmarineeducators.org). Items date as far back as the 19th century and include current reinvention of hands-on inquiry and standards-based education materials.

Today we serve nearly 3,000 educators a year, providing free individualized consultation and access to one of the largest curriculum collections in the region and a 6,000-item collection of loan materials. Our audience includes teachers—broadly defined to include the preK-12 community as well as home schoolers, park rangers, camp counselors and other out-of-school instructors. Most visitors are located in New England, but some come to us from around the world, and our materials can be shipped both nationwide and overseas.

Our collection includes:

- Several hundred **videos, audiocassettes and CD-ROMS** available for free loan. Videos can be previewed during a TRC appointment. Sample titles: *The Streamkeeper*, *Secrets of the Salt Marsh*, *Let's Explore a Seashore*.
- **A la carte items** that let your students hear ocean surf, try a “blubber glove” to learn how whales keep warm, feel the sharp edge of a fossil shark tooth, or wear the shell of a sea turtle that once nested on a Caribbean beach. Colorful puppets and games are available, as well as government-seized contraband such as whale bones, baleen, shells, corals and taxidermy mounts of protected species that students may touch. Borrowers are legally responsible for safe and timely return of items borrowed.
- Comprehensive and up-to-date hands-on inquiry and standards-based **curricula**, activities and lesson plans available for reference. Photocopies can be made for a nominal fee. **Circulating books** include science non-fiction, juvenile fiction, published curricula and field guides.
- **Kits** containing specimens, books, audiovisual materials and activities suitable for classroom learning centers include such titles as *Whales*, *Jellies*, *Penguins*, *Sharks*, *Watershed to Bay*, *Coral Reefs*, *Rain Forests*, *Tidepools*, *Sea Otter Biologist* and many more.
- **On-line worksheets and activities** specific to the Aquarium. Contact us at trc@neaq.org for more information about our electronic resources.
- For a **360° virtual tour** of the TRC, visit www.neaq.org/vtour/360trc.html.



USING THE JELLIES KIT

This guide provides information and basic lesson plans for different grade levels. Facts and general information on jellies, as well as additional activities for all grade levels and a role-playing activity for grades 9-12 are also included in the binder. Most materials necessary for each activity are included in the kit. The kit does not, however, include common school supplies such as scissors, crayons, glue, etc. The materials in the kit are durable but need to be handled with care. Please be sure that all items are returned to the kit at the end of the unit by checking them against the “Kit Inventory List” (those listed as consumables are exceptions).

KIT INVENTORY LIST

Kit Guide for Teachers

Books

- 1 *Amazing Jellies: Jewels of the Sea*
- 2 *Sea Jellies: From Corals to Jellyfish*
- 3 *Jellies—The Life of Jellyfish*
- 4 *Jellyfish and Kin of the Mid-Atlantic Coast*
- 5 *Jellyfish: Inside Out*
- 6 *Floating Jellyfish*

Video

Jellies: Phantoms of the Deep

Size Reels

Size cards, rulers (4) and ball of string*

Shapes and Colors Activity

Red plastic folder with large photographs (6)

Jelly Fact Cards

Purple plastic folder with large fact cards (11)

Glow-in-the-Dark Jelly Puppets

Glow-in-the-dark jelly puppets (2)

Jelly Dominoes

Jelly domino cards

Jelly Simulation

Packets of gelatin*

Create Your Own Jelly

Coffee filters*, ribbon*, yarn*

Memory Game

Blue plastic folder containing game key and cards

Jelly Anatomy Puppets

Hand puppet, finger puppet

Jelly Life Cycle Felt Board and Poster

Poster, felt board and pieces to build jelly life cycle

Food Chain and Food Pyramid

Food chain cards (16), white plastic folder containing instructions for Activities 11, 12A and 12B

The Predator-Prey Relationship of Jellies

Bag of small beads, clear plastic cups (8), larger plastic cups (4) and large plastic bowls (2)

Jellies In My Ocean (Tarp Game)

Tarp, dice (4), cards (11) and large glass beads

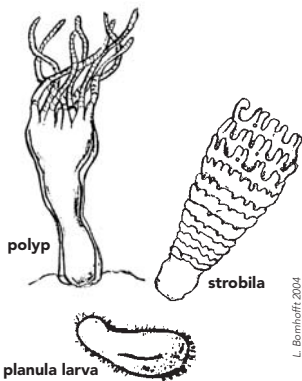
* These items do not need to be returned.

REFERENCE BOOKS AND WEBSITES

Visit these websites:

- www.newenglandaquarium.org
- www.mbayaq.org/efc/efc_se/se_jla.asp
- <http://www.aquarium.org/jellies/jellycam.htm>
- <http://www.extremescience.com/GiantJellyfish.htm>
- www.dnr.state.sc.us/marine/pub/seascience/jellyfi.html
- www.masla.com/jellyfish.html
- <http://jellieszone.com/gelatinousanimal.htm>
- <http://danenet.wicup.org/mmsd-it/jellyfish.html>
- <http://www.aloha.com/~lifeguards/jellyfish.html>
- <http://www.nationalgeographic.com/ngkids/9608/jellyfish/>
- <http://dockwatch.disl.org/glossary.htm>
- http://library.thinkquest.org/C007974/2_1box.htm
- <http://www.vanaqua.org/education/aquafacts/jellyfish.html>
- <http://www.cnn.com/EARTH/9607/29/jellyfish/>
- www.ucmp.berkeley.edu/cnidaria/scyphozoa.html
- **Jellies** by Twig C. George. April, 2000.
- **Sea Jellies: From Corals to Jellyfish** by Sharon Sharth et al. March, 2002.
- **Jellyfish** by Elaine Landau. September, 1999.
- **Jellyfish Inside Out** by Michelle McKenzie. February, 2003.
- **Jellyfish Inside Out** by Judith L. Connor, Nora L. Deans, and Terry Tempest Williams. March, 2002.
- **Sea Jellies: Rainbows in the Sea** by Elizabeth Tayntor Gowell. February, 1993.
- **A Guide to the World of the Jellyfish** by Eileen Campbell. March, 1992.
- **Floating Jellyfish** by Kathleen Martin-James. May, 2001.
- **Jellyfish** by L. R. Taylor, Norbert Wu, and Leighton Taylor. March, 1998.
- **Jellyfish: Sea Life** by Sharon Sharth. January, 2001.
- **Jellyfish** by Carol K. Lindeen. July, 2004.
- **Jellyfish Blooms: Ecological and Societal Importance**. Proceedings of the International Conference on Jellyfish Blooms, Held in Gulf Shores, Alabama, 12-14 January 2000.
- **Jellyfish** by Mary K. Dornhoffer, Terrence E. Young Jr., Jan Jenner, and Linda D. Labbo. December, 2003.
- **Down in the Sea: The Jellyfish** by L. Patricia Kite. September, 1992.
- **Amazing Jellies: Jewels of the Sea** by Elizabeth Tayntor Gowell. April, 2004.
- **Jellyfish and Kin: Coelenterates of the Mid-Atlantic Coast** by Marion Glaspey. April, 1988.
- **Jellyfish to Insects: Projects With Biology** by William Hemsley. March, 1991.
- **Discovering Jellyfish** by Miranda MacQuitty. August, 1989.
- **Jellyfish: Animals With a Deadly Touch** by Eulalia Garcia, Gabriel Casadevall, and Ali Garousi. January, 1997.
- **A Jellyfish Is Not a Fish** by John Frederick Waters and Kazue Mizumura. October, 1979.
- **Floating Jellyfish** by Kathleen Martin-James. March, 2001.
- **Jellyfish** by Lynn M. Stone. June, 1993.
- **The World of a Jellyfish** by David Shale. 1987.

WHAT IS A JELLY?



You might be surprised to know that all these shapes are forms of the common moon jelly, *Aurelia aurita*.

What do you think of when you hear the word "jellyfish"?

Most people think of a squishy, clear blob that stings.

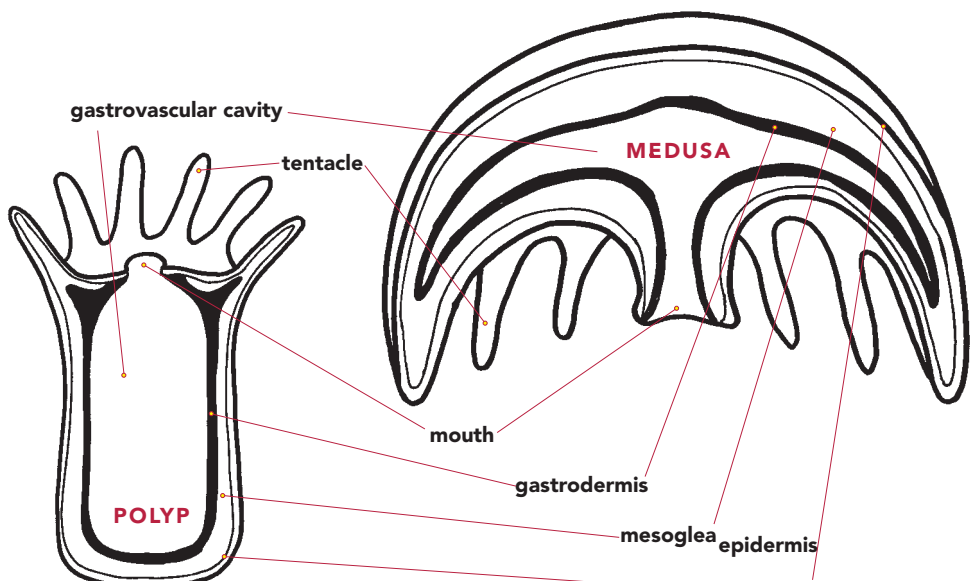
What shape comes to mind when you hear the word "jellyfish"?

Most people think of an umbrella or bell shape. In fact, not all jellies sting and they come in many shapes and sizes. Even the jellies with familiar bell-shaped medusae have complex life cycles that exhibit forms as different as a butterfly from a caterpillar.

General Characteristics

Jellies are classified into two groups (phyla), **cnidarians** (nī-dare'-ē-ahns) and **ctenophores** (teen'-ō-for'-ah). The common forms of cnidarians are the familiar, bell-shaped **medusa** and the cylindrical **polyp**. Ctenophores are usually spherical and smaller than a golf ball. Jellies consist of two or three layers of cells formed around a central opening that is fringed by tentacles. This arrangement of similar parts around a central axis is called **radial symmetry**. With this structure, no part of a jelly is ever far from the necessities: oxygen, nutrients and water.

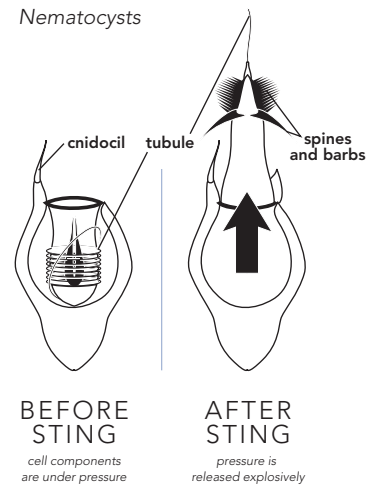
Jellies are 95% water by weight, which makes them fragile and transparent. Most move by pulsing. Despite the lack of a heart, brain and real eyes, they are effective predators. Many are planktonic, moving with the currents and capturing small prey such as crustaceans. Large jellies can even capture fish. Others stay put and use their tentacles to sting and engulf passing prey. The ctenophores don't sting, but instead capture prey with sticky tentacles. Most jellies can reproduce asexually through budding, or sexually.



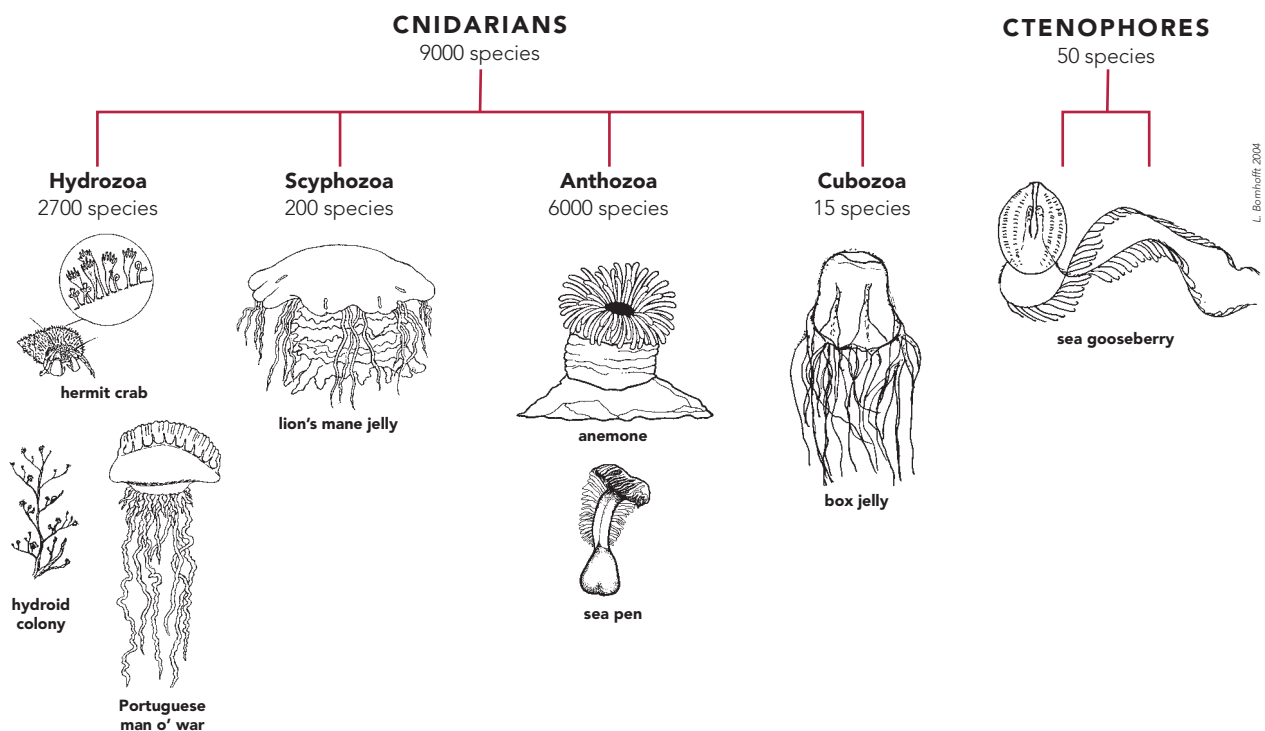
WHAT IS A JELLY? cont.

Cnidarians are best known for their **nematocysts**, specialized structures in certain cells that shoot out stinging threads for defense or to kill prey. Other features that help them function are simple nerve nets, contractile cells (instead of muscle cells), simple eyespots and receptors that respond to touch and chemicals. Cnidarians are generally divided into four classes: Hydrozoa, Scyphozoa, Anthozoa and Cubozoa.

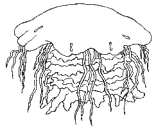
Hydrozoans include the Portuguese man o' war, freshwater hydra, fire coral (hydrocorals) and hydroids such as "snail fur," which is commonly found on shells occupied by hermit crabs. Most Hydrozoans are small and colonial, but many do have a distinctive medusa form as part of their life cycle. The Hydrozoan medusa is distinguished from that of Scyphozoans by its smaller size and by a shelf-like structure called a **vellum** along the inside edge of the bell. In colonial forms, the polyps bud, but stay attached and share continuous body layers. However, individual members of the colony can perform different tasks, such as capturing prey, digestion and reproduction. Hydroid colonies are frequently mistaken for seaweed because the small budding polyps form soft, branching structures. The Portuguese man o' war, on the other hand, is mistaken for a "jellyfish" because of its size and form. It is not a medusa, but a colony of specialized polyps, and some of those stinging polyps can be very painful.



The term "jellyfish" is most appropriately used to describe members of the class scyphozoa. However, it is not uncommon to hear the term used for any medusa in the phylum cnidaria.



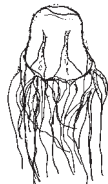
WHAT IS A JELLY? cont.



Scyphozoans are commonly known as “jellyfish” because the medusa is the dominant form in the life cycle. They include moon jellies, lion’s manes and sea nettles. Most Scyphozoans are marine animals that live in shallow water. Typically, the central layer, or **mesoglea**, is thick and large, giving them the characteristic jelly texture. They have long, frilly oral arms and circular gonads that are visible through the bell.



Anthozoa, the largest class of cnidarians, includes sea anemones, corals and seapens. Anthozoans do not have a medusa stage and can live as solitary individuals or in colonies. Though similar in overall shape to Hydrozoan polyps, they are usually much larger and have a significantly different internal structure. Some sea anemones can reach one meter across.



Cubozoans, or “box jellies,” resemble Scyphozoans at first glance. However, the umbrella of the Cubozoan medusa is a distinct cube shape and has four rubbery appendages to aid in swimming. This class is frequently represented by the infamous “sea wasp.” It can reach two meters in length, but is difficult to see because it is transparent. More than 70 people in Australian waters have received fatal stings from this jelly since the 1980s.



Ctenophores are commonly known as “comb jellies.” The name ctenophore is derived from the Greek work for “comb” and refers to the eight rows of comb plates that move in sequence along its body. Even when abundant, they are difficult to see due to their small size and transparency. Sea gooseberries and sea walnuts are representatives of this phylum. Like cnidarians, ctenophores are drifters that are made of thin tissues surrounding a gastric cavity. Unlike cnidarians, they are harmless. Instead of stinging, they capture food with specialized sticky cells.

Sources:

Ruppert, Edward E. and Robert D. Barnes, *Invertebrate Zoology, Sixth Edition*, Saunders College Publishing, 1994.

Luminescence is a spectacular characteristic exhibited by comb jellies. The light produced in the body wall emanates into the comb rows, creating the effect of neon lights. Cnidarians possess true muscle cells for movement. For the most part, they are hermaphrodites and can reproduce only sexually. They cannot replicate themselves by budding. Unlike cnidarians, they do not have a polyp stage.

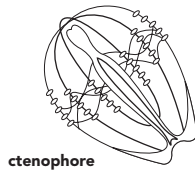


FACT SHEET

BLOBS OF GOO **Sea jellies are not just floating, stinging lumps of slime.**

Mistakenly called jellyfish, sea jellies are not fish at all. Jellies have no backbone, no brain, no heart, and are 95% water. Out of the water, they are shapeless gelatinous blobs often found on the beach after a rough storm. Underwater, however, they are beautiful, graceful swimmers.

FAMILY TREE



ctenophore

"Jellies" includes a huge spectrum of gelatinous zooplankton.

Most jellies are stinging cnidarians, but "jellies" also includes salps (more closely related to humans than to cnidaria) and ctenophores. Neither salps nor ctenophores sting. Anemones, corals and sea pens are also cnidarians, but unlike adult jellies, they do not have a free-swimming medusa life stage.

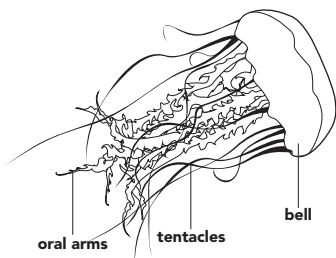
ANCIENT ANIMALS **Sea jellies have lived for millions of years.**

Fossils containing impressions of jellies have been found in 650-million-year-old rocks off the coasts of England, South Africa and Australia. Today, jellies live in all oceans and in some freshwater rivers and lakes.

EAT OR BE EATEN **Jellies are both predators and prey in the ocean food chain.**

They eat as they drift, catching plankton, fish eggs, larval fishes and invertebrates, and small shrimp-like animals. Some jellies also eat adult fishes and other jellies, while others supplement their diets with the products of photosynthesizing algae living in their tissues. As prey, jellies are a tasty meal for other animals, especially sea turtles.

TAKEOUT **Jellies eat on the go.**



Most use their tentacles to capture a meal, and then slowly pass the food toward their bell (or saucer-shaped body). If food is scarce, jellies have the unusual ability to shrink in size, requiring less food. When food is abundant, they can grow in size.

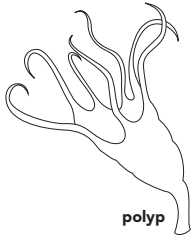
ON THE MOVE **Jellies travel in two ways.**

By simply riding the ocean's currents, a jelly can travel hundreds of miles. Most jellies can move themselves toward the sunlight, a food source, or the current, by using their pulsing swimming style.

BAD REPUTATION **Out of approximately 2,000 jelly species, only about 70 are known to be harmful to humans.**

The Portuguese man o' war is often feared. This jelly is actually a colony of animals working together to create the infamous floating creature. Swimmers can easily avoid the Portuguese man o' war's gas-filled float, but they might not see the 60 feet of stinging tentacles that trail behind. The sting from this jelly can be very painful, but is rarely fatal. The ocean's most dangerous jelly is the Australian sea wasp. Its sting can be deadly.

REPRODUCTION **The jelly's familiar bell shape is typically one stage in its complex life cycle.**



For example, moon jellies, which are common in Boston Harbor, spend part of their lives as tiny individual polyps attached to the ocean floor. The polyp can bud to produce more polyps or transform into a stack of tiny jelly saucers that break off to grow into the bell-shaped adult. The adult jellies then produce eggs that hatch and settle to the bottom to produce more polyps.

ENLIGHTENING **A jelly called *Aequorea* is especially interesting to scientists for its ability to emit light.**

This species contains proteins that glow when they come in contact with calcium. Because calcium plays an important role in human cell division, researchers studying cancer are using the glowing properties of *Aequorea* to successfully map calcium in a dividing cell.

SPACED OUT **In 1991, some 2,500 baby moon jellies were launched into space on the shuttle *Columbia*.**

These voyagers were then closely monitored to study what effect a weightless environment had on their swimming abilities. Scientists hope to learn how gravity influences development in jellies and higher animals, like humans.

TOO BIG TO BELIEVE **Sir Arthur Conan Doyle popularized the lion's mane jelly by making it the killer in one of his Sherlock Holmes mysteries.**

The lion's mane can grow to be one of the largest jellies in the world, reaching up to eight feet in diameter with tentacles up to 200 feet long. The lion's mane is a coastal jelly usually found near the water's surface. Lion's mane jellies can cause severe stings, but there have been rare reports that these stings are fatal.

THE MANY ROLES OF JELLIES

*Sea jellies have lived on earth for millions of years.
They can be found in all of the oceans of the world.*

Welcome to the world of goo, water and stinging cells. Meet a group of animals that are neighbors, beauties, adaptors, predators, survivors and opportunists—sea jellies.

- Jellies are key species in the ocean food web.
- Jellies are indicators of ocean health and are flourishing in disturbed systems, while other species are declining.
- Human activity is causing large changes in the ocean, and we can make choices that affect future ocean health.

JELLY FACT:

When a jelly dies, its whole body swiftly decays. The few jelly fossils that exist are jelly prints, not jelly parts. They are just impressions left in the sediment where a dead jelly settled.



JELLY FACT: **Upside-Down Jelly** *Cassiopea xamachana*

These jellies are often mistaken for sea anemones. Scientists have used the upside-down jelly to research the evolution of the Hox gene, which plays a role in human development of reproductive function.

JELLIES ARE NEIGHBORS

Jellies have seen the dawn of fishes, the extinction of dinosaurs, the ice ages and the arrival of humans.

Jellies have existed for millions of years, lived in all oceans of the world, inhabited some lakes and rivers, and rarely changed. Their lack of body structure has allowed them to live simply. These transparent floaters have long been mysterious and under-studied. However, we now realize that jellies can offer significant insights into the oceans.

The upside-down jelly (*Cassiopea xamachana*) inhabits tropical lagoons or mangroves and has developed a symbiotic relationship with algae. By living in shallow, sunny areas, the algae converts the sunlight into food for the jelly and the jelly provides the algae with a new home. The lagoon jelly (*Mastigias papua*) does this as well, but in a more aggressive manner. By following the sunrise and sunset, it minimizes the time spent in shady areas.

THE MANY ROLES OF JELLIES cont.

JELLIES ARE BEAUTIES

Jellies may be beautiful, but they've got bite. In addition to sharing fragile appearances, jellies seem to share huge appetites. Most are hungry predators of other zooplankton, krill, copepods, larval fishes and fish eggs. Jellies, except for ctenophores, move with the currents to sting prey. Their nematocysts (stinging cells) stun and kill prey. They then transfer food to their mouths by oral arms.

JELLIES ARE ADAPTORS

Seasonal jellies appear when the water is warm and die when it gets cold. Global warming causes water to warm earlier in the spring and stay warm further into fall. This allows jellies to begin feeding earlier in the season and continue feeding later. Warmer water also speeds up the jelly metabolism, causing them to reproduce faster.

JELLIES ARE PREDATORS

Although jellies are mostly water, they are a main food source for animals such as sea turtles (especially leatherbacks and loggerheads) and fish (salmon and ocean sunfish). In Japan, Korea and China, people dehydrate and eat jellies.

Rising jelly populations have caused problems in many ocean areas. Jellies consume fish eggs and larvae. Booming populations of jellies can affect regional fisheries because they often compete for the same food. A jelly's own survival is more certain when it has eaten its predator!

JELLIES ARE SURVIVORS

Pollution affects the health of the oceans and often causes the numbers of animal populations to decrease. So why are pollution and overfertilization not problems for hardy jellies? Fertilizer from lawns, farms, etc. runs into lakes, streams and eventually into the ocean, causing the presence of excess nutrients. Phytoplankton thrive on excess nutrients and grow rapidly, giving off oxygen. The phytoplankton eventually die and rot, using up oxygen in the water. This process is called eutrophication. Animals such as large fish, sea turtles and shrimp can escape, but others, such as larval fishes, mollusks and crabs cannot. Jellies live successfully in low-oxygen levels and feed on their stunned, oxygen-deprived prey.

(NON-) JELLY FACT: **Salps**

Salps are in the phylum chordata, which includes vertebrates. This makes them more closely related to humans than to jellies.

JELLY FACT: **Polyps and Ephyrae**

Two life cycle stages:

polyp: *next stage after the larva (fertilized egg) attaches to a surface and grows*

ephyra: *after the polyp splits into many flat segments and then falls off one at a time*

JELLY FACT: **Bittersweet Snack**

Sea turtles use their flippers to brush away the stinging cells of jellies once they've had a bite. But eating jellies can make their eyes swell from the stings.

JELLY FACTS: **Blue Blubber** **Catostylus mosaicus**

Often considered a Japanese and Chinese delicacy, it is described as crispy yet elastic. The blue color is a result of symbiotic algae living in the jelly. With no tentacles, the blue blubber pulses in a distinct, quick rhythm.

JELLY FACT: Invasion

By 2000, the total weight of the Black Sea's comb jellies was more than ten times the weight of all fish caught throughout the world in a year – Oearth, 2002.



**JELLY FACT: Atlantic Sea Nettle
Chrysaora quinquecirrha**

This jelly is native to the Gulf of Mexico. It feeds on comb jellies, larval crabs and zooplankton. Oyster fishermen are in favor of the nettles because comb jellies feed on oysters.

JELLIES ARE OPPORTUNISTS

It's good to be a jelly in the Gulf of Mexico. The populations of native jellies have increased in recent years. In addition, new species such as Australia's spotted jelly and the Caribbean's big pink jelly have moved in. These swarms have depleted the larval fish stocks and have made it difficult for fishermen to cast their nets.

The jellies also thrive because they can survive in the Dead Zone, an area encompassing 7,000 square miles of the Gulf of Mexico that becomes oxygen-depleted during the summer. Across the ocean, another area is affected by jellies, specifically comb jellies. Introduced into the Black Sea in the 1980s through ballast water, the comb jellies have survived free of competition. With no natural predators and voracious appetites, these ctenophores have caused the extinction of several commercial fisheries.

In 1997, a jelly that feeds on the comb jellies was introduced through ballast water into the Black Sea. The populations have decreased, but the ecological damage has already been done. The fishing industry has lost \$350 million and tourism has fallen.

YOU CAN HELP!

Fish decline while jellies thrive in unhealthy oceans.

Your choices can turn the tide. Whenever you use less electricity or gasoline, you are helping to stop global warming.

- **Use public transportation.**
- **Line dry your laundry when possible.**
- **Use a fan instead of air-conditioning.**

Overfishing threatens the population of jelly predators and changes the balance of ocean ecosystems.

- **Ask your supermarket to label where their fish is caught.**
- **Diversify. Choose a variety of sustainably harvested fish.**
- **Visit our website to learn more about sustainable fisheries:**
www.neaq.org/ecosound.

References:

- Anderson, J. and Bertrand, J.F., "NEAq Moon Jellies update," July 1994.
www.aquariumofpacific.org/CURRENT_EXHIBIT/Jellies/jellies_species_list.htm, viewed August 2003.
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www.mbayaq.org, viewed July 2003.
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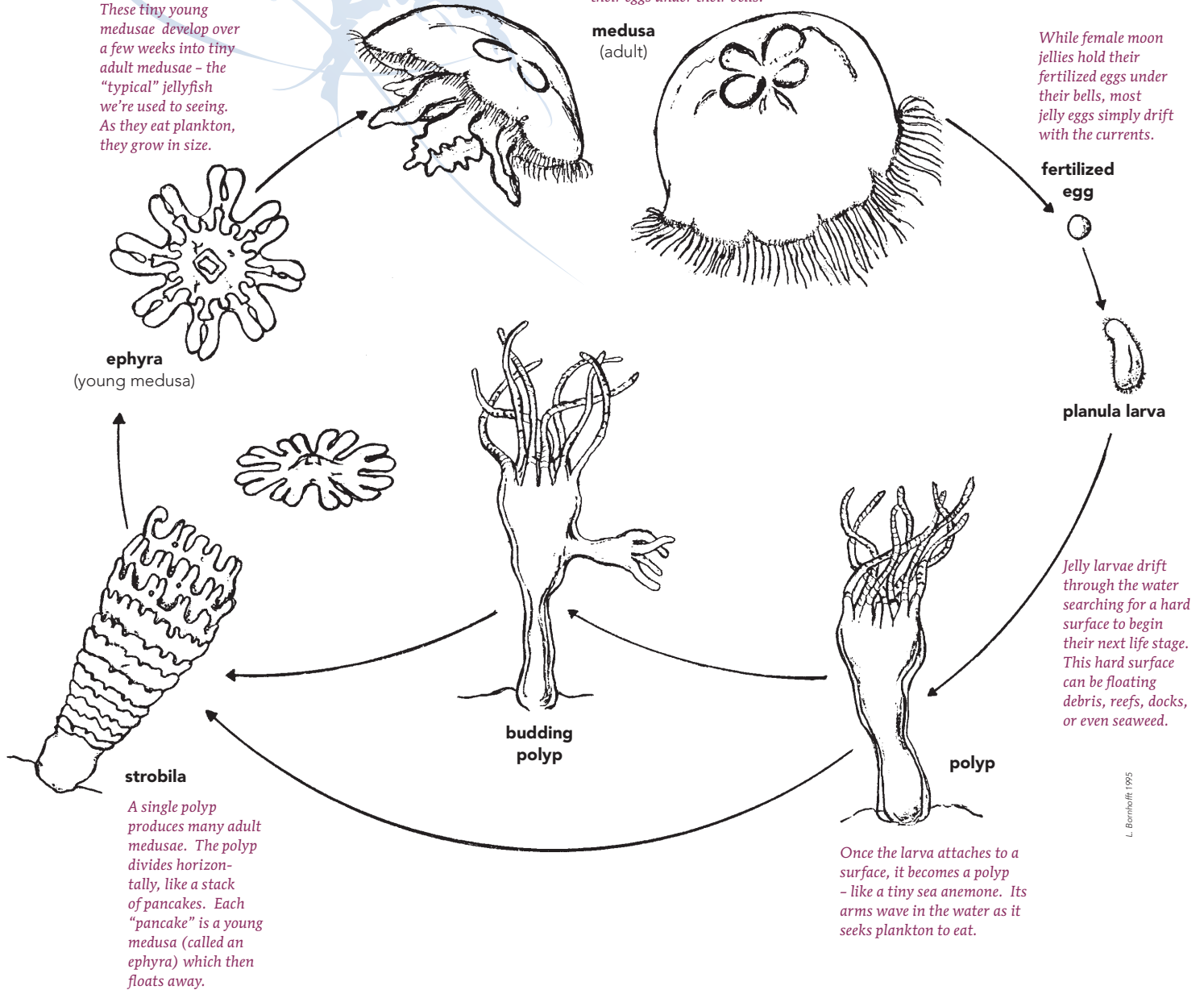
MEDUSA LIFE CYCLE

MOON JELLY *Aurelia aurita*

Male medusae release sperm into the water while female medusae of most jellies release eggs. Moon jelly females hold their eggs under their bells.

These tiny young medusae develop over a few weeks into tiny adult medusae - the "typical" jellyfish we're used to seeing. As they eat plankton, they grow in size.

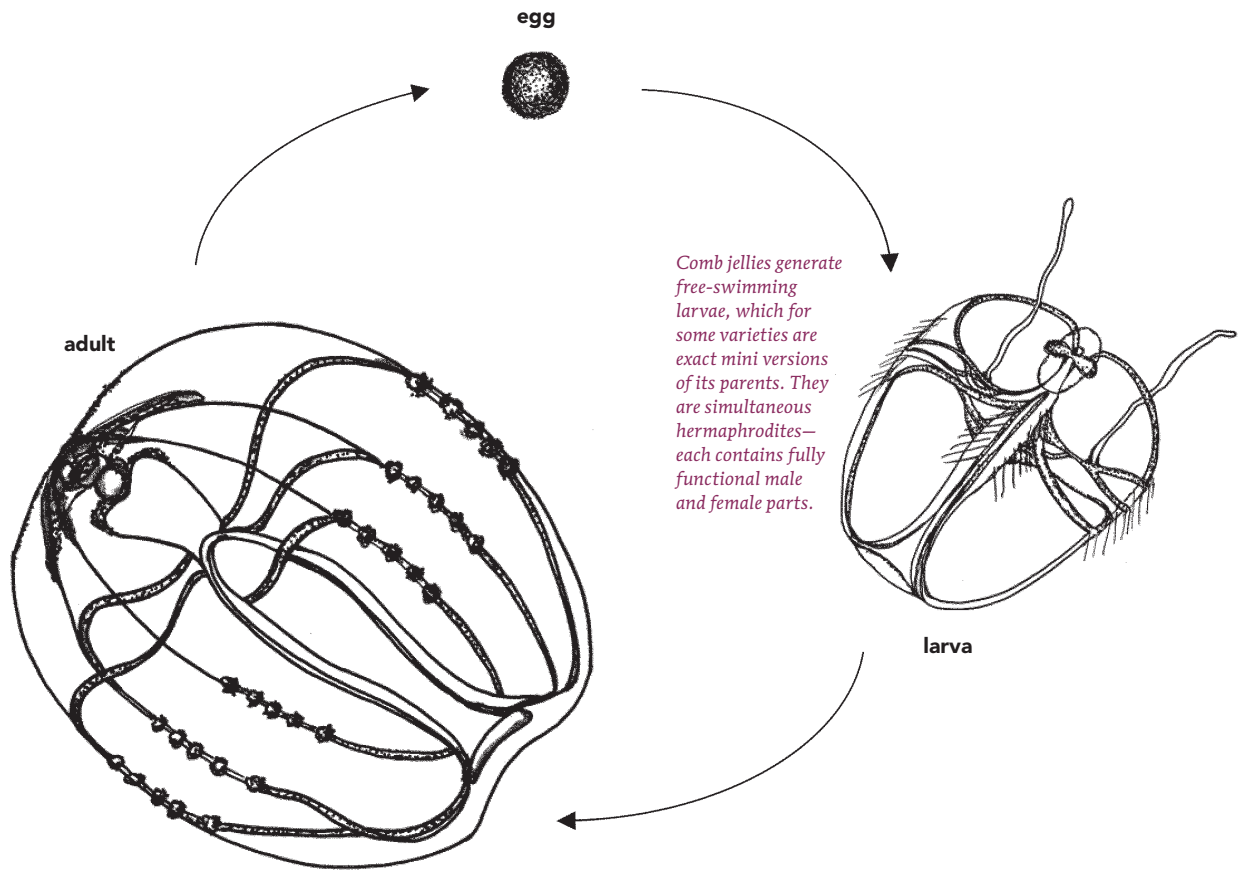
While female moon jellies hold their fertilized eggs under their bells, most jelly eggs simply drift with the currents.



L. Bernheft, 1995

COMB JELLY LIFE CYCLE

SEA WALNUT *Mnemiopsis leidyi*



ACTIVITY 1: **Size Reels** ♦ Grades 6-8

PURPOSE: To help students understand that jellies come in many different sizes.

KEY WORDS: bell, tentacles, diversity

MATERIALS:

- size cards
- measuring tape or ruler
- yarn/string
- scissors

DIRECTIONS:

Distribute the size cards to students. Depending on number of students, this activity can be done in pairs or in groups. Distribute measuring tape/rulers and the string. Students will measure the bell diameter and/or the length of their jelly's tentacles, cut the appropriate length of yarn/thread and tie it to the reel. Note and compare the lengths.

EXTENSION ACTIVITY:

Make a chart of sizes and compare.

ACTIVITY 2: **Shapes and Colors** ★ Grades PreK-5

PURPOSE: To introduce students to various shapes and colors displayed by different species of jellies.

KEY WORDS: diversity, cinquain

MATERIALS:

- photographs (can also use fact cards)

DIRECTIONS:

Display the photographs in the classroom on a board or distribute them to the students. Each student can choose one they like the most and describe it. Various possible activities include drawing and painting these jellies, looking for more information about them or creating a cinquain (five-line poem).

CINQUAIN RULES:

Line 1: one noun

Line 2: two adjectives describing the noun

Line 3: three verbs describing the action the noun performs

Line 4: a four to five-word phrase that describes the noun

Line 5: a noun that sums it all up

EXAMPLE:

*Jelly
Graceful, beautiful
Drifts, eats, stings
Indicators of our actions
Mystery*

ACTIVITY 3: **Jelly Fact Cards** ★ Grades PreK-5 ◆ Grades 6-8

PURPOSE: To familiarize students with interesting facts about jellies.

KEY WORDS: cnidaria, salps, ctenophores, predators, prey, polyps, bioluminescence

MATERIALS:

□ fact cards

DIRECTIONS:

The cards can be used in a variety of ways. They can be used to make a wall display or serve as a reading activity. Some games can be developed with these cards.

Example 1: The class can be divided into two groups. One group can randomly choose the cards and describe the features and other the group can try to identify the jellies.

Example 2: Students can select one special aspect of jellies and do more research. Suggested topics: bioluminescence, life cycle and development, anatomy and morphology, etc.

ACTIVITY 4: **Glow-in-the-Dark Jelly Puppets** ★ Grades PreK-5 ◆ Grades 6-8

PURPOSE: To familiarize students with the concept of bioluminescence in jellies.

KEY WORDS: bioluminescence

MATERIALS:

□ glow-in-the-dark jellies puppets

DIRECTIONS:

Expose the jellies puppets to light for few minutes and then observe them in the dark.

EXTENSION:

Research on other animals that use bioluminescence.

ACTIVITY 5: **Jelly Dominoes** ★ Grades PreK-5

PURPOSE: To familiarize students with the diversity of jellies.

KEY WORDS: diversity

MATERIALS:

□ jelly domino cards

DIRECTIONS:

The dominoes contain photographs of a variety of different jelly species. Dominoes can be laid out on a table (or floor). Students should then create matching pairs of the same image. There is no one correct way to lay out dominoes. Multiple patterns are possible. Students can match up photographs of the same species of jellies. This game can be played as a group activity with students taking turns, or as an individual activity.

ACTIVITY 6: Jelly Simulation ★ Grades PreK-5

PURPOSE: To provide a hands-on experience to children about how jellies feel.

KEY WORDS: ectoderm, endoderm, mesoglea

MATERIALS:

- gelatin
- zip-top plastic bags
- water
- refrigerator

DIRECTIONS:

Prepare the gelatin ahead of time. Follow directions on the gelatin package. Then, fill one plastic bag with the gelatin mixture (this simulates the ectoderm). Insert a second sandwich bag inside the first without allowing gelatin to enter (this simulates the endoderm). Attempt to evenly distribute the gelatin throughout first bag (this is the middle gelatinous layer).

The simulation can also be done as a demonstration so that all students can see that there are three layers to the jelly without the possibility of as much of a mess. One other option is to do the demonstration using the two sandwich bags and show the students the three layers. Then put an additional batch of gelatin in a plastic bag that can be passed around for students to feel.

ACTIVITY 7: Create Your Own Jelly ★ Grades PreK-5

PURPOSE: To familiarize students with different parts of the jelly anatomy.

KEY WORDS: bell, tentacles, oral arms

MATERIALS:

- coffee filters or paper plates
- ribbons
- crayons
- glue
- glitter
- elastic or yarn

DIRECTIONS:

Give each student one paper plate or coffee filter. Allow students to color the top of the paper plate. Have students mold plate around fist or another round object to create a bell-like shape. Allow students to choose from a sample of craft materials you have provided. Have students glue the chosen materials onto the sides and bottom of their plate to create tentacles and oral arms. Tell students to decorate the top of their plate with construction paper, glitter, etc. Attach elastic or yarn to the top of the jelly. (Elastic is preferable since it allows the jellies to move naturally.) Hang the completed jellies around the room to create a colorful "school" of jellies.

ACTIVITY 8: **Memory Game** ★ Grades PreK-5

PURPOSE: To familiarize students with the diversity of jellies.

KEY WORDS: diversity

MATERIALS:

- game boards
- cards

DIRECTIONS:

Make teams of two students. One student (student 1) gets the cards and the other (student 2) gets the card-key board. Student 1 should look through the cards for a few minutes and place them in any order he/she wishes, with the pictures facing down. Student 2 should then randomly pick a card (without revealing the picture to student 1), and describe it. Student 1 then guesses which jelly is being described, and the students can take turns guessing and describing, keeping count of the number of correct guesses each.

ACTIVITY 9: **Jelly Anatomy Puppets** ★ Grades PreK-5

PURPOSE: To familiarize students with different body parts of jellies.

KEY WORDS: bell, tentacles, oral arms, nematocysts

MATERIALS:

- jelly hand puppet

DIRECTIONS:

Use the puppets to explain jelly anatomy to the students, pointing out such parts as the bell, tentacles, oral arms and nematocysts, and explaining their functions.



ACTIVITY 10: Jelly Life Cycle Felt Board and Poster ★ Grades PreK-5 ◆ Grades 6-8

PURPOSE: To familiarize students with the different stages of the jelly life cycle

MATERIALS:

- felt board
- different stages of the jelly life cycle and arrows located in one of the clear plastic bags
- life cycle poster

DIRECTIONS:

Using the poster as a source of information, students may build a life cycle on the felt board.

ACTIVITY 11: **Food Chain and Food Pyramid** ♦ Grades 6-8

PURPOSE: To introduce students to the role jellies play in the ocean food web.

KEY WORDS: food chain, prey, predator, competition

MATERIALS:

□ 4 different sets of cards

HOW TO PLAY:

Ask each student to pick a card.

Depending on the color card they choose, make four groups:

- 1 Fish eggs
- 2 Jellies
- 3 Big fish (e.g. tuna, salmon, etc.)
- 4 Humans

Ask all students to move around in the classroom and imagine they are swimming, except those in the human group, which will pretend to be in a boat. Give a signal for food time by clapping or whistling. At that point, everyone is supposed to look for their food and catch it by holding hands.

DISCUSSION QUESTIONS:

- 1 Did you get your food?
- 2 Did your predator eat you before you found your prey?
- 3 What would you do to save yourself from the predators?
- 4 How do these animals protect themselves in nature?
- 5 Is there a chain formation in the classroom?
- 6 What will happen if one of the animal groups completely disappears?
- 7 In nature, is there competition for food?
- 8 What are some other examples of food chains?

EXPLANATION:

Jellies feed on zooplankton, krill, copepods, larval fishes and fish eggs. Although jellies are mostly water, they are a main food source for animals such as sea turtles and fish (salmon, tuna, ocean sunfish, etc.). These fish are caught for human consumption, and often, sea turtles are caught accidentally and die. Without as many sea turtles or fish, jellies are able to survive and reproduce.



ACTIVITY 12A: The Predator-Prey Relationship of Jellies

★ Grades PreK-5 ◆ Grades 6-8

PURPOSE: To give students a better understanding of jellies as both prey and predators.

KEYWORDS: predator, prey, food pyramid, competition for food

MATERIALS:

- 16 pieces of uncooked pasta (fish eggs)
- 8 small plastic cups (jellies)
- 4 larger plastic cups (fish or turtles)
- 2 boxes/containers that are large enough to cover the larger plastic cups (humans)

HOW TO PLAY:

Divide the class into four groups (if you do not have the exact number of students specified, divide them into this same proportion).

2 humans, which will get the big containers

4 fish or turtles, which will get large plastic cups

8 jellies, which will get small plastic cups

16 fish eggs, which will get the pasta

Ask the group to spread the fish eggs on the floor in the center of the classroom.

The jellies group then runs to “eat” the fish eggs (cover the pasta with small plastic cups). The fish/turtle group then runs to “eat” as many jellies as possible (cover small plastic cups with larger cups). Finally, the humans run to catch fish/turtles (cover the larger cups with the big containers).

DISCUSSION QUESTIONS:

- 1 What do we see in the center of the room?
- 2 Who were the prey and who were the predators?
- 3 Was it easy to get food?
- 4 What if one of the groups increased in number?
- 5 What if one of the groups completely disappeared?

EXPLANATION:

Jellies consume fish eggs and larvae. Most of them have huge appetites. Booming populations of jellies can affect regional fisheries because they often compete for the same food.

Comb jellies were introduced into the Black Sea in the 1980s through ballast water. With no natural predators and voracious appetites, these jellies have caused the extinction of several commercial fisheries. As prey, jellies play an important role in the food chain. They are a main food source for animals such as sea turtles (especially leatherbacks and loggerheads) and fish (salmon, tuna, ocean sunfish, etc.).

ACTIVITY 12B: The Predator-Prey Relationship of Jellies

★ Grades PreK-5 ◆ Grades 6-8

The same game can be played without materials. You need open space, such as an empty classroom or gym. For the fish eggs, use small pieces of paper, pebbles or pieces of crayons, etc. Place fish eggs in the center of the room. Divide students in three equal groups. Name the groups jellies, turtles and humans. Ask the groups to stand behind a border in a single line. Each group will stand on a different side of the room.

FIRST ROUND:

At the signal (clap or whistle), the jellies run toward the center and gather as many fish eggs as possible in five seconds. The jellies then have to run back and cross their safety border in five seconds, otherwise their prey eats them and they are out of the game. See how many got fish eggs. The jellies without fish eggs are also out of the game. (Explain that jellies can live without food for some time, but they would need to find some eventually, and that's why they are out of the game.)

SECOND ROUND:

Place the fish eggs back in the center. As in the first round, the jellies have five seconds to find fish eggs, but the turtles come in after three seconds. Jellies have to get their food and run to reach the safety border. Any jelly (before reaching the safety border) touched (and therefore caught) by the turtle goes with the turtles. The jellies that made it beyond the border without fish eggs as well as the turtles without jellies are out of the game. If two turtles have touched the same jelly, only one gets it and survives. (You can determine your own method for deciding which turtle, for example, by flipping a coin.)

THIRD ROUND:

Place the fish eggs in the center. Jellies have six seconds to get their fish eggs, and now the turtles come in after three seconds. Humans come in after five seconds. All of them have to get their food and escape from predators by reaching their respective safety borders.

DISCUSSION QUESTIONS:

- 1 How many got food and escaped the predators?
- 2 How many starved in order to protect themselves?
- 3 How many got food but were eaten up by their predators?
- 4 How many members should there be in each group so that everyone gets food?
- 5 How do different organisms compete for food and how do they survive in tough conditions?

EXPLANATION: See Activity 12A on page 27.

ACTIVITY 13: **Jellies In My Ocean (Tarp Game)** ★ Grades PreK-5 ◆ Grades 6-8

PURPOSE: To familiarize students with the concept of jellies as adaptors and the impact of human actions on the ocean ecosystem.

KEY WORDS: global warming, pollution, population, adaptation, ecosystem

MATERIALS:

- tarp
- dice
- cards
- beads (to act as jellies)

DIRECTIONS:

Spread the tarp on floor. Give students a bag of 10 beads (jellies) to start. At this point, tell them the ocean ecosystem is in balance. Students can stand on the start circle and throw the dice and move ahead the correct number of circles. The message on the corresponding number card will either remove or add jellies to the students' jelly bag. The students can play a single round by reaching the circle labeled "end" or play multiple rounds. Discuss the messages on the cards with them. Also discuss how an increase in jelly population can affect the fish population and the ocean ecosystem.