# Section 2: Inquiry Box A

## Customized lesson plan and specimen information

## *Table of Contents (Section 2)*

## *Welcome to the Beaty Box Inquiry A!*

This outreach kit is intended to provide you and your students with the opportunity to connect with the Beaty Biodiversity Museum's (BBM) unique biological collections. The Beaty Box contains touchable specimens and other scientific objects to stimulate inquiry and discussion within the classroom, enhancing the student learning experience.

### Theme

The theme for this Beaty Box is **inquiry**, with a focus on **sketching** and creating visual representations to record scientific observations. Under this theme, students can learn more about:

- The importance of sketching in the field of science
- The different types of techniques used when sketching natural history specimens
- Sketching as a way of identifying observable features of plants and animals

By the end of the lesson, your group should feel more comfortable with identifying scientific features of organisms and communicating these observations through sketching.

If sketching isn't right for your classroom, use the specimens to explore other concepts including conservation, taxonomy, evolution, recognizing local species, ecology and more! The lesson plan in this booklet focuses on sketching, but feel free to make your own.

### How can I integrate the Beaty Box into my curriculum?

- We encourage you to adapt the contents of the Beaty Box and its lesson plan to best fit your curriculum.
- Before you begin your lesson, please take the time to familiarize yourself with the contents of the Beaty Box.
    - Section 1 and 2 of this manual contains useful background information on each specimen.
    - It is highly encouraged that you convey information about these organisms (such as their habitat, behaviours, characteristics) to your group before or during the activity.
- Use the online resources that are referenced throughout the manual to help compliment your lessons.
    - For additional worksheets and activities, please visit the BBM website to view our Educator Resources.
- Show some videos of the Beaty Box organisms during the activity to help bring the specimens to life.
- If possible, consider taking your group to the BBM before or after using the Beaty Box to add to their biodiversity experience.

***Sketching Lesson Plan***

Sketching and close observation are ways of highlighting the biodiversity of living things. Processing and analyzing information by representing observations through drawing is a skill for all ages. In this section, we have included a suggested sketching lesson plan for your group. Please feel free to modify these activities to best suit your needs.
Some of the "big ideas" and core concepts this Beaty Box touches on are:

## Arts Education

- K-1: Develop processes and technical skills in a variety of art forms to nurture motivation, development, and imagination
- Arts Education 2: Develop processes and technical skills in a variety of art forms to refine artistic abilities, reflect on creative processes and make connections to other experiences
- Arts Education 3-5: Connect knowledge and skills from other areas of learning in planning, creating, and interpreting works of art
- Arts Education 6-7: Demonstrate an understanding and appreciation of personal, social, cultural, historical, and environmental contexts in relation to the arts; interpret creative works using knowledge and skills from various areas of learning
- Arts Education 8-12: A variety of content links can be explored during this program.

## Science Education

- Kindergarten: Plants and animals have observable features; daily and seasonal changes affect all living things
- Science 1: Living things have features and behaviours that help them survive in their environment
- Science 2: All things have a life cycle
- Science 3: Living things are diverse, can be grouped, and interact in their ecosystems.
- Science 4: All living things and their environment are interdependent
- Science 5: Multicellular organisms have organ systems that enable them to survive and interact within their environment
- Science 6: Multicellular organisms rely on internal systems to survive, reproduce, and interact with their environment
- Science 7: The theory of evolution by natural selection provides an explanation for the diversity and survival of living things
- Science 10: Genes are the foundation for the diversity of living things
- Biology 11: All organisms have characteristics that define them as living and interdependent. Life can be organized in a functional and structural hierarchy ranging from cells to the biosphere; living things are interdependent; living things are diverse and evolve over time
- Biology 12: Cells are the basic unit of life

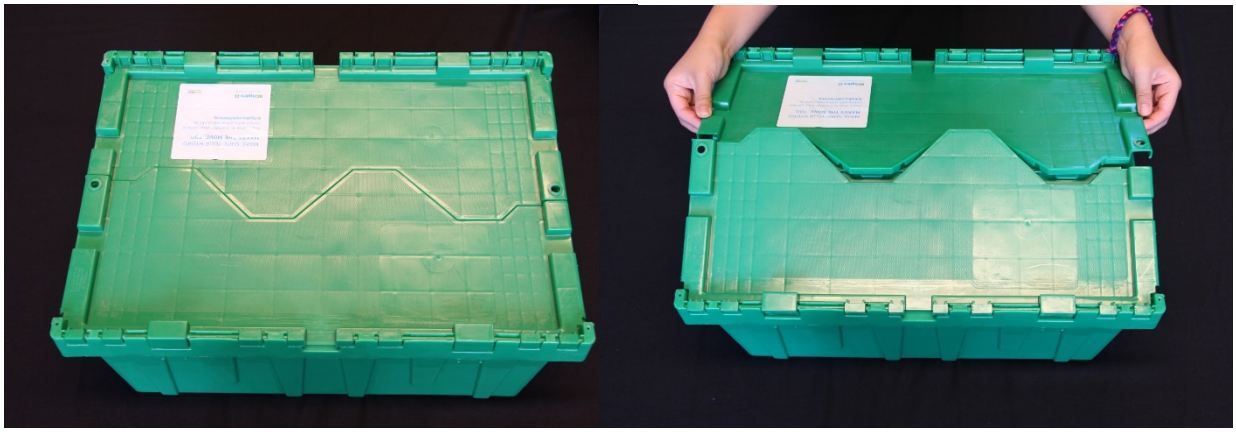
## *Photos: Unpacking Your Beaty Box*

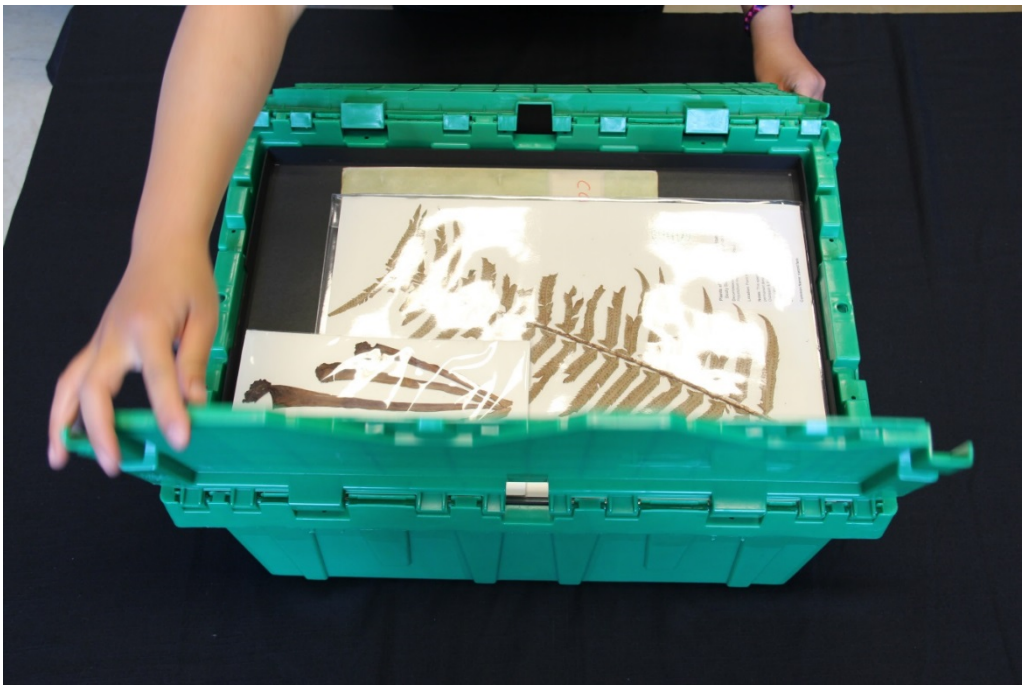
Don't rush! Plan to spend a few minutes unpacking the box. Clear at least one large table to use for Beaty Box specimens.

The Beaty Box contains four numbered layers of trays. Please remove one tray at a time, lifting by the black edges of the trays, using both hands for support. Individual boxes can then be removed from each tray.

*Note: the bottom layer is stuck to the inside of the box and is not intended to be removed.*

***Opening the box:***





***Tray 1:***

***Tray 2:***

***Tray 3:***

***Tray 4:***

Note: the bottom layer is stuck to the inside of the box and is not intended to be removed. Take out each specimen tray individually, using the edges of the trays.

## *Inquiry Box A Specimen List*

This information is also located on the flash cards included in the box.

| | | |
|---|---|---|
| **Herbarium** | **Specimen** | Pitcher Plant *(Sarracenia sp.)* |
| | **Image** |   Photo: flickr user wplynn, used through a creative commons license |
| | **Habitat** | *Native*; northeast BC to Newfoundland, eastern US<br>Wet environments such as bogs and swamps |
| | **Diet** | *Carnivore*; Small insects such as flies, ants, and mosquitoes |
| | **Description** | Pitcher plants often look like pitchers filled with water, but they can also mimic the appearance of flowers to attract food. Flies and other insects are lured into its cupped leaves and fall into a pitfall trap. These fallen insects become stuck in the plant's waxy fluids and are unable to climb back out, ultimately becoming food for the pitcher plant. |
| | **Safety & Handling** | Hold the top and bottom corners of the sheet with both hands for support. |
| | **Resources** | ***Sarracenia purpurea*** \| E-Flora BC<br>linnet.geog.ubc.ca/Atlas/Atlas.aspx?sciname=Sarracenia%20purpurea<br>**Sarracenia** \| Botanical Society of America<br>http://botany.org/Carnivorous_Plants/Sarracenia.php |

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| **Herbarium** | **Specimen** | Western Sword Fern *(Polystichum munitum)* |
| | **Image** |   Photo: flickr user Debbie Ballentine, used through a creative commons license |
| | **Habitat** | *Native*; coastal BC and northwestern coast of North America<br>Prefers moist and shady environments in the forest understory |
| | **Description** | These are the biggest evergreen ferns that grow naturally in the Vancouver area. They can grow up to 1.5 m tall (the size of a short adult). The leaves are called fronds and they grow from a central base. Each leaflet (individual pieces of the frond) is pointed, dark green and thick. Ferns do not produce flowers or fruits, but instead produce spores to make new plants. Spores are like a fine dust. Clusters of red-brown spores can be found on the undersides of the fronds, on the back of the leaflets. |
| | **Safety & Handling** | Hold the top and bottom corners of the sheet with both hands for support. |
| | **Resources** | ***Polystichum munitum*** \| E-Flora BC<br>linnet.geog.ubc.ca/Atlas/Atlas.aspx?sciname=Polystichum%20munitum<br>**Sword Fern, *Polystichum munitum*** \| Biodiversity of the Central Coast<br>www.centralcoastbiodiversity.org/sword-fern-bull-polystichum-munitum.html |

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| **Marine Invertebrates** | **Specimen** | Coquina Shells *(Donax variabilis)* |
| | **Image** |   Photo: flickr user lil'bear., used through a creative commons license |
| | **Habitat** | *Non-native;* native to the eastern coast of USA<br>Sandy beaches in the intertidal zone |
| | **Diet** | *Filter feeder*; phytoplankton, algae, detritus |
| | **Predators** | Fish, shore birds, crabs, humans |
| | **Description** | Coquinas rely on the waves to help them move up and down the beach. They use their muscular foot to bury themselves in the sand to prevent being washed away by strong waves. These filter feeders are a major food source for fishes, crabs, and birds. Because coquinas are highly sensitive to environmental changes, biologists often use them as an indicator species for beach habitat conditions. |
| | **Safety & Handling** | Do not open or shake the plastic containers. |
| | **Resources** | ***Donax variabilis* Information** \| Animal Diversity Web<br>animaldiversity.org/accounts/Donax_variabilis/<br><br>**Coquina clams** \| Florida Fish and Wildlife Conservation Commission<br>myfwc.com/research/saltwater/mollusc/other-molluscs/coquina-clams/ |

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| **Marine Invertebrates** | **Specimen** | Frilled Dog Whelk *(Nucella lamellosa)* |
| | **Image** |   Photo: Wikimedia commons user JoJan., used through a creative commons license |
| | **Habitat** | *Native;* coastal BC and western coast from Alaska to California Mussel beds and rocky shorelines in low to mid intertidal |
| | **Diet** | Barnacles, mussels, small bivalves |
| | **Predators** | Sea stars, gulls, crabs |
| | **Description** | Frilled dog whelks have a strong, spiral shell which varies in shape, size, colour, and texture. Most active at night, the whelks drill through their prey's shell with their tongue-like radula to rasp the exposed soft flesh. |
| | **Safety & Handling** | Do not open or shake the plastic containers. |
| | **Resources** | **Frilled dogwinkle, *Nucella lamelosa*** \| Biodiversity of the Central Coast www.centralcoastbiodiversity.org/frilled-dogwinkle-bull-nucella-lamellosa.html<br>***Nucella lamelosa*** \| Walla Walla University inverts.wallawalla.edu/Mollusca/Gastropoda/Prosobranchia/Order_Neogastropoda/Suborder_Rachiglossa/Family_Nucellidae/Nucella_lamellosa.html |

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| **Entomology** | **Specimen** | Butterfly Riker Mount<br>i. *Papilio philoxenus termessus*<br>ii. *Papilio photinus*<br>iii. *Callithea pastazza* |
| | **Image** |  |
| | **Habitat** | Wide range of habitats; prefer warm environments close to their food source |
| | **Diet** | Caterpillars eat leaves; adults sip nectar from flowers or juice from fruits |
| | **Predators** | Varies; examples include birds, snakes, rats |
| | **Description** | Butterflies are flying insects with coloured wings that vary from species to species. They go through a life cycle called complete metamorphosis. There are four stages in a butterfly's life cycle: egg, larvae (caterpillar), pupa (chrysalis), and butterfly. To avoid predators, some butterflies use camouflage to disguise themselves in their surroundings. Other species have also evolved to contain toxic chemicals in their bodies, with their bright colours serving as a warning to predators. |
| | **Resources** | **Basic Facts About Butterflies** \| Defenders of Wildlife<br>www.defenders.org/butterflies/basic-facts<br>**Growing Up Butterfly (VIDEO)** \| National Geographic Channel<br>natgeotv.com/ca/great-migrations/videos/growing-up-butterfly |

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| **Marine Invertebrates** | **Specimen** | Eccentric Sand Dollar (*Dendraster excentricus*) |
| | **Image** |   Photo: flickr user Pieter Edelman, used through a creative commons license |
| | **Habitat** | *Native;* coastal BC and western coast from Alaska to California<br>Sandy bottoms of sheltered bays |
| | **Diet** | Phytoplankton, crustacean larvae, algae, detritus |
| | **Predators** | Gulls, crabs, sea stars, fishes |
| | **Description** | Live sand dollars have a different appearance than their grey-white exoskeletons (called 'tests'). A live sand dollar is usually covered in delicate purple/black cilia-covered spines which help the sand dollar move and bring in food particles towards its mouth. The non-living, grey-white test shows the five-leaf petal-like flower pattern-shape on the top surface. People like to collect these tests when they wash up on the beach. Urchin tests are best left to break apart, recycling minerals back into the ocean for other marine life to use. |
| | **Resources** | **Sand dollar** \| Monterey Bay Aquarium<br>www.montereybayaquarium.org/animal-guide/invertebrates/sand-dollar<br><br>**Sand dollars** \| Oregon Coast Aquarium<br>aquarium.org/animals/sand-dollars/ |

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| **Fossils** | **Specimen** | Fossilized fern |
| | **Image** |   Photo: flickr user Timothy Allen, used through a creative commons license |
| | **Description** | This is a small fossil of what was most likely an ancient fern. While we do not know when or where this particular specimen was found, the fossil record suggests that ferns began to appear on Earth approximately 300 million years ago. The earliest types of fern are now extinct and scientists believe the current families and species we see today appeared about 145 million years ago. |
| | **Safety & Handling** | This fossil is quite fragile, so handle carefully by using one or two fingers to touch. |

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| **Marine Invertebrates** | **Specimen** | Sponge (*Porifera, Demospongiae*) |
| | **Image** |   Photo: flickr user Richard Ling, used through a creative commons license |
| | **Habitat** | *Native;* wide range of habitats worldwide<br>Mostly in marine environments, but some sponges have been found in freshwater |
| | **Diet** | *Filter feeder;* plankton, bacteria, other organic particles |
| | **Predators** | Some species of fish, sea slugs, Hawksbill sea turtle |
| | **Description** | Sponges are among the simplest and oldest multi-cellular organisms on the planet. Approximately 95% of all living sponges are in the class Demospongiae. Demosponges, like bath sponges, have a spongy skeleton made of protein fibres. The collar cells (choanocytes) of the sponges pump water through tiny pores and channels in the outer walls to filter out plankton and bacteria. Waste materials are passed through channels in the inner walls and out through the central top opening (osculum). |
| | **Safety & Handling** | Touch gently with one or two fingers, rather than squeezing or picking apart the specimen. |
| | **Resources** | **Porifera Information** \| Animal Diversity Web<br>animaldiversity.org/accounts/Porifera/<br><br>**About Sponges** \| Tree of Life Web Project<br>tolweb.org/treehouses/?treehouse_id=3431 |

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| **Entomology** | **Specimen** | Locust (*Acrididae*) |
| | **Image** |  Photo: flickr user Kumon, used through a creative commons license  |
| | **Habitat** | *Non-native*; Wide range of tropical habitats such as plains regions, deserts, seashores; none in BC |
| | **Diet** | *Herbivores*; grass, grains |
| | **Predators** | Varies; examples include beetles, birds, and small mammals |
| | **Description** | Locusts "sing" a humming sound by rubbing their legs and wings together against their body. Locusts can sometimes gather in swarms, which looks like giant black clouds filled with billions of insects. There are currently no locusts found in B.C. since we don't have the long, warm summers that some of these grasshoppers require (although rising temperatures could soon create locust swarms in the future). |
| | **Resources** | **Locusts** \| National Geographic animals.nationalgeographic.com/animals/bugs/locust/ |

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| **Tetrapods** | **Specimen** | Varied thrush (*Ixoreus naevius*) |
| | **Image** |   Photo: flickr user Eleanor Briscetti, used through a creative commons license |
| | **Habitat** | *Native*; found in the Pacific Northwest from Alaska to N. California Damp, shaded old growth coniferous forests and forested urban areas |
| | **Diet** | *Omnivore*; Arthropods, berries, nuts |
| | **Predators** | Cats, crows, raptors |
| | **Description** | This shy bird is known for its ringing song and its distinct striped feathers. Thrushes like to forage the ground for food, then fly up to a perch to search for other foraging sites. Males like to fly to the tops of trees to sing their unique song while hiding in the foliage. Varied thrushes eat insects in the summer, and then usually migrate south in the winter to feed on seeds and berries. |
| | **Safety & Handling** | Stroke the feathers in the direction of the tail using the pinky finger rule. |
| | **Resources** | **Varied thrush** \| Vancouver Avian Research Centre www.birdvancouver.com/b_varied_thrush.html<br>**Varied Thrush** \| Cornell Lab of Ornithology www.allaboutbirds.org/guide/Varied_Thrush/lifehistory |

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| **Tetrapods** | **Specimen** | Mallard *(Anas platyrhynchos)* |
| | **Image** |  <br>Photo: flickr user Derek Keats, used through a creative commons license |
| | **Habitat** | *Native*; breeds throughout Canada and migrates south to southern US and Mexico for the winter; usually found in and around water |
| | **Diet** | *Omnivore*; Aquatic plants, arthropods, mollusks, worms, seeds, grains |
| | **Predators** | Humans, crows, raptors, snakes, raccoons, turtles, foxes, coyotes |
| | **Description** | Mallards are large, web-footed dabbling ducks. On water, they feed at the surface amongst the shore vegetation by tipping their head under water. They will also graze on land. Males have glossy green heads, chestnut-brown chests and bright yellow bills. They adopt female plumage during a period of the year when they cannot fly (due to flight feather renewal). Females are mottled brown with a dull orange and black bill. |
| | **Safety & Handling** | Stroke the feathers in the direction of the tail using the pinky finger rule. |
| | **Resources** | **Mallard** \| Boreal Songbird Initiatives<br>www.borealbirds.org/bird/mallard<br><br>**Mallard** \| Cornell Lab of Ornithology<br>www.allaboutbirds.org/guide/Mallard/ |

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| **Tetrapods** | **Specimen** | Eastern grey squirrel *(Sciurus carolinensis)* |
| | **Image** |   Photo: flickr user grendelkhan., used through a creative commons license |
| | **Habitat** | *Invasive*; native to central and eastern North America, but has been introduced into BC and other parts of western North America<br>Prefer mature mixed forests with an abundance of trees throughout the year. They build dreys, a round nest made of twigs and leaves, or they use natural hollows or woodpecker holes as dens. |
| | **Description** | The majority of Eastern grey squirrels found in Vancouver are black, while those found in their native range tend to have grey colouration. They build dreys, a round nest made of twigs and leaves, or they use natural hollows or woodpecker holes as dens. These squirrels are mainly herbivores, eating seeds mainly from oak, maple, ash, and elm trees. In the warmer months, the Eastern grey squirrel may eat the buds, flowers, and leaves of plants, and sometimes eggs and young birds. |
| | **Safety & Handling** | Pet in the direction of the squirrel's fur using the pinky finger rule. For skeleton boxes, do not shake or flip upside down. Do not open the container. |
| | **Resources** | **Eastern Grey Squirrel** \| Invasive Species Council of British Columbia bcinvasives.ca/invasive-species/identify/invasive-species/invasive-animals/eastern-grey-squirrel/<br>***Sciurus carolinensis*** \| Garry Oak Ecosystems Recovery Team www.goert.ca/documents/InvFS_sciucaro.pdf |

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| **Herbarium** | **Specimen** | Eucalyptus seed pod |
| | **Image** |   Photo: flickr user Matt Mets, used through a creative commons license |
| | **Habitat** | *Non-native*; mostly native to Australia, some species of *Eucalyptus* are found in BC; generally found in tall, open forests |
| | **Description** | Eucalyptus trees (also known as gum trees) develop hard, woody seed pods after flowering. The size and shape of these seed pods correspond to the particular species of Eucalyptus trees. This plant is also often grown as ornamental garden plants. Koalas are able to eat Eucalyptus leaves, unlike North American animals that are not adapted to its toxins. As such, there is very little diversity of Eucalyptus stands in North America. |
| | **Resources** | **Eucalyptus trees** \| BBC Nature<br>www.bbc.co.uk/nature/life/Eucalyptus<br>**Eucalypus, Corymbia, and Angophora** \| ANPSA Plant Guide<br>http://anpsa.org.au/eucal1a.html |

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| **Marine Invertebrates** | **Specimen** | Zigzag Scallop (*Euvola ziczac*) |
| | **Image** |   Photo: flickr user James St. John, used through a creative commons license |
| | **Habitat** | *Non-native;* North Carolina to Florida, Bermuda, and the West Indies<br>Shallow waters near the shore, sandy areas |
| | **Diet** | *Filter feeder*; plankton, organic matter |
| | **Predators** | Sea stars, crabs, lobsters, octopuses, sea anemones, gastropods, humans |
| | **Description** | Zigzag scallops have bright blue eyes called "ocelli" on the edge of their mantle. These light-sensitive ocelli signal the scallop to close its shell once it detects shadows or disturbances that make it feel threatened. When extremely disturbed, scallops will repeatedly clap and shoot water out of their shells in a jetting motion, allowing them to move via jet propulsion to escape from predators. The popularity of zigzag scallops in the global seafood industry has recently raised concerns about overfishing. |
| | **Resources** | **Bermuda Sand Scallop/Zigzag Scallop** \| Marine Invertebrates of Bermuda<br>www.thecephalopodpage.org/MarineInvertebrateZoology/Euvolaziczac.html |

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| **Marine Invertebrates** | **Specimen** | Common Crown Conch (*Melongena corona*) |
| | **Image** |  Photo: flickr user Kathy, used through a creative commons license  |
| | **Habitat** | *Non-native;* found along the Atlantic coast (Florida to NE Mexico) Shallow, muddy water habitats and intertidal oyster reefs |
| | **Diet** | *Carnivore;* oysters, clams, carrion (dead flesh of animals) |
| | **Predators** | Murexes and conchs (cannibalism) |
| | **Description** | The common or Florida Crown Conchs have glossy shells of brownish-grey to purple with white to yellow-white spiral bands. It has vertical-curved white spines on the shoulder of each whorl that gives it the appearance of a crown. Crown conchs are highly variable in size, colouration and architecture. |
| | **Safety & Handling** | Do not open or shake the plastic containers. |
| | **Resources** | **Melongena corona** \| Smithsonian Marine Station at Fort Pierce www.sms.si.edu/irlspec/Melongena_corona.htm<br>***Melongenidae* (Melon & Crown Conchs)** \| Natural History Museum at University of Washington Tri-Cities shells.tricity.wsu.edu/ArcherdShellCollection/Gastropoda/Melongenidae.html |

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| **Marine Invertebrates** | **Specimen** | Stony or Hard Coral (*Cnidaria, Anthozoa*) |
| | **Image** |   Photo: flickr user Ladymaggic, used through a creative commons license |
| | **Habitat** | Clear, tropical oceans around the world; they live close to the surface so they can be exposed to the sun |
| | **Diet** | Varies; some corals have algae that use energy from the sun to make their own food (photosynthesis), others feed on zooplankton and smaller animals, some do both |
| | **Predators** | Parrotfish |
| | **Description** | Stony corals have a hard skeleton made up of calcium carbonate (similar to limestone). The skeleton is secreted by tiny animals called polyps to protect their soft bodies. Coral polys are related to sea anemones and have tentacles that surround the mouth. The tentacles have stinging cells that are used to catch small organisms like plankton or fish. Some corals have algae living inside their tissues to make food. Thousands of these polyps can form colonies that build large coral reefs. Coral reefs – highly sensitive to climatic change – are some of the most important and diverse ecosystems in the world. |
| | **Resources** | **Coral Reef** \| Kids Do Ecology<br>kids.nceas.ucsb.edu/biomes/coralreef.html<br><br>**Coral Reef** \| Defenders of Wildlife<br>www.defenders.org/coral-reef/basic-facts |

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| **Herbarium** | **Specimen** | Douglas Fir Cones & Bark (*Pseudotsuga menziesii)* |
| | **Image** |   Photo: Wikimedia commons user Walter Siegmund, used through a creative commons license |
| | **Habitat** | *Native*; southern BC and western coast of North America<br>Rocky Mountain Douglas fir can be found in cold, mountainous regions; coastal Douglas fir prefer moist, mild climates |
| | **Description** | This tree is the second tallest coniferous tree in the world. It can reach up to 120 m in height (as high as some skyscrapers). These conifers have flat needles arranged all around their twigs. The needles are about as long as a paper clip. Conifers do not produce flowers or fruit, but cones to house the seeds. Squirrels, chipmunks, mice, and other animals eat the seeds, while bears eat the sap. |
| | **Resources** | ***Pseudotsuga menziesii*** \| E-Flora BC<br>linnet.geog.ubc.ca/Atlas/Atlas.aspx?sciname=Pseudotsuga%20menziesii<br>**Douglas-fir** \| Ministry of Forests, Province of British Columbia<br>www.for.gov.bc.ca/hfd/library/documents/treebook/douglasfir.htm |

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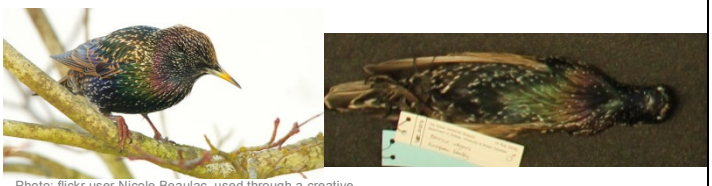
| **Tetrapods** | **Specimen** | European starling *(Sturnus vulgaris)* |
| | **Image** |  <br>Photo: flickr user Nicole Beaulac, used through a creative commons license |
| | **Habitat** | *Invasive*; found throughout North America from Alaska to northern Mexico<br>Nest in nestboxes, tree holes and crevices, and corners/holes in buildings |
| | **Diet** | *Omnivore*; Insects, fruits (including berries), seeds, grains |
| | **Predators** | Cats, raptors, crows |
| | **Description** | This European bird was first brought over to New York's Central Park in 1890 by a Shakespeare enthusiast who wanted to introduce all of the birds in Shakespeare's work to North America. European starlings are excellent sound mimics, including the calls of eagles and hawks. They are an invasive species due to their aggressive competition with native birds for space and food. Starlings are also agricultural pests that damage farmers' crops and berries. |
| | **Safety & Handling** | Stroke the feathers in the direction of the tail using the pinky finger rule. |
| | **Resources** | **European Starling** \| Living With Wildlife in BC<br>www.bcwgc.org/file/144/download?token=lr-k5Xix<br>**European Starling** \| Cornell Lab of Ornithology<br>www.allaboutbirds.org/guide/European_Starling/lifehistory |

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| **Herbarium** | **Specimen** | Forest floor sample |
| | **Image** |   <br>Photo: flickr user NatureServe, used through a creative commons license |
| | **Description** | This sample generally consists of moss, along with smaller plant organisms, from the floor of an old-growth forest. |
| | **Safety & Handling** | Do not pick the specimen apart; handle gently to ensure that the moss does not break. |

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| **Marine Invertebrates** | **Specimen** | Barnacles on Rock (*Balanus glandula)* |
| | **Image** |   Photo: flickr user tommysloancamp, used through a creative commons license |
| | **Habitat** | *Native;* along the coast of BC<br>High and mid-intertidal, attached to rock or other hard surfaces |
| | **Diet** | *Filter feeder;* plankton, detritus |
| | **Predators** | Whelks, sea slugs, limpets, sea stars, crabs, ribbon worms, fishes |
| | **Description** | Barnacles are crustaceans (related to crabs and shrimps) that look like tiny shrimp during their larval stage. Once they are ready to grow up, the larvae "glue" themselves head-first onto hard surfaces like rocks, docks, or ships. The barnacles then secrete a volcano-shaped casing around themselves for protection, closed by double doors at the top. When the tide comes in, the double trapdoors open so the feathery legs can filter food such as plankton or detritus. When the tide goes out, the double trapdoors close tightly to conserve moisture. |
| | **Resources** | **Acorn Barnacle** \| Monterey Bay Aquarium<br>www.montereybayaquarium.org/animal-guide/invertebrates/acorn-barnacle<br>**Barnacles** \| Woods Whole Oceanographic Institution<br>www.whoi.edu/science/B/people/kamaral/Barnacles.html |

| | | |
|---|---|---|
| **Tetrapods** | **Specimen** | Chipmunk *(Tamias sp.)* |
| | **Image** |   Photo: flickr user Melody Lytle., used through a creative commons license |
| | **Habitat** | *Native*; found throughout North America from Alaska to northern Mexico<br>Found in deciduous forest areas with burrows, rocks, logs, and plenty of hiding spots to shield them from predators |
| | **Diet** | *Omnivore*; acorns, nuts, seeds, fruits, berries, insects, mushrooms |
| | **Predators** | Owls, coyotes, hawks, foxes, snakes |
| | **Description** | Chipmunks (often mistaken for striped ground squirrels) are members of the squirrel family, easily recognized by their facial markings and the light and dark stripes along their back. They like to dig burrows where they can spend their winter underground. Their good hearing and vision is also helpful when trying to escape from predators. Chipmunks are able to store lots of food in their enormous cheek pouches, which can stretch to three times the size of their head! |
| | **Safety & Handling** | Pet in the direction of the chipmunk's fur using the pinky finger rule. For the skeleton box, do not shake or flip upside down. Do not open the container. |
| | **Resources** | **Eastern chipmunk Facts Sheet** \| Canadian Geographic Kids!<br>www.canadiangeographic.ca/kids/animal-facts/eastern_chipmunk.asp<br>**Chipmunk** \| Canadian Wildlife Federation<br>cwf-fcf.org/en/discover-wildlife/flora-fauna/fauna/mammals/chipmunks.html |

| | | |
|---|---|---|
| **Tetrapods** | **Specimen** | Lynx skull w/ ear cartilage (*Lynx canadensis)* |
| | **Image** |   Photo: flickr user Art G., used through a creative commons license |
| | **Habitat** | *Native*; found across Canada and Alaska<br>Generally live in boreal forests, but can also be found in open forests, rocky areas, and tundra |
| | **Diet** | *Carnivore*; snowshoe hares, red squirrels, mice, voles, birds |
| | **Predators** | Humans, cougars, wolves |
| | **Description** | Lynx have thick winter coats with large feet to let them run on deep snow. Like other cats, lynx scent-mark their territories and possess excellent hearing and vision for hunting. Canadian lynx are strictly carnivorous animals that like to hunt at night. They prey on small mammals and birds, but are particularly dependent on snowshoe hares for their diet. Predators of the lynx include cougars, wolves, and humans that hunt them for their fur. |
| | **Resources** | **Basic Facts About Canada Lynx \|** Defenders of Wildlife<br>www.defenders.org/canada-lynx/basic-facts<br><br>**Canada Lynx Facts Sheet** \| Canadian Geographic Kids!<br>www.canadiangeographic.ca/kids/animal-facts/canada_lynx.asp |
| | **Safety & Handling** | The bones (especially around the ear cartilage) are fragile, so touch them gently with one or two fingers during interaction. |

## *Sketching Lesson Plan*

### Learning Objectives

After this lesson, students should be able to:

- Identify the biodiversity of living things in the natural world
- Recognize the observable features of plants and animals
- Communicate observations and ideas by drawing and by using oral or written language
- Communicate through the arts using new artistic techniques and perspectives

### Big Ideas & Concepts

***Arts Education***

- K-1: Develop processes and technical skills in a variety of art forms to nurture motivation, development, and imagination
- Arts Education 2: Develop processes and technical skills in a variety of art forms to refine artistic abilities, reflect on creative processes and make connections to other experiences
- Arts Education 3-5: Connect knowledge and skills from other areas of learning in planning, creating, and interpreting works for art
- Arts Education 6-7: Demonstrate an understanding and appreciation of personal, social, cultural, historical, and environmental contexts in relation to the arts; interpret creative works using knowledge and skills from various areas of learning
- Arts Education 8-12: A variety of content links can be explored during this program.

***Science Education***

- Kindergarten: Plants and animals have observable features; daily and seasonal changes affect all living things
- Science 1: Living things have features and behaviours that help them survive in their environment
- Science 2: All things have a life cycle
- Science 3: Living things are diverse, can be grouped, and interact in their ecosystems.
- Science 4: All living things and their environment are interdependent
- Science 5: Multicellular organisms have organ systems that enable them to survive and interact within their environment
- Science 6: Multicellular organisms rely on internal systems to survive, reproduce, and interact with their environment
- Science 7: The theory of evolution by natural selection provides an explanation for the diversity and survival of living things
- Science 10: Genes are the foundation for the diversity of living things
- Biology 11: All organisms have characteristics that define them as living and interdependent. Life can be organized in a functional and structural hierarchy ranging from cells to the biosphere; living things are interdependent; living things are diverse and evolve over time
- Biology 12: Cells are the basic unit of life

## Materials & Supplies

The Beaty Box provides a range of organisms for your class to sketch. Additional suggested supplies (not included in the Beaty Box) may include:

- Pencils
    - Optional: different hardness/softness: H through B, charcoal pencils
- Paper
    - Optional: different weights, colours, and textures
- Sharpeners
- Erasers
- Whiteboard and markers or chalkboard and chalk
- Optional: coloured pencils, crayons, or pastels
- Optional: hand lenses
- Optional: an iPad or similar technology to show videos of the organisms in real life

## ACTIVITY: Sketching

***Distributing Beaty Box specimens***

- Decide on your classroom layout. We suggest enough tables or clusters of desks to seat 4-6 students. Specimens can be moved to different stations throughout the activity. Alternatively, you may have one large table with all of the specimens.
- Lay out all of the Beaty Box specimens on the tables before the students come in.
    - Once the group arrives, give them some time to observe the specimens without touching them. After the group has finished their brief observation, you may proceed with the lesson.
    - This ensures that the specimens do not distract students during your introductory discussion.
- You may also choose to hand out specimens after you have completed the introduction portion of the lesson.
    - In this case, introduce the Beaty Box specimens and review the specimen handling procedures while you distribute the specimens to each table.
- In both cases, please ensure that students do not touch the specimens until after you have reviewed specimen handling.

*Introduction*

1. **Introduce the Beaty Box specimens:**
    - Point to some of the specimens laid out on the tables. What organism do you think this is? Have any of you seen this before?
    - Give some background information on the specimens (cool facts, what they eat, where they are found, videos of this organism, etc.)
    - You may also choose to continue talking about the specimens during or after the sketching activity

2. **Review the specimen handling procedures with your group (refer to Section 1 of this manual):**
    - Before we begin sketching, it's important for us to know how to handle specimens.
    - What are specimens? Why is it important to take care of them?
    - Physically demonstrate how to handle the specimens in front of the class. Students are encouraged to practice touching the organisms using the 'pinky finger rule'. Have them practice using their pinkies to "pet" their own hands, and then transfer this technique over to a real specimen.
    - Discuss the differences in handling furry/feathery specimens, plants, shells, etc.

3. **Discuss the concept of biodiversity**:
    - We are sketching biodiversity today. What does biodiversity mean to you? How can you describe it?
    - Brainstorm ideas and the names of different creatures in your environment.
    - Come up with a class definition for biodiversity. Ensure it includes words that reflect "life" and "variety"

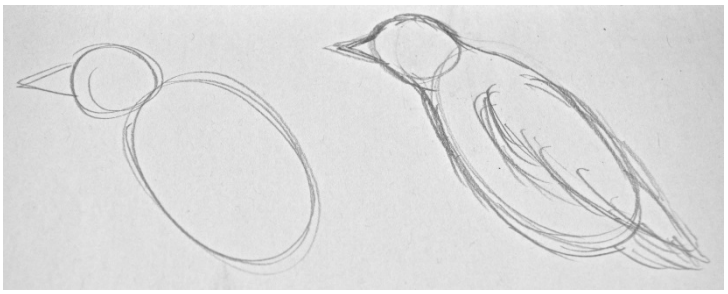
4. **Discuss the importance of sketching:**
    - What is sketching? What are the purposes of sketching? (Brainstorm ideas and talk about techniques)
    - What is *artistic sketching* vs. *scientific drawing*? Why do you think scientists sketch? Artistic drawings are more flexible and may include scenery and things that you aren't looking at – for example, a locust drawn into a field. A scientific drawing reflects exactly what you are looking at – for example, if a locust is missing a leg, you don't draw it.
    - Even though they collected specimens, scientists needed to sketch the organisms they saw in order to give detail and meaning to their research. In the past centuries, photographs weren't an option.
    - It's also often hard to take photos of tiny parts of organisms – by drawing these parts while you observe them under a microscope, you can capture the detail much better.
    - Drawings are also used in scientific papers (see example below of spider parts in Dr. Maddison's spider ID papers). These drawings show the reader exactly what he is talking about!

**Dr. Wayne Maddison's spider sketches.**
See Appendix 1 for larger image

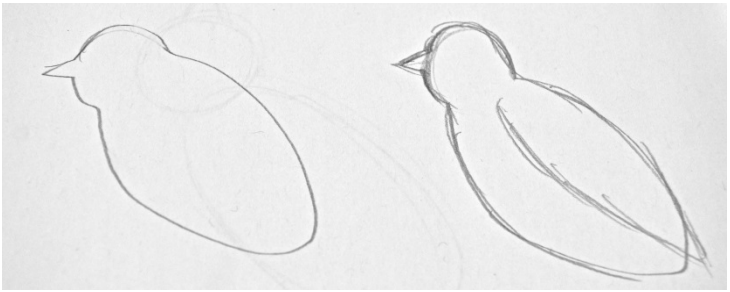
5. **Give some reminders about sketching:**
    - Sketching is the first stage in drawing – it can help get the basic appearance of an object onto the page. After this, students can erase any unnecessary lines, trace over their lines neatly, add any extra detail and begin to shade it in.
    - Students should be encouraged to sketch freely and not worry about making mistakes. They can always erase lines if needed.
    - Remind students that when they are sketching a specimen it is a different process than doing an imaginative drawing. They should really be focusing on the detail, shape, and size of the specimen. The drawing should only include details that they see on the specimen. Their drawings should include the name of the organism, labels, and any other relevant information.
    - Encourage students to draw specimens from multiple perspectives. If the specimen is able to be turned to different angles and moved around the room this will allow students to learn more about the general appearance of the organism.
    - The flash cards may be helpful here to give background information about the specimens.

6. **Walk through a sketch together:**
    - Pass out paper, pencils, hand lenses (if using) and erasers.
    - Discuss the materials you are using and try them out.
        - For younger grades, we suggest using a whiteboard to demonstrate each technique the students are using.
        - Fold the paper in four, so that you can use one quarter for trying out the pencils, and one for each of the three sketching types later in the program.
        - Square 1:
            - How dark and how light can you make each line? How does the side of the pencil look? The edge? How fine and thick can you make each line?
            - Draw a few shapes and different types of lines.
            - Encourage everyone to hold the pencil lightly (it might help to hold them really tight, then really loose, then somewhere in between). Then, shake out the hands to loosen them up.
    - Discuss the specimen(s) you will pass out or are already at each table. Where do these specimens live? What types of behaviour do they have? Tell a story to make the specimen come to life.
    - Pass one specimen out to each table with students, or ask each student to select one specimen to draw that is already at their table. Request that students touch specimens gently to ensure specimen safety. Leave the specimens on the desk while they are sketching.
    - Reassure students that there will be lots of time to see other specimens in today's activity, so if they don't get their first choice right away, they can see it later.

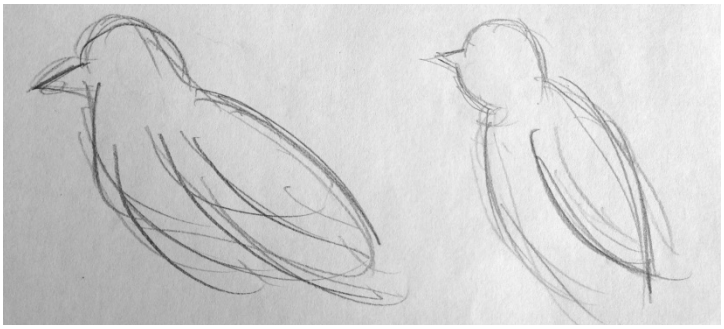
- Spend some time observing the specimen using sight and touch. Walk them through this stage. For the first minute in each step, do quiet solo observation. After the first minute, discuss in small groups or as a whole class. Spend lots of time here!
    - **Sight**: look at all angles and edges of the specimen. Discuss different shapes, colours, patterns and any other characteristics together.
    - **Touch**: feel all sides and edges of the specimen gently. Try using the back of your hand or arm to make different observations. Try closing your eyes when you touch the specimen gently. Does it feel different than your eyes want you to believe? Discuss how different spots feel different. What descriptive words do you have to explain how it feels?
    - (Optional) **Magnification**: how does this specimen change when you look at it closely? Demonstrate how to use the hand lenses.
    - Have students write some of these descriptions down to come back to later. They may make notes in Square 1 with their pencil samples, or on a separate page.
- Start sketching this first sample (remember to draw lightly). Older students can start on their own. Younger students or those with less experience may want to start in one of three ways. Try out each technique in the three remaining squares on your paper
    - **Shape sketching:** Imagine your specimen being divided into geometric shapes (triangles, rectangles, lines, ovals), and roughly sketch them onto the page. Connect the shapes together and smooth out any lines.



    - **Contour lines:** A contoured line drawing involves drawing the basic outline of an object without taking your pencil off the page. It can be done with or without looking at the paper. This can help students get a general feel for the outline of the object before they begin to add detail.



- **Quick, gestural sketching:** Provide students with about 10-20 seconds to sketch the general shape of their object as quickly and loosely as they can. Younger students may need 40-50 seconds. Framing this exercise in a fun way can really help students who are struggling with perfectionism or don't know how to begin learn the basics involved in sketching.



- We suggest It might be useful to try a few sketches with the same specimen to show different methods on one sheet of paper. You may want to rotate the specimen for each practice too.
- Optional: choose one of your initial sketches to detail further.

***Main Sketching Activity***

1. **Introduce the main sketching activity:**
   - Place students in specific groups and assign them to a table with specimens.
   - "We will be sketching for the next 45 minutes to an hour. You have lots of time."
   - "I want you all to try something new today. Try to be detailed – you can draw one specimen from many angles, or draw several of them."

2. **Write down the sketching steps for younger students:**
   - For example:
     1. Loosen up.
     2. Get your materials ready. (Show everyone where the extra materials are)
     3. Fold paper into quarters for most drawings, and use a full page for your favourite specimen.
     4. Observe the specimens closely and carefully, making sure to handle them properly. Write down your observations (sight, touch, magnification) or any questions you might have about the specimen.
     5. Do a rough sketch of the specimen using one of the three techniques. You can choose a favourite technique, or use a different technique for each specimen.
     6. Add details and smooth out your drawing.
     7. Make sure you sign and date your work!

3. **Time to sketch!**
    - Remind students that they will have a chance to see all the specimens, so not to be disappointed if they aren't at their favourite yet.
    - Depending on your set up, you have a few options to rotate specimens:
        - Use a timer to have students move over one chair every 2-3 minutes. Save 10 minutes at the end of the sketching time to find their favourite specimen and complete a longer drawing.
        - Use a timer to have full groups of students switch tables every 15 minutes. They get a chance to either sketch everything on their table, or spend time on one drawing at each table.
        - Have students raise their hand when they finish with a specimen, and ask you to bring them a new one.
        - Use one or two long tables and students can choose their places to sketch. There may be places that lots of students cluster, but it is their choice to sketch a more popular specimen.
    - Float around the tables. Talk about one or two that the group seems to be focused on. Get the students to touch the specimens as they draw them.
        - Use an iPad or similar technology to show videos of the organisms in real life.
    - Some students will draw for 30 seconds and say "I'm done." To help them get a little more creative, ask them questions like:
        - Are there details on the organism that you can't see on your drawing?
        - Where do you think it lives?
        - Do you want to add in background or scenery?
        - Do you want to add colour?
        - You can also encourage them to write creatively along with their drawing if sketching seems frustrating.
    - Leave a lot of quiet time to focus and sketch. If a student is drawn to something that isn't on the tables, that's OK.
    - If they have time, you may wish to draw the students' attention to shading or colouring. Shading is a way of representing the darker portions on a specimen and can be done either with pencils or with charcoal.
    - Give positive encouragement and tips to them while they are sketching. Encourage self-exploration, and following what their interests are.
    - When 5 minutes are left, let students know they will need to finish the drawing that they are working on.

4. **Body Break/Stretch (Optional)**
    - Students will probably need a body break some time during the program, especially younger children. Being loose and relaxed helps you sketch better – students may choose to do these stretches frequently.
    - Have students stand up and do some stretching exercises (e.g. roll out your shoulders/neck, touch your toes, etc.).
    - Shake your hands out a few times to loosen them up.

***Debrief***

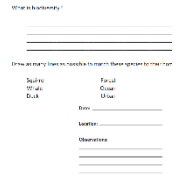
- All of the students should have a few completed sketches to take with them or leave in the classroom. They should feel more comfortable about approaching sketching objects, specifically natural history specimens.
- What have we observed today? Discuss the theme for the day.
- What is biodiversity? Did you get a diverse group of drawings? Relate this back to the theme and biodiversity.
- Share drawings with each other. Ask what the favourite specimen to draw was.
- You may choose to set up the drawings as a self-curated gallery. Get each student to put their favourite drawing on the table near the specimen they drew (or where they were sitting last), and have students walk around the tables, observing and talking. Sharing can increase their confidence as an artist and allows them to take ownership for their work.
- Encourage students to give positive and specific comments to their classmates, such as "I really like the way you shaded this part of the specimen." "How did you sketch that feather? It looks really cool!" "I can really imagine your drawing in real life!"

## *Additional Resources for Sketching Activity*

### Worksheets and Activities

Our website contains a number of supplementary resources to help add to your Beaty Box experience. These museum-developed activities, which include worksheets and nature guides, are a great resource for bringing the museum experience into your classroom.

#### *For use in the classroom without a museum visit:*



**Beginner Biodiversity Quiz**

beatymuseum.sites.olt.ubc.ca/files/2016/01/BBMBeginnerBiodiversityQuiz.pdf

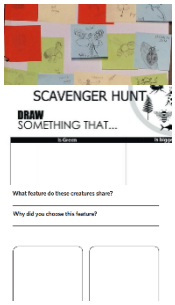
**Nature Journal Observation Sheet**

beatymuseum.sites.olt.ubc.ca/files/2016/01/BBMNatureJournalObservationSheets.pdf

**Five Senses Activity Package**

beatymuseum.sites.olt.ubc.ca/files/2016/01/BBMFiveSensesPackage.pdf

#### *For use in the museum before/after using the box (optional):*




**Entomology Collage**

beatymuseum.sites.olt.ubc.ca/files/2016/01/BBMEntomologyCollage.pdf

**Describing and Drawing Organisms**

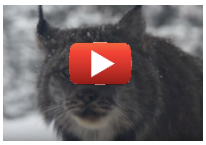
beatymuseum.sites.olt.ubc.ca/files/2016/01/Describing-and-Drawing-Organisms.pdf

**Creature Features**

beatymuseum.sites.olt.ubc.ca/files/2016/01/BBMCreatureFeatures.pdf

## Videos

**Barnacle feeding | Shedd Aquarium**
youtube.com/watch?v=v6RJxGGYE2Q

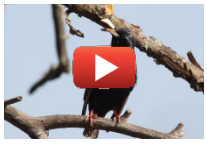


**Canada lynx: wildlife celebrity | Canadian Geographic**
youtube.com/watch?v=BWoDpIUTq2o

**Growing up Butterfly | National Geographic Channel**
natgeotv.com/ca/great-migrations/videos/growing-up-butterfly

**Monarch Butterfly Metamorphosis Time-lapse**
youtube.com/watch?v=ocWgSgMGxOc

**Varied Thrush | Squamish River Estuary**
youtube.com/watch?v=1RuoSBxjh1s



**European Starling – *Sturnus vulgaris* | Macaulay Library**
macaulaylibrary.org/video/482897

## *Photos: Repacking Your Beaty Box*

When reassembling the Beaty Box, please follow the photograph on the base of each tray. This ensures that specimens are arranged properly and will fit back together again. Carefully place one tray at a time inside the Beaty Box.

Take your time. The specimen trays will fit snugly, but you shouldn't have to force them. Notice that the black board is what supports each tray; there is no direct weight on any specimen.

***Pack individual boxes into their trays:***

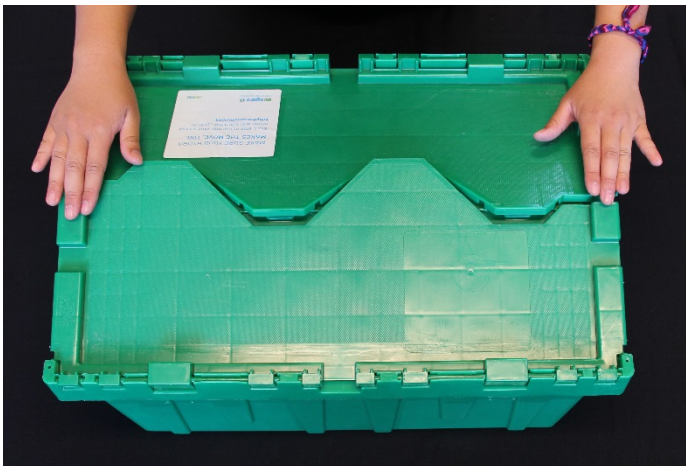
***Tray 4:***

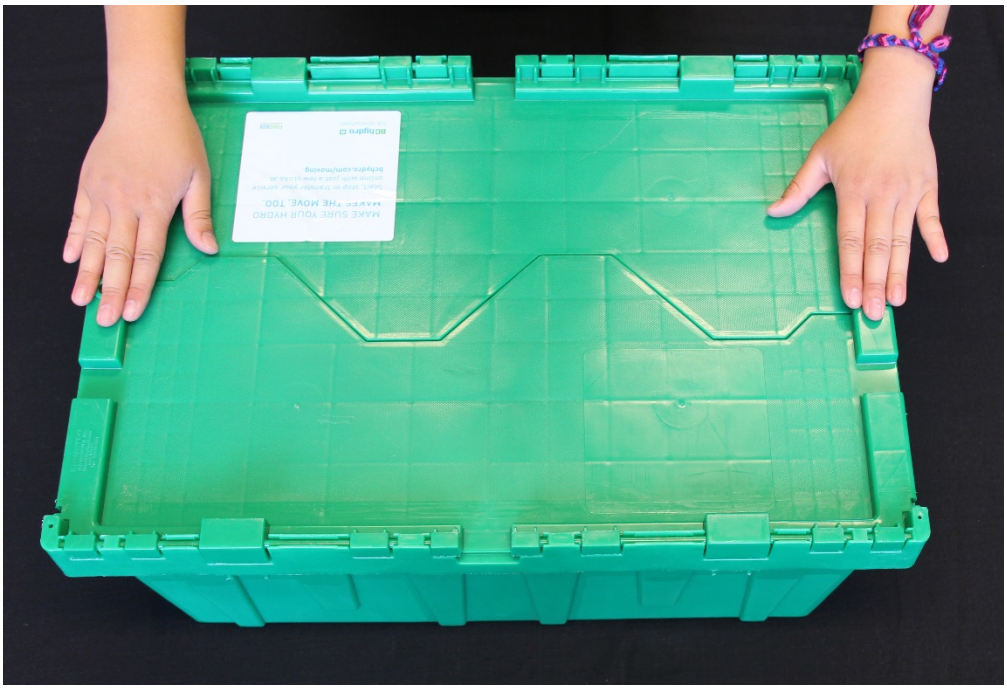
***Tray 3:***

***Tray 2:***

***Tray 1:***

***Closing the Beaty Box:***
Place the manual, USB key and flashcards on the top of tray 1. Interlock the flaps of the lid together, and press to close. It should be totally flat.





If you think it might rain when you return your Beaty Box to the museum, please cover the box with a towel or garbage bag to prevent moisture from getting to the specimens.

## *Inquiry Box A Inventory*

Please make sure all of the specimens are properly put away inside the Beaty Box. See the 'Returning the Beaty Box Checklist' page in Section 1 for more information on sending the Beaty Box back to the museum.

### Tray 1

| Check (Yes/No) | Item | Notes |
|---|---|---|
| | Educator's Manual | Manual & USB Stick |
| | Pitcher Plant *(Sarracenia sp.)* | Herbarium mount |
| | Western Sword Fern *(Polystichum munitum)* | Herbarium mount |
| | Flash Cards | 23 |

### Tray 2

| Check (Yes/No) | Item | Notes |
|---|---|---|
| | Chipmunk *(Tamias sp.)* | 1 skeleton |
| | Coquina Shells *(Donax variabilis)* | 5 small plexi boxes |
| | Frilled Dog Whelk *(Nucella lamellosa)* | 1 medium plexi box |
| | Butterfly Riker Mount | |
| | Eccentric Sand Dollar (*Dendraster excentricus*) | |
| | Fossilized fern | |
| | Sponge *(Porifera, Demospongiae*) | |
| | Locusts | |
| | Varied thrush (*Ixoreus naevius*) | 2 wings |
| | Mallard *(Anas platyrhynchos)* | 1 large wing |

Inventory list continued on next page →

## Tray 3

| Check (Yes/No) | Item | Notes |
|---|---|---|
| | Eastern grey squirrel *(Sciurus carolinensis)* | 1 mount |
| | | 2 boxes of skeleton |
| | Chipmunk *(Tamias sp.)* | 1 box of skeleton |
| | Eucalyptus seed pod | |
| | Zigzag Scallop (*Euvola ziczac*) | 1 mat box with foam |
| | Coquina Shells *(Donax variabilis)* | 1 small plexi box |
| | Common Crown Conch (*Melongena corona*) | 1 medium plexi box |
| | Stony or Hard Coral (*Cnidaria, Anthozoa*) | 2 pieces |
| | Douglas Fir Cones & Bark | 3 cones, 1 bark |

## Tray 4 (bottom)

| Check (Yes/No) | Item | Notes |
|---|---|---|
| | European starling *(Sturnus vulgaris)* | 1 bird |
| | Forest floor sample | |
| | Barnacles on Rock | |
| | Chipmunk *(Tamias sp.)* | 1 mount |
| | Lynx skull (with ear cartilage) | |

## *Beaty Box Feedback*

*We value all of your suggestions and feedback. Please answer all questions as specifically and honestly as possible. Please write any additional comments on the back of this sheet. Thank you for your feedback!*

### Format of Box

- What are your overall thoughts on the box layout?
  *Is the box appropriate size for transport? Would you prefer a suitcase with wheels?*

- What are your overall thoughts on the number and type of specimens?

### Teacher Guide

- What information should be included in a teacher guide to help the educator get the most out of the box?
  - Would model lesson plans to suggest how the specimens may be used be helpful?
    *For example, sketching, BC species, evolution*
  - Would you like us to include worksheets?
- Comments:

- Should we include any of the following? How would you like this information to look?
  - Information about specimens *(names, images, description of habitat and lifecycle)*
  - Information about specimen preparation methods *(drying plants, mounting skins)*
  - Information about the museum
- Comments:

- What are your overall thoughts on the lesson plan included in Section 2?
  - Were the instructions clear/easy to follow?
  - Did you modify the lesson plan and activity? If so, how?
  - What did you like/dislike about the lesson plan?
- Comments:

## Future Boxes

- What themes would be useful for you?

## Other Questions

- How did you hear about the Beaty Box program?

- The current focus is on specimens – are there other supporting materials you would like included?
  *Field guides, maps, stories about people (First Nations use, UBC Researchers)*

- Would you like to have a teacher training session at the museum or with a museum staff member?

- Would you like access to a webpage with supporting information for teachers using the Beaty Box?

- Please include any other comments or suggestions to help us improve the Beaty Boxes.

## *Appendix 1*
**Dr. Wayne Maddison Spider Sketches**

## *Appendix 2*

### Beaty Box Dimensions

*Length:* 55.4 cm (21.8″)
*Width:* 38.8 cm (15.3″)
*Height:* 25.0 cm (9.8″)
*Weight:* 5.94 kg (13.1 lbs)