

Vocabulary list and definitions for all lessons*

Abiotic stresses - the negative impact of non-living factors (high wind, extreme temperatures, drought, flood, or natural disaster) on organisms in a specific living environment

Adult clam - a clam that has reached maturity

Anas rubripes - the binomial name for the black duck

Anemometer- often called the wind gauge and measures the speed of the wind

Anus - the opening through which waste matter is expelled; in the clam, the waste travels from the anus into the excurrent siphon

Anterior adductor muscle of clam - the muscle located towards the front of the shell that contracts to pull the shell toward the midline of the body; in the clam, the muscle works to close the shell

Anterior adductor muscle scar - the small round-shaped scar located on the anterior or front end of the clamshell.

Anterior end of clam - the front end of the clam

Anterior scar elongate -?

Apogee - a point in the orbit where the orbiting body is farthest from the body it orbits; often connected to the moon orbiting the earth

Ascophyllum nodosum - also known as knotted wrack is a brown seaweed with long strap like fronds.

Autumnal equinox - usually around September 22/23rd, when the sun crosses the plane of the equator and day and night are the same length; marks the beginning of autumn in the Northern Hemisphere; occurs twice in a calendar year (vernal equinox)

Bathymetry- the measurement of the depth of the ocean floor from the water's surface

Barometer-an instrument for measuring atmospheric pressure; which may indicate a change in weather

Bell buoys - a navigational buoy that has a bell that sounds when the wave motion moves it

Benthos - the bottom of a sea or lake. The animals and plants living at the bottom of a sea or lake

Binomial name - the two word scientific name for a species. For example *Mya arenaria* for the soft-shell clam

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Biodiversity – the variation of life forms within a given ecosystem

Biogenic habitats – habitats created by the growth of certain plants and animals. In the Gulf of Maine there are salt marshes, sea grass beds, kelp beds, shellfish beds, and cold-water corals.

Biomass – the mass of living organisms in a given area(ecosystem) in a given time

Biomimicry – a science that studies nature and tries to copy it to solve human problems.

Biotic stress – is a stress that occurs due to the damage caused to a living organism by another living organism such as a bacteria, fungi, virus, parasites, beneficial and harmful insects, weeds, and cultivated or native plants

Bivalve - a mollusk, having a shell consisting of two hinged parts. Example: A clam

Byssus - a tuft of fine silky strong filament that comes from a gland in mollusks that is used to attach them to a surface

Bloodworm - *Glycera dibranchiata*; a worm whose bodily fluids show through its pale skin to give it a creamy reddish/pink color; length of up to 35cm (14 "); has a bite that is painful even to a human; can prey on small clams (3mm); is carnivorous.

Black duck – a predator of the soft-shell clam; a dabbling duck that is partially migratory; often winters on the eastern coast of the U.S., eats plants mainly, but also some mollusks

Cancer irroratus - the binomial name for the rock crab

Carcinus maenas – the binomial name of the green crab

Carnivorous - flesh eating

Cerebratulus lacteus – the binomial name of the milky ribbon worm

Clam larva - an early stage in the life cycle of the clam

Chondrophore- a spoon like, tooth like structure on the left hinge of the clam's shell

Cold water corals –suspension feeding invertebrates with feathery tentacles that capture food particles from the water column; they can form a unique habitat that hosts a great diversity of species

Consumer – An organism that gets food from eating other organisms

Core sampling – a cylindrical section of a naturally occurring substance; for example, a section of sand or mud; taken to analyze what organisms are found

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Crangon septemspinosa-the binomial name of sand shrimp

Crystalline style of clam – a rod-shaped structure which is turned by cilia in a sac connected to the stomach; the turning motion helps to bring food into the stomach and sort it for digestion

Cultured clam – clams grown in a controlled environment such as a hatchery or farm

Currents – the direction and flow within a liquid or gas (water current or air)

Daylight saving time – many areas in the world modify their time zones by one hour or more at various times in the year; since 2007 in the United States, most states (Arizona and Hawaii do not) change from 2:00 LST (local standard time) to 3:00 LDT (local daylight time) on the 2nd Sunday in March; on the first Sunday in November, the time changes from 2:00 LDT to 1:00 LST

Data - information that can be organized for analysis or decision-making

Desiccation – the drying out of a living organism

Digestive gland of clam – an organ or structure that secretes an enzyme that helps break down the food

Digestive system-the organs which work to break down food into a form the organism can use

Discus buoy – round shaped, moored buoys that measure from 10 m to 12m and record data

Diurnal tides – one high and one low tide each day or one tidal cycle per day

Dorsal – referring to the top (the dorsal side or top side)

Dunes – a hill of sand built by the forces of the wind and water that in a coastal area usually runs parallel to the water

Ebb – the flowing back of the tide from high water to low water

Ecology - the science of the relationships between organisms and their environments.

Ecosystems – an environment that includes all the living organisms that can survive in a particular area as well as the abiotic components (non-living) of air, soil, water, and sunlight

Eelgrass/sea grass bed- a highly diverse and productive ecosystem that in the Gulf of Maine are dominated by eelgrass, but in other climates may include other sea grass species.

Egg – a female reproductive cell

Enclosure – an area that is surrounded on all sides

Esophagus-the tube through which food passes from the mouth to the stomach

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Euspira heros - the binomial name of the northern moon snail

Euspira triseriata-the binomial name of the spotted moon snail

Excretory pore - a small opening in the excretory system of the clam

Excurent siphon - the exhalant siphon through which waste material exits the clam's body; smaller than the incurrent siphon and located on the hinge side of the clam

External Anatomy - the outside structure of an organism

Fecundity - the quality or power of producing abundantly

Fertilization - to initiate reproduction of a species; the fusion of gametes (sperm and egg) to produce a new organism

Final shell length - for our project, a measurement of the clam after it has been harvested

Flow - the rise of the tidal water from low to high tide

Food Chain - the transfer of food energy from one organism to another

Food Web - a complex interactive system of food chains

Foot - also called pedal of clam; a hatchet shaped muscular structure used for movement

Fouling communities - habitats of species that may become established on piers, docks, wharves, shipwrecks, artificial reefs, bridge abutments or other human-made structures. In the Gulf of Maine, blue mussels, barnacles, tunicates, and sponges are some of the more common species found in this type of habitat. Many non-native species are found here as well.

Fundulus heteroclitus - the binomial name of the mummichog

Gill (of clam) - an organ that exchanges gases for respiration; an organ that traps and transports food toward the mouth using mucus and cilia; two pairs of gills in the mantle cavity area of a clam

Glycera dibranchiata - the binomial name for bloodworm

Gonad of clam - reproductive organ of the clam

Gravitational force - a natural phenomenon in which physical bodies attract with a force proportional to their mass; it is known familiarly as the force which gives weight to objects with mass and causes them to fall when released

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Green crab - *Carcinus maenas*; an edible shore crab and crustacean predator whose population is growing and spreading.

Growth rate - for our project, the average length that our juvenile clams grow over a set period of time

Growth rings - the thickened ridges on the shells of a clam which indicate yearly growth

Gulf of Maine, the - see The Gulf of Maine

Habitat - the environment in which an animal or plant normally lives and grows

Habitat formed by human activity - biogenic or physical habitats that owe their existence to human activity. Biogenic habitats may be formed by invasive species and physical habitats may be formed on dock pilings, boat hulls, and other structures in the water

Hatchery - a place where eggs are hatched and grown under artificial conditions

Hatchery mark - a distinctive shell-shaped mark on the shell of a hatchery raised clam, which is noticed after the clam has been introduced and left in a wild environment for a period of time

Heart - a hollow muscular organ that pumps blood to the body of the clam

High tide - occurs when the incoming tidal water has reached its highest level for that time period

High water line/mark - a definite area of the landscape that shows the highest level that the tidal water reaches because of evidence left by the water flow

Hinge line adductor scar - the mark or scar inside the shell that shows where the hinge ligament connected the two shells of the bivalve together

Hinge ligament - tissue that joins the two shells of the bivalve (clam) together

Holdfast - a root-like structure that anchors an organism such as seaweed to the substrate

Homarus americanus - a species of lobster found on the Atlantic coast of North America; also called the American lobster, Northern lobster or Maine lobster

Horizontal - parallel to the horizon

Hypothesis - a statement that makes a generalization about a set of facts that can be tested by further investigation

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Incurrent siphon – the inhalant siphon; the siphon through which water containing its food (plankton) enters the clam; larger than the excurrent siphon

Infauna - animals that live in the soft sea bottom

Initial length – for this project, the length of measurement of the clams when first planted in the containers

Internal Anatomy – the internal structure of an organism

Intertidal – above water at low tide and under water at high tide; also called littoral.

Intestine-the tube like portion of the digestive system that extends from the stomach to the rectum

Invasive species - a non-native plant or animal

Invasive-plant habitats – habitats formed when a human activities such as shipping, aquaculture or the release of aquarium pets results in the establishment of a species that would not exist naturally in an area. These habitats can replace other habitats and cause profound ecological changes. They are usually contained/eliminated

Invertebrate - having no backbone or spinal column

Juvenile – for our project, a clam (or other organism) that has not yet reached its adult size or sexual maturity; usually a juvenile clam measures $\frac{1}{2}$ " - $1\frac{1}{4}$ ".

Kelp bed – a productive ecosystem made up of anchored kelp

Labial palp of clam – small flap that sorts and directs food to the mouth of the clam

Left valve (of clam shell) – the side of the clam which has the chondrophore (small spoon like projection) which is attached to the socket of the right shell by hinge ligaments

Life cycle – the repeating stages of life that an animal goes through from sperm and egg to mature adult

Local daylight time – *see Daylight saving time*

Local standard time – *see Daylight saving time*

Low tide- occurs when the incoming tidal water has reached its lowest level for that time period

Lower intertidal zone - the area of the shoreline where the tidal water reaches its lowest level

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Low water line/mark – the lowest level that the tidal water will reach during a given time period

Mantle of clam – a thin, whitish membrane/lining that encloses the internal organs of the clam; a function of the mantle is new shell growth when the mantle secretes the limy shell

Marine – of the sea or relating to the sea

Mean high water – the highest level that tides reach over a period of time

Mean low water – the lowest level that tides reach over a period of time

Mesh – an open space in a net or screen

Middle intertidal zone – an area of the landscape halfway between the upper intertidal zone and the lower intertidal zone; an area that is exposed to the air halfway between tide cycles

Milky ribbon worm - *Cerebratulus lacteus*; a more voracious predator on clams than other worms; a long slender worm with no segments or parapodia; prey on clams by everting its proboscis into the clam's siphon and eating the clam from the inside out.

Mixed tides – some areas of the world have high tides and low tides that are of varying levels; a high tide may be a 10 foot tide, the next high tide could be a 7 foot; the same with the low tide; a low tide could be a 3 foot tide, the next could be a 1 foot

Mollusk - marine invertebrates having a soft un-segmented body and a shell covering, including clams, oysters, and snails

Mortality rate - a percentage measure of the number of deaths in a group after a period of time

Mouth of clam -the opening through which food enters the digestive system of the clam

Moon phases – see *phases of the moon*

Mya arenaria - the binomial (two term) name of the soft-shell clam, a bivalve; an edible clam with a thin oval-shaped shell found in the coastal regions of the U.S. and Europe

Muddy bottom – a physical habitat whose main substrate (bottom) is mud

Mummichog - *Fundulus heteroclitus*; a coastal fish reaching a length of 4-6" which is a voracious eater of clams of less than 20mm; travels in schools and is very hardy

Muscle scar – an area on the inner side of the valve (shell) that shows a distinctive shape

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National Data Buoy Center – part of NOAA’s National Weather Service (NWS); the NDBC designs, develops, operates and maintains a network of data collecting buoys and coastal stations

Neanthes virens - the binomial name of the sand worm

Neap tides – When the sun and moon are at a 90° angle from each other when viewed from the earth, the gravitational forces of the sun and the moon tend to cancel each other out, and the tidal range does not fluctuate as much. Neap tides occur at the first quarter moon and third quarter moon

Neoplasia - an abnormal mass of tissue

Nephridia (excretory gland) - a long, glandular tube and bladder that helps to remove wastes from the clam

Northern Moon snail - *Euspira heros*; is a boring gastropod that drills a hole in the umbo area of the bivalve, everting its proboscis into the hole of the clam and consuming it

Organism – any living system (plant, animal, fungus, or micro)

Pallial line – the line on the inner shell of the clam that shows where the mantle was attached

Pediveliger stage – a late larval stage in which most of the muscular characteristics of the adult exist

Pelagic – of or pertaining to the oceans, not close to the bottom

Perigee – the point at which an orbiting body makes its closest approach to the body it orbits; often refers to the moon as it orbits the earth

Periostracum - a substance that forms the colored layer of the bivalve shell

Phases of the moon - the appearance of the moon’s illuminated portion as it orbits the earth in relation to the position of the sun and rotation and orbits of the earth and moon; phases are described as viewed from earth in the Northern Hemisphere; phases are New moon (no moon visible or 0%), Waxing crescent (1-49% moon visible on right side), First quarter moon (50% of the moon visible on the right side), Waxing gibbous (51-99% of the moon visible on the right side), Full moon (100% of the moon visible), Waning gibbous (51-99% of the moon visible on the left side), Last/Third quarter moon (50% of the moon visible on the left side), Waning crescent (1-49% of the moon visible on the left side)

Physical habitats – habitats that are defined by substrate and water depth; the common ones for the Gulf of Maine are rocky, sandy, muddy, and water column.

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Plankton – Microscopic plant (phytoplankton) and animal organisms (zoo plankton) that float in bodies of water with their movements controlled by tides and currents; they are an important food source

Phytoplankton – Microscopic plants that are free floating drifters; an important food source in the marine food web

Posterior adductor muscle - the muscle located towards the rear end of the shell that contracts to pull the shell toward the midline of the body; in the clam, the muscle works to close the shell

Posterior adductor muscle scar – the small round-shaped scar located on the inside posterior or rear end of the clam shell

Posterior end – the rear or back end of the clam

Predation – an interaction where a predator feeds on prey

Predator- an animal that preys upon others for food

Proboscis - a long, flexible snout

Producer – an organism that makes its own food from the energy of the sun such as phytoplankton. Producers form the base of the food web

Quadrat – a metal, wood or plastic square which is placed on the area being sampled; used to isolate a small area for the purpose of counting organisms in the sample area

Rainfall – the condensation of water vapor into drops heavy enough to fall

Recruitment – in biology, when the juvenile organisms have survived long enough to be added to the population

Rectum – the final portion of the intestine

Right valve (shell) – the side of the clam that has a socket into which the chondrophore of the left valve fits; hinge ligaments attach the chondrophore to the socket

Rock crab- an edible crab with nine marginal teeth on the carapace of its shell; known as Maine crab, Atlantic crab, peeky toe crab

Rockweed bed – an ecosystem made up of anchored *Ascophyllum nodosum* (bladder wrack)

Rocky bottom – a physical habitat whose main substrate is cobble and pebble, boulder, or solid rock

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Rocky Shore – a habitat that consists of horizontal zones between the high and low tide marks. The highest zone is the splash zone, followed by the high intertidal, middle intertidal, low intertidal and subtidal zones with invertebrates and algae of different species exist due to their abilities to tolerate the environment, predation, and competitive pressures of each unique zone.

Rotation of the earth – the eastward movement of the Earth around its own Axis

Salinity - the amount of salt in a solution

Salt marsh/pond – a biogenic habitat that occurs in the upper coastal intertidal zone and is dominated by herbs, grasses, and low shrubs

Sandworm - *Neanthes virens*; a worm which can reach 4 feet in length, has two pincher teeth, and parapodia (leg like structures) on the sides of its body which act as gills and also provide locomotion; mainly eat seaweed and microorganisms; will prey on clams 3mm or less

Sandy bottom – a physical habitat whose main substrate is sand

Sand shrimp – several species of filter feeding animals are known by this informal title; one species common in New England but ranging to Florida is *Crangon septemspinosa* which can be found in depths of over 1000 meters; provide a food source for many other marine creatures; lives near the ocean bottom

Sediment - organic/inorganic material that is deposited from water, ice, or wind

Sea grass/eelgrass beds-see eelgrass/sea grass beds

Seagull-a bird that is both a scavenger and a carnivore

Semidiurnal tides - two high tides and two low tides each day or two tidal cycles per day

Shell (of clam) – the external skeleton of the clam which is formed by the secretions from the mantle of the clam in growth ridges or rings

Shellfish bed – a biogenic habitat usually formed by a collection of bivalve mollusks. In the Gulf of Maine the three types noted are mussel beds, oyster beds, and scallop beds

Siphon - a tube shaped organ through which water is taken in and expelled; found in clams and other bivalves

Slope of the habitat (shore or rock) – the degree or angle of the land/substrate of a habitat; for example, a coastal habitat could be a vertical rock face or a sloping sand beach

Spat - a young clam measuring less than ½ “

Spatulali – possibly the plural of spat

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Sperm – a male reproductive cell

Spotted moon snail-a species of predatory sea snail; a gastropod mollusk

Spray/splash zone – the highest zone in the Rocky shore where lichens can live

Spring tides – When the sun, moon, and earth form a line, the tidal range is at its maximum or the tidal highs are higher, tidal lows are lower, slack water times, the time when there is little movement one way or the other, are shorter, and tidal currents are faster. Spring tides occur at the new moon and full moon

Stability of the substrate – whether or not the substrate can easily shift and move affects what species will grow and thrive in a particular habitat

Station 44027 (Jonesport, Maine) – one of the moored buoys (3 m discus) of the National Data Buoy system that records data for Downeast Maine

Stock enhancement - a process of aiding the growth of a living organism

Stomach of clam – a saclike digestive organ

Straie of clam

Stress ring – a thinner shell ridge on the shell of the clam

Style sac – a small sac which holds the crystalline style used in the digestion process of a clam

Substrate – the basic surface on which an organism lives, such as mud, sand or rock

Subtidal – a zone that is permanently covered with water

Sunlight – light from the sun

Summer solstice – the day at which the sun is at its highest altitude in the sky usually June 21 in the Northern Hemisphere (December 21 in the Southern Hemisphere); the day the sun is at its northernmost point in the sky for the Northern Hemisphere (southernmost point for the Southern Hemisphere); the day that is called the longest day/shortest night for the Northern Hemisphere; summer solstice occurs because the axis tilt of the earth does not change, continually pointing to the same point in the sky as the earth revolves around the sun; in the summer solstice for the Northern Hemisphere, the earth is tipped away from sun

Survival rate – a percentage measure of the number of the group that is alive after a period of time

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Taking Samples - a methodical process that results in data that depict a specific characteristic of an area. For example, taking samples may show the number of holdfasts of *Ascophyllum nodosum* that occur on average in a particular area.

Temperature - the physical property of matter that is commonly described as hot or cold

The Gulf of Maine - a large gulf in the northeast Atlantic Ocean delineated by Cape Cod, Massachusetts in the south to Cape Sable, Nova Scotia in the northeast.

Tidal bore - a wave of water of the incoming tide (flood tide) moving in the opposite direction of the normal flow of water in a river or stream; for example, the river is flowing down stream, the bore is moving upstream; may be a few inches to several feet high, depending on the tidal situation at the time; generally occurs when water from a wider bay moves into an inlet or river, usually occurs in areas where there is a fairly large tidal range

Tidal current tables - the horizontal movement of water in response to tides; current is more pronounced at the coasts and can create a concern in normal conditions and more of a concern during spring tides or storm conditions; tidal current tables show the speed of this current in particular locations

Tidal height - a measurement that the tidal water reaches at a given time

Tidal inundation - a phrase used to describe the inflow of the tide

Tidal pool - a pool that forms in the depressions of intertidal rock outcrop which provide homes for some animals and algae that might not survive exposure to air while the tide is out; often an area of high salinity water concentrations

Tide charts/tables - a predictive chart that uses prior known data to depict expected tides for a future period of time; most tide charts will state that the information may not be accurate; often data found on a tide chart may include date, time of day, range in feet of the expected tide, mean high water, mean low water

Tide tables/chart - *see tide charts/tables*

Tide - the rise and fall of sea levels due to the combined effects of the gravitational forces of the earth, sun and moon and the rotation of the earth

Transect - a fixed path along which one records data and occurrences of a phenomena; for example, how many of a species is observed in this fixed path could lead to an estimate of the biological abundance of a species in a particular area

Tree line - the area where the shoreline meets the land

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Trochophore – a type of free swimming larvae with several bands of cilia; early stage in life cycle of clam

Umbo - in biology, a small knoblike bulge on the surface of a bivalve shell near the hinge, which was formed when the clam was a juvenile

Umboes of clam – another name for umbo

Upper tidal zone – the area of the shoreline where the tidal water reaches its highest level

Upper intertidal zone – the upper portion of coastland that is between mean high water and mean low water

Veliger – the stage in development that follows the trochophore larva stage;

Vernier calipers - a tool used as a measuring device between two points

Vertical - perpendicular to the horizon; straight up

Ventral – referring to the bottom side (the ventral side)

Vernal equinox - usually around March 20/21, when the sun crosses the plane of the equator and day and night are the same length; marks the beginning of spring in the Northern Hemisphere; occurs twice in a calendar year (autumnal equinox)

Visceral mass of clam - **visceral cavity contains the internal organs of the clam**

Voracious – consuming great amounts of food

Watch circle radius – the distance around the weather buoy from which data is compiled; usually listed on the Weather Station data report

Wave action – the result of wind blowing over a fluid surface

Weather buoy/station terms – Moored buoys (measure 1.5 m to 12 m) or drifting buoys (measure 30 to 40 cm) collect weather and ocean data; Moored weather buoys often made of steel or aluminum are usually yellow and are anchored to the ocean floor; Drifting buoys often made of plastic or fiberglass may be solid black, solid blue, or bicolor Are usually connected to a sea anchor and collect less data than a Moored buoy; Data collected can be transmitted by radio, cellular, or satellite communications to weather centers and can be used for forecasting or climate studies; Data collected could be wind direction, wind speed, wind gust, wave height, dominant wave period, average wave period, atmospheric pressure, pressure tendency, air temperature, water temperature, dew point, ice accretion, wind chill (combines wind speed, gust and air pressure) **Data terms are defined in Lesson 15**; weather buoys are more accurate than ships which measure from higher level (up to 40 m) compared to a buoy(5 m); weather buoys collect data for a measured size of area around the buoy called a “watch circle radius”

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Wind – the movement of a large amount of air

Winter solstice – the day at which the sun is at its lowest altitude in the sky usually December 21 in the Northern Hemisphere (June 21 for the Southern Hemisphere); the day the sun is at its southernmost point in the sky for the Northern Hemisphere (northernmost point for the Southern Hemisphere); the day that is called the shortest day/the longest night for the Northern Hemisphere; winter solstice occurs because the axis tilt of the earth does not change, continually pointing to the same point in the sky as the earth revolves around the sun; in the winter solstice for the Northern Hemisphere, the earth is tipped toward the sun

Zooplankton – microscopic animals that are free floating drifters with their movements controlled by the ocean tides and currents; an important food source in the marine food web