



Glossary of Common Ocean Farming Terms

5-line array: A growing system used for farming kelp that consists of five equal length lines spaced closely together and secured to a stiff bar or spreader at both ends, along with anchors and buoys to maintain tension and position in the water column.

acoustic doppler current profiler (ADCP): A tool for measuring water current that uses the *Doppler shift principle* to measure speed and direction of ocean currents; an ADCP emits high-frequency sounds in the water and measures the way that the frequency changes as it scatters off of particles in the water.

air bladder: A common name for a pneumatocyst, a gas-filled structure, or vesicle, on the thallus of brown seaweeds that provides buoyancy to lift the seaweed toward the surface and access sunlight for photosynthesis.

algae: Simple, non-flowering, and typically aquatic plant of a large group that includes the seaweeds and many single celled forms. Algae contain chlorophyll but lack true stems, roots, leaves, and vascular tissue. Algae are important as primary producers in aquatic ecosystems.

algaculture: Farming of algae, typically refers to microalgae cultivation.

alginate: Salt of alginic acid.

alginic acid: An insoluble gelatinous carbohydrate found in many brown seaweeds, chiefly as salts which can be used as thickening agents.

alien species: Introduced outside its natural past or present distribution; includes any part, gametes, seeds, eggs, or propagules of any such species that might survive and subsequently reproduce. Synonymous: introduced, invasive, exotic or non-native species.

amnesic shellfish poisoning (ASP): An illness caused by the ingestion of the marine biotoxin domoic acid—which is produced by the diatom *Pseudo-nitzschia* sp., a type of naturally occurring microscopic algae consumed by shellfish. In mammals, including humans, ASP may cause permanent short-term memory loss, brain damage, and death in severe cases.

amoeba: A type of cell or unicellular organism that has the ability to alter its shape, and which moves and feeds using **pseudopodia** and reproduces by fission.

anchor: 1. A heavy object attached to a rope or chain used to moor a vessel — or ocean farm rigging — to the sea floor; **2.** To secure in place.

anchor base plate: A component of a Manta Ray anchor consisting of a structural steel plate attached to a steel driving rod, designed to be driven into the seafloor and embedded in sediment.

anchor chain: A length of chain connecting an anchor to anchor line or cable; typically the bottom 10% of an anchor rode in ocean farming applications.

anchor footprint: The horizontal distance between the crown of the anchor and the starting point of the growline, as measured on the seafloor.

anchor line: Line that connects the anchor to the growline; and may run from the head or anchor ring at the end of the anchor shaft to a buoy at the water surface.

anchor line buoy: A buoy attached to the end of the anchor line at the water surface; along a horizontal growline, the anchor line buoy may mark the ends of the growline.

anchor knot: Knot generally used to fasten a line to an anchor; also referred to as an anchor bend or anchor hitch.

anchor rode: A length of chain, rope, cable, or a combination of these materials used to connect the anchor to an object such as a boat or growline; nylon is the material of choice for the rope portion of the rode due to its elasticity and ability to absorb shock loads.

aquaculture: Breeding, farming and harvesting of marine and freshwater animals, plants, or algae, such as finfish, shellfish, or aquatic plants, or seaweed in open water, or controlled aquatic conditions; farming in water; sometimes referred to as aquatic farming.

aquatic farm: An area of fresh or marine water designated for the purposes of cultivating aquatic organisms, such as finfish, shellfish, algae, or aquatic plants.

aquatic farming: See **aquaculture**.

array: An ordered arrangement of one or more horizontal lines used to support aquatic farm crops and associated gear, anchored to the seafloor and held in place in the water column with buoys and weights.

array footprint: The area between an array's anchor points as measured on the seafloor.

array length: The distance between an array's anchor points as measured on the seafloor.

at-depth sampler: A device for obtaining samples of water at a specific depth, consisting of a cylindrical tube to capture water, stoppers on either side of the tube, a trigger mechanism to initiate the stoppers, and a long cord used to lower the sampler into the water. See also **Niskin bottle**; **Van Dorn water sampler**.

bailiwick: A person's sphere of operations, niche, or particular area of interest or expertise.

bearing: Heading used in navigation, using measurement of the horizontal angle between the direction of an object and another object, or between it and that of true north.

bend: A knot used to join two rope ends or one line (rope) to an object, usually temporary e.g. sheet bend.

bends: Decompression sickness; a painful condition that can occur in scuba divers who ascend too quickly (or in aviators flying at high altitudes) when bubbles from dissolved gases e.g. nitrogen, form in the blood or tissues as a result of rapidly decreasing pressure on ascent.

benthic: 1. Anything associated with or occurring on the bottom of a body of water; 2. A habitat or organism found on the seafloor or water bottom.

benthic algae: Seaweeds growing attached to the seafloor.

benthic zone: One of the ecological regions of a body of water. It comprises the bottom—such as the ocean floor or the bottom of a lake—the sediment surface, and some subsurface layers.

benthos: Organisms living in the benthic zone i.e. on or in the bottom of a body of water.

best management practices (BMPs): 1. Practices, policies, or procedures implemented to mitigate (counteract) and/or minimize the adverse environmental effects of an activity, i.e.

aquaculture; 2. Usually voluntary practices developed by an industry such as aquaculture, but can also be required by law or lease and/or permit approvals.

bioengineering: Genetic engineering practices.

bioethanol: Seaweed bioethanol production from carbohydrate content of seaweed converted to fermentable sugars as an alternative energy to fossil fuels.

bioextraction: The removal of nutrients from an aquatic ecosystem through the cultivation and harvest of shellfish and/or seaweed; an environmental management strategy.

biofiltration: Seaweed biofiltration allows for the removal of nutrients from an integrated mariculture system.

biofouling: Or biological fouling, the accumulation of algae, microorganisms, plants, or small animals on wet or submerged surfaces, such as pipes that have a mechanical function causing structural deficiencies, or on biological organisms such as kelp creating functional deficiencies or reducing the quality of blades prior to harvest.

biofuel: Alternative to liquid fossil fuels, algal biofuel is an alternative to other biofuels such as those made from corn and sugarcane and can be made from seaweed, i.e. macroalgae.

biomass: 1. The mass of a living organism (algae, plants, animals, microorganisms) including all parts of the organism (roots, stem, blade, etc); or total mass of organisms in a given area or volume; 2. Mass per unit area (dry weight); 3. Plant materials and animal waste used as a source of fuel; 4. Cellulose, lignin, sugars, fats, and proteins.

bioplastics: Plastic materials produced from renewable biomass sources, such as vegetable fats and oils, corn starch, straw, woodchips, sawdust, recycled food waste, etc. It can be made from agricultural by-products and used plastic bottles and other containers using microorganisms, as well as kelp and other seaweeds.

biorefinery: Facility that integrates biomass conversion processes and equipment to optimize the use of biomass for materials, fuels, chemicals, power, energy applications, and value-added products, where the use is related to costs, economics, markets, yield, environment, impact, carbon balance and social aspects.

bivalve: An aquatic mollusc that has a compressed body enclosed within a hinged shell, such as oysters, clams, mussels, and scallops.

blade: Flat, leaf-like part of the seaweed thallus; frond.

blanching: Preparation for freezing or further cooking by immersing briefly in boiling water.

blue economy: 1. The ocean economy; spanning fisheries, shipping, carbon storage, coastal protection, biodiversity, cultural values; 2. The sustainable use of ocean resources for economic growth, improved livelihoods and jobs, while preserving the health of the ocean ecosystem.

boathook: Long pole with a hook and a spike at one end, used for moving boats or retrieving objects from the water.

botany: Scientific study of plants, including their physiology, structure, genetics, ecology, distribution, classification, and economic importance.

bottom culture: A shellfish cultivation technique that involves seeding and or growing shellfish directly on the ocean bottom.

bottom tray: A tray used to contain and grow shellfish that is positioned on and elevated slightly above the ocean bottom.

bow: Front end of a ship or vessel.

bowline: A type of knot used to form a non-slipping loop at the end of a line (or rope).

brailer bag: Strong carrying device with lifting straps used for carrying and unloading large quantities of fish (e.g. salmon), consisting of a net made of small-mesh webbing that can be attached to a frame and lifted out of the vessel.

breeding: Sexual reproduction that produces offspring in animals, plants, algae, or other sexually reproductive organisms.

bridle: The length of line attached to either end of the spreader in the five-line array, which connects the spreader to another connection point, such as the anchor line or anchor line buoy, forming a triangle.

broodstock: A group of sexually mature individuals of a cultured species used in aquaculture for breeding purposes; used for enhancement or replacement of existing populations, or the establishment of new populations.

Bruce anchor: A brand name of claw anchor.

buoy: An anchored float used to identify boundaries of a farm lease, anchor points, growline locations, and other structures on an ocean farm.

c-link: A stainless steel C-shaped connector or chain link for marine rigging; commonly used in ocean farming applications to quickly connect lines to one another.

carabiner: A metal ring, typically oval or D-shaped, with a spring-hinged opening on one side.

carbon credit: A generic term for any tradable certificate or permit representing the right to emit one ton of carbon dioxide or the equivalent amount of different greenhouse gases; devised as a market-oriented mechanism to reduce greenhouse gas emissions.

carbon dioxide: An important trace gas in Earth's atmosphere; one molecule of carbon dioxide is made up of one carbon atom and two oxygen atoms; CO₂.

carbon offset: A certifiable reduction of carbon dioxide emissions, resulting in the generation of a carbon credit.

carbon sequestration: The process of capturing and storing atmospheric carbon dioxide, to slow or reverse atmospheric CO₂ pollution and mitigate climate change.

carrageen: An edible red seaweed with a purplish pigment found in the Atlantic containing substantial amounts of carrageenan; *Chondrus crispus*, also known as Irish Moss.

carrageenan: A substance extracted from red and purple seaweeds, consisting of a mixture of polysaccharides, and used as a thickening or emulsifying agent in food products.

catenary: Curve formed by the weight of a chain, cable, or line hanging freely from two points; see catenary array.

catenary array: A longline array for growing seaweed composed of multiple horizontal longlines spaced closely together and tied at either end to a horizontal catenary framing line; the framing line provides uniform tension across the series of longlines, which are cut to different lengths. Catenary arrays require fewer, but larger anchors than the equivalent amount of longlines used on a series of single-line arrays.

checklist: List of items required, things to be done, or points to be considered.

chlorophyll: Pigment that makes plants green present in all green plants and cyanobacteria. It is vital for photosynthesis and allows plants to convert sunlight into energy, and converts water and carbon dioxide into starches that plants can use for food.

chlorophyta: Scientific name of green algae.

ciliate: Single celled organisms that at some stage in their life cycle possess cilia or ciliary structures - short hairlike organelles used for locomotion and food gathering. Ciliates are part of a large and diverse group of advanced protozoans.

clam: A marine bivalve mollusc with shells of equal size and a “foot” for burrowing in the sand.

claw anchor: Drag embedment anchor with a fixed shank and scoop-shaped fluke.

cleat: T-shaped piece of metal or wood used for securing rope, especially on a boat, ship, or dock.

compass: Instrument containing a magnetized pointer that shows the direction of magnetic north and bearings from it.

concrete anchor: Manufactured or homemade anchor composed of cement, sand, and gravel; generally rectangular, pyramidal, or trapezoidal in shape.

continental shelf: Area of seabed around a large landmass where the sea is relatively shallow compared with the open ocean and geologically part of the continental crust.

consumer packaged good (CPG): An industry term for items used daily by the average consumer that must be replaced or replenished frequently, such as food, beverages, toiletries, clothes, and household products.

cross-sectional diagram: 1. A depiction of a vertical plane cut through an object or area; 2. In ocean farming, a drawing of an array from the seafloor to the sea surface that shows the position of and relationship between anchors, buoys, growlines, crops, and associated gear, as well as bottom type, water depths, and other information; as if viewed from underwater.

crown: Point of connection between different parts of an anchor, generally at the base; on a fluke anchor, the crown connects the stock, fluke, shank, and tripping ring.

cultivar: Plants obtained by targeted selection or breeding, where different cultivars can be obtained from the same species.

cultivation: 1. Act of nurturing and growing. e.g. a crop; 2. Cultivate (verb) an area, i.e. land or sea.

current: 1. The motion of the ocean; 2. The continuous, directed movement of sea water generated by a number of forces acting upon the water, including wind, waves, tides, temperature and salinity differences, and other forces.

current meter: An instrument used to measure the speed and direction, or just the speed of a current.

current velocity: The speed of the movement of ocean currents, measured in centimeters per second (cm/s) or knots (kn). Current velocity may differ between the surface, water column, and seafloor.

cytoplasm: The gelatinous liquid that fills the inside of a cell.

davit: Small crane on board a vessel used for suspending and lifting gear, including kelp lines and shellfish cages.

deadweight anchor: Heavy objects repurposed for use as permanent moorings (granite slabs, engine blocks, railroad wheels, etc.); their holding power is equivalent to their weight alone.

deploy: 1. Install; 2. Move into position.

diatoms: 1. Single celled algae; 2. Major group of algae, specifically microalgae, found globally in oceans, waterways and soils.

direct seeding: Method where seaweed seedlings (meiospores, gametophytes, or sporophytes) are applied directly to cultivation lines by painting or spraying a solution seedlings onto the lines, sometimes with special glues or binders.

dock: 1. Structure extending alongshore or out from the shore into a body of water, to which a boat can be moored; 2. to tie up a boat or ship at a dock, especially in order to load or unload passengers or cargo.

domoic acid: A naturally occurring toxin produced by certain types of algae (including diatoms of the genus *Pseudo-nitzschia* sp. and some red algae) that causes amnesic shellfish poisoning. Shellfish may accumulate domoic acid without apparent ill effects, but contaminated shellfish can be harmful and even fatal to humans. Cooking or freezing does not destroy domoic acid in shellfish.

Doppler shift principle: A principle used to describe the change in frequency of a sound or light wave in relation to an observer; the Doppler shift or Doppler effect.

drag-embedment anchor: An anchor that derives its holding power from being buried or embedded within the seabed; installed by towing or dragging into position.

drag-tilt principle: Within a stationary current flow, a tethered object will experience a tilt induced by the force balance of buoyancy, drag, and mooring tension.

drifter: A floating object, such as a ball or buoy, that can be used to measure sea surface current speeds when timed floating between two fixed points.

drive steel: A steel rod that is attached to some types of embedment anchors for setting and removed once the anchor base-plate is driven to the proper depth.

drogue: Device, typically conical or funnel-shaped with open ends, towed behind a boat, (aircraft, or other moving object) to reduce speed or improve stability.

ear hanging: A scallop cultivation technique developed in Japan, in which a hole is drilled into one of two flat corners of the shell (called the ear) near the hinge so that it can be tied to a submerged line for grow-out.

ebb: 1. Movement of the tide flowing out to sea; 2. moving away from the shoreline.

ecosystem: 1. Biological community of interacting organisms and their physical environment; 2. Complex network or an interconnected system.

ecosystem services: 1. Material or energy outputs from ecosystems; 2. Services can be grouped into four broad categories: provisioning, such as the production of food and water; regulating, such as the control of climate and disease; supporting, such as nutrient cycles and oxygen production; and cultural, such as spiritual and recreational benefits.

embedment anchor: An anchor that derives its holding power from being buried or embedded within the seabed.

endemic: 1. Native; 2. Found in a certain place; 3. Located in a geographical area.

eukaryote: Organisms whose cells have a nucleus enclosed within membranes. Eukaryotes include all living organisms other than the eubacteria and archaeobacteria.

exclusive economic zone (EEZ): 1. Area that extends up to 200 miles offshore from a state or country's coastline; 2. Boundary of national jurisdictional waters with international waters beyond 200 miles.

fid: Tool shaped like a spike with a handle traditionally made from wood or bone that is used in seamanship to splice rope and work with canvas; a must-have tool for an ocean farmer.

flagella: 1. Slender threadlike structure, especially a microscopic appendage that enables many protozoa, bacteria, spermatozoa, etc. to swim; 2. Whip-like attachment.

flagellate: Protozoan of a cell or single celled organism with one or more flagella used for swimming.

floating line: A type of rope that will float to the water surface when not under tension; typically made of polypropylene or other synthetic materials.

flood: 1. Movement of the tide flowing in from the sea; 2. Moving towards the shoreline.

flotsam: 1. Floating debris; 2. The wreckage of a ship or its cargo found floating on or washed up by the sea.

fluke: 1. Broad triangular plate on the arm of an anchor; 2. Lobes of a whale's tail.

fluke anchor: A lightweight type (LWT) drag-embedment anchor with large pivoting triangular flukes and a hinged stock that allows the anchor to self right.

fo'c'sle: Forecastle (see below).

footprint: Area or space taken up by an aquaculture site or ocean farming gear, as measured on the seafloor.

forecastle: Forward part of a ship below the deck, traditionally used as crew's living quarters; often shortened to fo'c'sle.

frond: The flattened structure of the seaweed thallus that resembles a leaf; lamina.

gamete: Reproductive or sexual cell, either an ovum or a sperm, containing one copy of the chromosome set.

gametophyte: Seaweed organism consisting of cells with a single chromosome set is called a gametophyte, i.e. the haploid and sexual phase in the life history of an algae, produces gametes.

gear area: The area (length x width) as measured on the seafloor that contains your ocean farming gear (including all anchors, lines, and buoys).

genetic engineering: Transformation and regeneration process.

Geographic Information System (GIS): Application used to store, view, and analyze geographical information.

Global Positioning System (GPS): System of satellites, computers, and receivers.

grapnel anchor: Grappling hook; small anchor with several flukes.

grapple: 1. Seize with a grapnel; 2. Act of grappling.

grappling hook: Device with iron claws, attached to a rope and used for dragging or grasping.

growing season: Duration of time between outplanting and harvest, when crops are accumulating biomass.

growline: A submerged longline on an ocean farm that crops are attached to and grow from.

growline clearance: The vertical distance between your horizontal growline and the seafloor, measured at mean lower low water and mean high water.

growline footprint: The linear length of growing area on a growline plus any additional length needed for attaching the growline to anchor lines or other structures.

growline floatation buoy: A buoy attached to the growline with a length of rope; meant to maintain the depth of the growline relative to the water surface.

haploid: Single set of chromosomes, i.e. half the normal number.

haptera: Plural of **hapteron**.

hapteron: A structure that attaches the alga to an object or substratum, e.g. to a line or the ocean floor; holdfast.

harmful algal bloom (HAB): Dense aggregation of phytoplankton that produces harmful toxins and when consumed by filter-feeding bivalves can lead to various nasty and occasionally lethal shellfish poisoning symptoms.

harvest: 1. Process or period of gathering a crop; 2. Season's yield or crop.

hatchery: Facility where kelp spores are induced and cultivated ready for outplanting to the farm site; also applies to facilities for cultivation of oysters or fish. See also, **nursery**.

heavy metal: some may be poisonous e.g. mercury, cadmium, lead; others play an important nutritional role by providing a source of trace elements, e.g. iron, copper, manganese.

helical anchor: Embedment anchors made up of one or more helical blades attached to a vertical shaft, which must be twisted or "screwed" into place by hand or with marine hydraulic equipment; a screw anchor.

helical blade: A helix-shaped bearing plate welded to the central shaft on a helical anchor.

high tide: State of the tide when it reaches its highest level.

hitch: Connection that fastens a rope or line to another object, such as a carabiner or pole, and relies on that object to hold it.

holdfast: A specialized structure at the base of the seaweed that acts as an anchor and allows it to attach to a surface, e.g. to a growline or rock; hapteron.

holding power: The pounds of force that an anchor can hold per pound of anchor dry weight (i.e. breakout force/anchor dry weight).

hook: Slang term for anchor.

inbreeding: 1. Production of offspring through mating between closely related individuals, especially over many generations; 2. Crosses between two related individuals of the same population, which are genetically close.

induce: Bring about, initiate, or influence.

induced sporing: 1. Bring about reproduction artificially; 2. Assisted reproduction, e.g. stimulating kelp sorus tissue to reproduce under hatchery conditions.

inorganic nitrogen: Inorganic forms of nitrogen including N₂ gas, nitrate, nitrite, and ammonium. Nitrate is the most common form of inorganic nitrogen in soils, and can be absorbed by plants. If too much inorganic nitrogen is leached into the marine environment (through terrestrial runoff) it can lead to eutrophication.

inorganic nutrient: In general, an inorganic nutrient is a category of nutrients that does not contain carbon in its chemical structure.

installation: Place, deploy or fix equipment in position ready for use.

integrated multi-trophic aquaculture (IMTA): A type of aquaculture in which multiple aquatic species from different trophic levels are farmed together, such that the byproducts from one aquatic species (such as excretia from finfish) act as inputs for another (seaweed and/or shellfish).

invasive species: 1. Alien or non-native species established outside of its natural past or present distribution; 2. Introduction and/or spread threatens natural biological diversity.

invertebrate: An animal lacking a vertebral column, or backbone.

jetsam: Unwanted materials or goods that have been thrown overboard from a ship and washed ashore; cargo that is intentionally discarded from a ship or wreckage.

jettison: Action of throwing goods overboard to lighten the load of the ship if it is in danger of sinking.

kelp: The common name for any number of species of brown macroalgae of the order Laminariales.

keystone species: A species that is both critical to the function of a particular ecosystem and upon which other organisms depend; removal of a keystone species would result in drastic change or collapse of an ecosystem.

knot: 1. Intentional complication in cordage which may be useful or decorative. Typically a knot joins two ropes together or a rope to itself, and done correctly a knot will hold shape regardless of it being fixed to something else. Practical knots may be classified as hitches, bends, or splices; 2. A nautical unit of speed; one knot is equivalent to one nautical mile per hour; standard symbol for the knot is kn.

lagan: 1. Goods cast overboard that are heavy enough to sink to the ocean floor, but are tied or otherwise linked to a floating marker, such as a buoy or cork, so that they can be found again by whoever marked the item; 2. Large objects trapped within a sinking vessel.

lamina: 1. Lamina or blade in macroscopic algae like seaweed is a generally flattened structure that typically forms the principal bulk of the thallus. It is often developed into specialized organs such as flotation bladders and reproductive organs; 2. layer, thin plate, or scale.

laminaria: Brown algae or large seaweeds commonly known as kelp, which requires nutrient rich water below about 20°C and can be found growing in underwater forests; laminariales.

landing craft: A vessel designed for putting people and or equipment ashore on a beach; usually includes a large cargo deck and ability to lower the bow like a gate for ease of transport of equipment, supplies, vehicles, and personnel.

lantern net: Cylindrical nets with one or more chambers, which hang vertically in the water column from a longline or other structure, used for growing shellfish. Lantern nets were first developed in Japan for scallop cultivation.

lead line: A length of rope either embedded with lead shot or lead-core line or weighted with external lead beads (seine leads), designed to sink in water.

lease: Areas or grounds (for mariculture) usually held in the public trust, e.g. by the State, where seaweed and/or shellfish cultivation is allowed and the area is leased by the ocean farmer, with permits and licenses required to authorize mariculture operations.

leeward: 1. Downwind; 2. On or toward the side sheltered from the wind.

leeway: Sideways drift of a ship (or aircraft) to leeward of the desired course or direction.

license: 1. Permit from an authority to own or use something, or to do a specific thing like carry on a particular trade, e.g. mariculture license.

life cycle: Duration and steps which an organism goes through, from a single-cell stage, to the next generation, usually involves an alternation of haploid and diploid generations (haplo-diplobiontic) and sexual reproduction.

lightweight type anchor (LWT): An anchor that is relatively light for the amount of holding power it provides.

line: A length of cord, rope, wire, or other material serving a particular purpose; a line is labeled by the job it performs (i.e anchor line, dock line, etc.).

local strains: Cultivated strain or variety whose genetic background is similar to that of the natural population geographically close. The degree of similarity taken into account is directly dependent on the observed genetic diversity of the species in the considered area, compared to distant populations of the same species. It is a relative parameter ("more or less similar").

logistics: Detailed coordination of a complex operation.

macroalgae: Large, multicellular aquatic and photosynthetic plant-like form of algae.

mariculture: 1. Controlled cultivation of marine and estuarine organisms in salt waters, i.e. in oceans, estuaries, embayments; 2. A specialized type of aquaculture undertaken in marine environments.

marine: 1. Relating to or produced by the sea; 2. relating to shipping or naval matters.

marine farming: See **mariculture** and **ocean farming**.

marine macroalgae: 1. Refers to seaweeds, growing in the ocean with size range from small to large, traditionally classified into three groups: Brown (*Phaeophyceae*), Red (*Rhodophyta*), and Green (*Chlorophyta*); 2. group of multicellular organisms which can form large "forests" in the ocean.

marine protected area (MPA): areas of the seas, oceans, estuaries, or U.S. Great Lakes that are fully or partially protected from human activities for conservation purposes.

mariner: 1. Sailor; 2. Person who navigates or assists with navigating a ship.

maritime: 1. Living or found near or in the sea; 2. Connected with the sea, especially relating to seafaring commercial or military activity.

marker buoy: See **regulatory marker buoy**.

marketing: Art of communicating the value of your products to people who need, want, and are able to purchase them.

marlinspike: Metal tool used in marine ropework with natural and synthetic lines, and it can also open shackles.

mean high water (MHW): The average depth of water at high tide over the available period of record.

mean higher high water (MHHW): The average highest water depths at highest tides over the available period of record.

mean low water (MLW): The average depth at low tide over the available period of record.

mean lower low water (MLLW): The average of the lowest depths of low tide available over a period of record; usually the depth listed on a nautical chart.

mean water level (MWL): The average of all hourly water levels over the available period of record.

mean sea level (MSL): The average depth of the ocean.

meiosis: A type of cell division that produces four cells, each with half the number of chromosomes of the parent cell.

meiospore: A haploid spore produced from meiosis; a precursor to the gametophyte life phase.

meristem: 1. Region of rapidly dividing, undifferentiated cells; 2. area of rapid growth.

microalgae: 1. Unicellular algae e.g. blue-green microalgae; 2. also called phytoplankton or diatoms.

midrib: Middle of a kelp blade.

mitosis: Process of dividing a cell and its nucleus into two cells, each with their own nucleus.

mollusc: A diverse phylum of invertebrate organisms ranging from snails, bivalves, squid and octopuses. Common features of the mollusca phylum include a soft unsegmented body, living in aquatic or damp habitats, and many have an external, calcareous shell.

monoculture: The practice of growing a single crop in a given area at a time.

moor: 1. To secure in place; to anchor; 2. To make fast with or as if with cables, lines, or anchors.

mooring: Device for holding a vessel in place, where an anchor, concrete block, or similar device is placed or dropped on submerged lands with a line attached to a buoy to which the vessel is attached, may be temporary or permanent.

mooring block: Permanent anchor, can be made of concrete.

multi-trophic aquaculture: Practice of growing several aquatic species together. For example, fed fish together with seaweeds absorb nutrients and nitrogen from the fish, and/or filter-feeding animals, such as shellfish, that can absorb organic nutrient waste from the fish.

mushroom anchor: Cast iron embedment anchor with a curved mushroom-like cap (or bell) with the shank welded to its center.

mussel: The common name for a type of commercially important bivalve mollusc that is found in both saltwater and freshwater environments. The shells of these organisms are elongated and asymmetrical.

mussel sock: A soft, oblong fabric container used for cultivating mussels on an ocean farm. Often hangs in loops from a longline.

nacre: Shiny layer of a mollusc's shell, usually on the inside, known as mother-of-pearl.

native species: Local to and settled in an area, naturally and independently from any human activity.

nautical: Related to maritime.

nautical mile: 1. unit used to measure distance at sea, equal to approx. 2,025 yards (1,852 m); 2. also used in air and space navigation, and; 3. in definition of territorial waters. Abbreviation is NM or nmi.

navicular: Boat shaped.

navigable: Refers to a waterway or sea, and the ability to be sailed on or navigated across by ships or boats.

navigable waters: 1. Waters subject to the ebb and flow of the tide; 2. Inland waters presently used, or have been used in the past, or may be susceptible for use, to transport interstate or foreign

commerce while the waterway is in its ordinary condition at the time of statehood, as defined by the US Army Corps of Engineers¹. Federal agencies define jurisdiction based on location of navigable waters.

navigate: 1. Plan and direct the course of a boat, using instruments or maps; 2. sail or travel over a stretch of water (or land).

neap tide: 1. Tide happens twice a month, just after the first or third quarters of the moon when there is the least difference between high and low water; 2. occurs when the sun, moon, and earth form a right angle which causes regular high tides and low tides to become much lower than usual.

nearshore: Location close to shore.

neutrally buoyant line: Rope that is composed of a mix of fibers (such as nylon and polypropylene) with density equal to the density of the fluid in which it is immersed, resulting in the buoyant force balancing the force of gravity that would otherwise cause it to sink or rise.

Niskin bottle: A sampling device that allows the user to collect water at a desired depth and bring it to the surface without fear of mixing with water of other depths; once at the surface water quality measurements may be performed; see also **at-depth sampler** and **Van Dorn water sampler**.

non-native: Species introduced deliberately, or not, into an area as a result of human activities. Also alien or invasive.

nursery: Infrastructure where spores from native parent plants are released, settled onto seed string wrapped around a PVC pipe, and cultivated in clean seawater to reach the juvenile kelp stage which takes about 4 to 6 weeks. See also, **hatchery**.

nylon: a tough, lightweight, elastic synthetic polymer with a protein-like chemical structure, able to be produced as filaments, sheets, or molded objects

nytin: Positive Icelandic term to describe a person who uses things to their fullest.

ocean acidification: The reduction of pH in the ocean over a period of time caused by uptake of large amounts of carbon dioxide from the atmosphere. Harmful to aquatic life, including shellfish.

ocean farm: A commercial enterprise that uses the nutrients floating freely in the water and the light of the sun to grow food, predominantly seaweed and shellfish.

¹ as codified under 33 [CFR 329](#)

ocean farming: See **mariculture**.

off-bottom culture: A method of cultivating seaweeds and shellfish that involves floating gear suspended from arrays.

offshore: Common notion of "offshore" simply refers to "not on land", meaning the cultivation of fish, shellfish or seaweed in cages, long lines or other structures in the sea. In the context of seaweed farming, it is suggested that the term "offshore" can be used for large-scale activities in open-sea waters, or Federal waters, unlike most farming in "nearshore" coastal waters.

outboard: On, towards, or near the outside, especially of a ship or boat, e.g. outboard motor which is usually mounted on the outside of the stern of a boat.

outbreeding: Production of offspring through mating between unrelated or distantly related individuals.

outplanting: Term used to describe practice of transferring seeded lines and/or juvenile kelp and planting out in the open water at the ocean farm site.

onion bag: Mesh bag used to collect, hold and drain harvested kelp.

oyster: 1. The common name for a number of edible, marine, bivalve molluscs with rough and irregular shells, closed by a single adductor muscle; 2. To dredge or take oysters.

paralytic shellfish poisoning (PSP): A naturally occurring marine biotoxin that is produced by some species of microscopic algae. Shellfish eat these algae and can retain the toxin in their tissue. People can become ill from eating shellfish contaminated with Paralytic Shellfish Poison. This biotoxin affects the nervous system and paralyzes muscles, thus the term "paralytic" shellfish poison. High levels of Paralytic Shellfish Poison can cause severe illness and death.

pear link: Pear shaped connecting link with a narrow end that restricts the movement of the line (rope) and chain used in a mooring, and a wide end for attaching to multiple connectors.

pelagic: Open sea.

pelagic zone: 1. Area of the ocean outside of coastal areas which lies over and beyond the continental shelf; 2. also called the open ocean.

permit: Authorization or approval to operate or conduct a specific activity e.g. mariculture permit.

PFD: Personal Floatation Device.

phenotype: Set of observable characteristics of an individual resulting from the interaction of its genotype with the environment.

photosynthesis: Ability for a plant to produce energy and give off oxygen.

phytoplankton: Plankton consisting of microscopic plants

phycology: 1. Scientific study of algae, also known as algology; 2. Branch of life science and often regarded as a subdiscipline of botany.

plankton: Small and microscopic organisms drifting or floating in the sea or in freshwater, consisting chiefly of diatoms, protozoans, small crustaceans, and the eggs and larval stages of larger animals. Many animals are adapted to feed on plankton, especially by filtering the water.

plow anchor: Anchor with ability to swivel on a hinged shaft and adapt to pull of tide change.

pneumatocyst: A gas-filled structure, or vesicle, on the thallus of brown seaweeds that provides buoyancy to lift the seaweed toward the surface and access sunlight for photosynthesis; air bladder.

polyculture: The practice of growing several crops, simultaneously in a single farming system.

polypropylene: A type of common plastic, commonly used in lines. Polypropylene line floats.

population: Group of individuals belonging to the same species, reproducing mainly between themselves, occupying a common geographical area and playing a particular role in the ecosystem (Odum 1971).

port: 1. Town or city with a harbor where ships load or unload, especially one where customs officers are stationed; 2. Side of a ship or boat that is on the left when one is facing forward; 3. Turning to port means moving the vessel toward the left.

porthole: Opening in the side of a ship which can also be used for boarding or loading.

PPE: Personal Protection Equipment.

pretensioning: The process of applying tension to a length of rope or line to stretch it and remove slack before measuring, cutting, or tying. Depending on the elasticity of the rope, and as long as the rope was not stretched beyond its elastic limit, it will recover to its original length and shape.

product: 1. Article or substance manufactured to create a product for sale; 2. Person or thing that is the result of an action or process; 3. Product in marketing is an object or system made available for consumer use; 4. Anything that can be offered to a market as a product to satisfy the desire or needs of a customer.

propagate: 1. Process of growing or breeding new specimens of (a plant or animal) by natural processes from the parent stock; 2. Sexual or asexual reproduction.

protozoan: Single-celled microscopic animal of a group of phyla of the kingdom *Protista*, such as an amoeba, flagellate, ciliate, or sporozoan. Like bacteria, single celled but are larger, and contain a nucleus and other cell structures, making them more like plant and animal cells.

protist: Eukaryotic organism that is not an animal, plant, or fungus. It can be a single or multi-celled organism such as kelp.

protozoa: An informal term for single-celled eukaryotes, either free-living or parasitic, which feed on organic matter such as other microorganisms or organic tissues and debris. Protozoa is a high-level taxonomic group used in some systems of biological classification.

pseudopodia: A temporary, arm-like projection of the cytoplasm of a eukaryotic cell.

public commons: A natural resource available to all members of society, such as air, water, and a habitable earth, and managed collectively by a community or society.

pyramid anchor: Cast iron embedment anchor that is shaped like a pyramid, with a short shank welded to its base; a compact redesign of the mushroom anchor.

rack and bag culture: A method of oyster cultivation in the intertidal zone where oysters are housed in bags and secured to the seafloor by rebar. The tidal fluctuation allows the oysters to access nutrients at high tide, and exposes them to the open air to prevent fouling at low tide.

regenerative: 1. Renewal, regrowth or restoration of a system; 2. Process enabling ecological and social systems to return to and maintain a healthy state; 3. To grow and evolve.

regenerative ocean farming: A zero-input (no feed, fertilizer, or freshwater), small-footprint, polyculture model that grows a mix of native seaweed and shellfish species—sequesters carbon and rebuilds marine ecosystems, feeds the planet, and creates viable and sustainable economic activity in coastal communities hard hit by climate change.

regulatory buffer: An area of reserved open space around the outermost perimeter of your ocean farm gear. Sometimes dictated by state or Coast Guard mandate, often 50-feet.

regulatory marker buoy: An informational buoy, often of a tall conical or cylindrical shape, or with orange or brightly colored markings, that advise caution of a nearby danger such as shallows, or the submerged gear of an ocean farm.

restorative: Action of returning or bringing back, i.e. restoring social and ecological systems, to a healthy, balanced state.

rhodophyta: Scientific term for classification of red algae.

rig: 1. Setup; 2. Assemble; 3. Make ready for operation.

rigging: 1. System of ropes, cables or chains used to support the structure of an ocean farm; 2. System of ship's masts and used to control yards and sails.

riparian: Relating to wetlands located adjacent to bays, rivers and streams.

rode: A line (or chain) securing an anchor or trawl. The entire distance between the anchor and gear it supports is referred to as the "anchor rode."

rope: A length of fibers twisted or braided together to provide a means of connecting, securing, and or pulling objects. Often called a line, in maritime settings.

salinity: Level of saltiness or amount of salt dissolved in a body of water, usually measured in parts per thousand (PPT).

scallop: 1. The common name for a commercially important bivalve mollusc with ribbed, fan-shaped shells; scallops swim by rapidly opening and closing their shells; 2. To gather or dredge for scallops.

scope: Ratio of the length of chain or rope attached to an anchor in relation to the depth of the water.

screw anchor: See **helical anchor**.

sea anchor: Object dragged in the water from the bow of a boat in order to keep the bow pointing into the waves or to lessen leeway movement.

seaweed: 1. The common name for countless species of marine plants and algae that grow in the ocean as well as rivers, lakes, and other water bodies; includes microscopic and macroscopic organisms 2. Marine macroalgae.

Secchi disc: A measuring device that consists of a circular, opaque disk which the user descends slowly into the water column via a long cord attached to its center. The depth at which

the disk is no longer visible translates to a measurement of water clarity; this measurement is directly related to turbidity.

seed spool: PVC pipe wrapped with string or twine used for kelp seeding process.

seedstring: (Also seed string) string or twine seeded with kelp spores produced in a nursery. Kelp sorus tissue (i.e. native kelp reproductive tissue) releases spores into clean seawater, where they settle onto string pre-wound on specialized spools. Spores grow and evolve on the string into microscopic gametophyte stages where they continue development stages to reproduce and become young juvenile kelp.

selection program: Process by which artificial selection for individuals with targeted traits is operated through a succession of crosses between selected biological parents.

selective breeding: Forced sexual reproduction of organisms with desirable traits in an attempt to produce offspring with similar desirable characteristics or particular phenotypic traits.

senescence: Condition or process of biological deterioration that happens with age.

set: Place gear or anchor so that it holds position securely.

shackle: A metal link, typically U-shaped and closed by a bolt, which is used to secure a chain or rope to something else.

shaft: (anchor anatomy) The long central piece of the anchor that is pulled to set the anchor. Also see shank.

shank: The elongated vertical central stem of an anchor that is pulled to set (or bury) the anchor on the seafloor.

single-line array: A type of array used in ocean farming consisting of one horizontal growline (for seaweed or shellfish) suspended by growline buoys and anchored one either end. Compare to 5-line or multiline catenary array.

sinking line: A line that is not buoyant or neutrally buoyant in the water. Polyester, nylon and natural fiber lines are sinking lines.

skiff: Small open boat used as a runaround, usually without a wheelhouse, handy for checking lines.

social license: 1. Definition of social acceptability (Brunson, 1996) that refers to the perceptions of local stakeholders and the acceptance and ongoing approval of the local community for a project or operation such as an ocean farm; 2. Social permission.

soft shackle: A connection point made from spliced line (commonly Dyneema) that mimics the function of a metal shackle. A small length of line with an eye spliced at one end and a stopper knot at the other.

sorus (sori): Cluster of reproductive structures.

sorus induction: 1. Process of manipulating a non-reproductive kelp blade to form sorus tissue, through maintaining the blades in a short-day (8 hrs light per day), cool temperature (10 - 15°C) environment; 2. Further enhancement of sorus formation can be achieved through the removal of the blade meristem.

spat: Common term for settled bivalve larvae, especially oysters and mussels.

splice: 1. Join or connect (with a rope or ropes) by interweaving the strands; 2. Multi-strand bend or loop.

sporangia: Reproductive structures.

spore: Cell that functions an organism's means of dispersal and asexual reproduction. Some seaweeds reproduce by means of spores.

sporophyll: Part of seaweed that produces spores for reproduction.

sporophyte: Originates from a spore undergoing mitosis to produce a new organism, a multicellular gametophyte which produces differentiated gametophytes (egg and sperm cells) that fuse together to form a zygote from which a new sporophyte originates.

sporulation: Formation of spores, especially the division into many small spores usually of vegetative cells during unfavorable environmental conditions.

spreader bar: A hollow aluminum pipe with welded eyes that serves as a connection point for multiple growlines in a 5-line array. Commonly spreader bars are 3" in diameter and 10' long, with welded eyes spaced every 2'.

spring tide: 1. Tide occurring just after a new or full moon, when there is the greatest difference between high and low water; 2. Occurs when the sun, moon, and earth are lined up and causes regular high tides and low tides to become much higher or lower.

stakeholder: Defines someone with an interest or concern in relation to something such as an ocean farm.

starboard: Side of a boat or ship that is on the right when one is facing forward.

stern: Rear end of a vessel (boat)

stipe: Stalk or stem, especially of a seaweed

stochastic disturbance: nondeterministic disruption (often to an ecosystem); patterns of disruption that can be analyzed statistically but not predicted precisely; random probability.

stock: (anchor anatomy) the horizontal arm at the end of the shank that is set at right angles to the flukes of the anchor. The stock ensures that the arms rest vertically on the seabed, and thus one fluke will dig itself in, providing maximum holding power.

strain: Term has no official definition or ranking status in botany but can refer to the offspring from a common ancestor with uniform phenotypes (Usher, 1996)² (In order to avoid any confusion between the terms “strain” and “lineage” in these guidelines, we make the choice to use “strain” as one isolated individual (e.g single isolated genotype) from either a wild or a cultivated population. “Lineage” will refer to the succession of offsprings from artificial crosses between strains.)

sugar kelp: *Saccharina latissima*, most common species of kelp being cultivated commercially worldwide.

substrate: the natural environment in which an organism lives, or the medium on which an organism (such as kelp) attaches and grows.

sustainable: Practice to ensure that an activity meets the needs of the present without compromising the ability of future generations to meet their own needs.

swivel: (Or swivel shackle.) A type of hardware connection that allows one piece to rotate 360-degrees in relation to the other. Ideal for anchor connections to minimize twisting of an anchor rode.

tagline: A line attached to the back of an anchor that is used to position or retrieve the anchor. Pulling the tag line release the anchor from the substrate, or pulls in the opposite direction than the gear.

TEK: Traditional Ecological Knowledge.

temperate: Moderate temperature, i.e. not extreme.

² add footnote

temperate oceans: Regions of mixed moderate temperature water i.e. not tropical or arctic, located between the winter ice pack limit and the tropics, where currents of warm tropical water move toward the poles and cold polar water moves toward the equator.

tension buoy: A buoy spliced or attached along the run of the anchor rode to pull tension on an array during slack or low tide.

thallus: The entire body of a seaweed.

3D ocean farming: A vertical polyculture farming system that utilizes the entire water column to grow a mixture of seaweed and shellfish; see also **regenerative ocean farming**.

tidal bore: Large wave or bore caused by the constriction of the spring tide as it enters a long, narrow, shallow inlet.

tidal range or zone: Distance between the depths of water reached during the highest high tide and the lowest low tide.

tide: Alternate rising and falling of the ocean or sea due to the attraction of the moon and the sun.

tidewater: 1. Water affected by the ebb and flow of the tide; 2. Water overflowing land at flood tide; 3. Low-lying coastal land.

tilt current meter: a simple tool for measuring current flow consisting of a meter and data logger housed in a vertical PVC pipe that is tethered to a ballast fixed in position on the seafloor. The PVC pipe bends in the direction of current flow, and the meter measures and logs tilt (angle) and direction (or bearing) using the drag-tilt principle.

to make fast: To make secure; to fasten firmly.

trace elements or trace minerals: Minerals present in living tissues in small amounts.

transgenic organisms: Genetically engineered to carry transgenes – genes from a different species – as part of their genome.

transplanting: Action of moving cultivated seedlings from the hatchery into the open ocean for continued growth and development as part of kelp cultivation on an ocean farm.

trophic level: Position an organism occupies in the food web where the food chain is the succession of organisms that eat other organisms and then an organism may in turn be eaten. The trophic level of an organism is the number of steps it is from the start of the chain.

turbidity: an optical parameter of water which measures that amount of light that is scattered by suspended material throughout; the relative clarity of a liquid.

twine: String

upwind: Against the wind; in the opposite direction to that in which the wind is blowing

value added product: Raw agricultural products that have been modified or enhanced to have a higher market value and/or a longer shelf life. Some examples include fruits made into pies or jams, meats made into jerky, and tomatoes and peppers made into salsa.

Van Dorn water sampler: A horizontal container with a spring-loaded closing device allowing water to be sampled at depth. See also **at-depth sampler** and **Niskin bottle**.

vegetative: Not associated with reproductive cells or sexual reproductive capacity.

vegetative reproduction: Asexual reproduction, e.g. cloning process, in which a mature organism grows from a fragment of the parental plant or its zoid.

vessel: Ship or boat.

water clarity: A measure of how far down in the water column light can penetrate. High water quality is associated with low concentrations of suspended particles and organisms. Low water quality (turbid waters) have high levels of suspended particles that absorb or scatter the light.

water column: an oceanographic concept used to describe the physical and chemical characteristics of seawater for its entire vertical depth at a defined geographical point.

wheelhouse: 1. Part of a boat or ship serving as a shelter for the person at the wheel; 2. Place or situation in which one is advantageously at ease.

weigh anchor: Bring the weight of the anchor back onto the boat.

wing anchor: a stockless drag embedment anchor that has a spade-shaped fluke that is designed to furrow into the seafloor until it embeds. See also **plow anchor**.

winged kelp: Common name for *Alaria esculenta* found in the North Pacific and North Atlantic; also called Wakame.

wrack: 1. Organic material deposited at or near the high tide line; 2. Items washed onto the beach from the open sea.

wrack zone or wrack line: Coastal feature where organic material such as kelp, seagrass, and other debris is deposited at high tide.

wreck: 1. Destruction of a ship at sea; 2. Shipwreck.

yield: The full amount of a product that has been produced. Such as the total amount of kelp grown on an ocean farm in one season.

zoid: 1. Reproductive cell that possesses one or more flagella, and is capable of independent movement, 2. Term used in botany.

zoospore: An asexual spore that is capable of swimming.

zygote: Cell resulting from the fusion of two gametes.