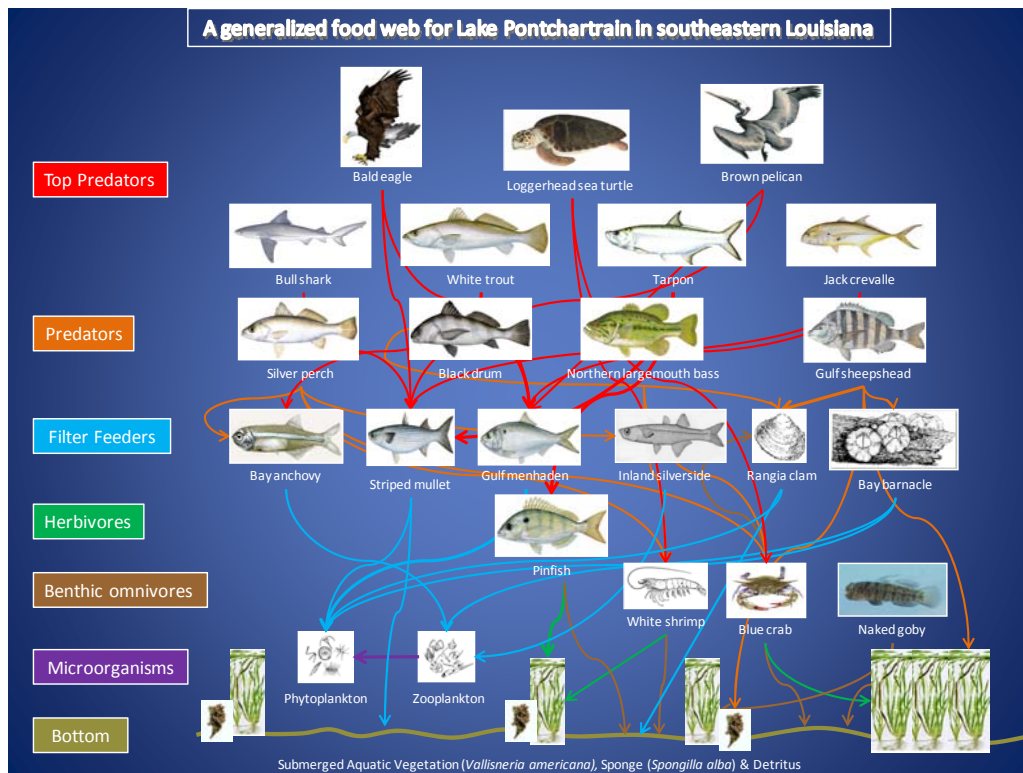


A Generalized Food Web for Lake Pontchartrain in Southeastern Louisiana

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SAVE OUR COAST SAVE OUR LAKE

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Introduction

Food webs illustrate a set of interconnected food chains by which energy and materials circulate within an ecosystem. Energy enters the food web from the sun and is subsequently lost at each stage or level as; feces (solid waste), movement energy and heat energy resulting in only a small amount of energy and biomass incorporated into the consumer's body and transferred to the next feeding level. Food webs transform overly simplistic food chains that show simple linear pathways into a complex network of interactions. Aquatic food webs have multidimensional levels that include a variety of organisms that play a specific role within their environment. These roles are dependent on habitat and environmental variables within an ecosystem or particular living place. These variables include temperature, salinity and dissolved oxygen concentration as well as human disturbances such as dredging, pollution, runoff and overfishing. Food webs are in a delicate balance and the smallest changes can have severe, detrimental effects on the organisms within the ecosystem. Aquatic food webs typically include the following levels: primary producers or autotrophs, filter feeders and herbivores, small predators, large or top predators and detritivores.

Primary producers or autotrophs are the most important organisms within aquatic food webs. Microorganisms called phytoplankton as well plants or algae within the aquatic ecosystem produce complex organic substances, essentially food, from an energy source and materials. These photosynthetic organisms use the sun's solar energy to convert carbon dioxide and nutrients into oxygen, carbohydrates and other molecules used by life. Autotrophs are the most numerous organisms within the aquatic environment because they serve as the base or first level of the food web. The vitality of all other organisms within aquatic ecosystems relies on the presence of primary producers. Zooplankton are heterotrophic microorganisms that feed on phytoplankton in order to survive and serve as food for filter feeding organisms.

Filter feeders and herbivores are the second level in aquatic food webs. Suspension feeders are animals that feed by straining suspended matter and food particles such as phytoplankton and zooplankton from water, typically by passing the water over a specialized filtering structure. There are a variety of filter feeding organisms within aquatic ecosystems including bivalves, sponges, barnacles, jellyfish, fish, sharks and whales. Suspension feeders play an important role by clarifying water. Herbivores within aquatic ecosystems feed on plants such as seagrass and algae. These organisms play an important role in reducing overgrowth. Filter feeders and herbivores form an important link within food webs as they consume plants in order to receive the carbohydrates produced by a plant from photosynthesis. Filter feeders and herbivores are considered primary consumers and are required to eat large quantities of food matter in order to obtain the necessary amount of nutrition.

Small predators are the third level in aquatic food webs. Secondary consumers within the aquatic environment primarily feed on filter feeders and benthic omnivores. Top predators are the fourth level in aquatic food webs. Tertiary consumers within the aquatic environment primarily feed on small predators or secondary consumers. Apex predators are located at the top of the food web and have few if any enemies. These heterotrophic organisms actively hunt or ambush their prey resulting in the death of that organism. As the trophic levels rise, the predators become fewer, larger and more agile. Predators play an important role in controlling the populations of filter feeders and herbivores within the aquatic environment. Several predatory organisms are considered keystone species. Keystone

species have a disproportionate effect on its environment relative to its abundance to the point where they affect many other organisms in an ecosystem and help determine the types and numbers of various other species in the community. Predators are exceedingly important within the aquatic food environment and the elimination of these consumers has catastrophic effects to the food web of the entire ecosystem.

Detritivores, also known as detritus feeders, are heterotrophs that obtain nutrients by consuming detritus or decomposing matter. These organisms generally play the role of decomposers and are often eaten by consumers and therefore commonly play important roles as recyclers in ecosystem energy flow and biogeochemical cycles. These scavengers are commonly invertebrates that feed on living or dead biomass on the bottom. Common detritivores within aquatic ecosystems include bivalves, crabs and shrimp but can also include fish species.

Lake Pontchartrain is a brackish water estuary located in southeastern Louisiana. It is the second-largest saltwater lake in the United States covering approximately 630 square miles. The lake has an average depth of 12-14 feet with a maximum of 18 feet and is characterized with a gradual sloping bottom. Lake Pontchartrain temperature ranges from 9°C in December to 34°C in June and August. Lake Pontchartrain is an oligohaline estuary meaning the salinity typically remains between 0-5 ppt although it can be higher during draughts or large influxes of water from the Gulf of Mexico. Lake Pontchartrain lies in the heart of the Pontchartrain Basin and is a vast ecological system that is home to many different species of fish, birds, mammals, and plants. As well as being tremendously important habitat for local wildlife, it functions as the center of the region's commercial and recreational fishing industries. The food web dynamics of Lake Pontchartrain are in a delicate balance due to the quality of the region's water and the multitude of organisms involved. It is the purpose of this presentation to describe the individual roles each organism has in the complex food web of Lake Pontchartrain.

Methods

The generalized food web of Lake Pontchartrain was constructed using the research of Dr. Rezneat M. Darnell. Dr. Darnell examined gut contents from fish and invertebrate species residing in Lake Pontchartrain in order to determine their food habits. That research publication was supplemented with more recent isotope data conducted by Dr. Jason Turner and the Nekton Research Lab at the University of New Orleans. These two large informational databases were compiled in order to determine the primary diets and trophic relationships each organism serves within the food web of Lake Pontchartrain.

Top Predators

Osprey (*Pandion haliaetus*) – Commonly known as the “sea hawk” this large raptor feeds primarily on fish along lakes, bays, river systems and coastal areas. This bird has dark brown upperparts and predominantly grayish white on the head and underparts while reaching two feet in length with a six foot wingspan. Ospreys sight their prey 10-40 meters above the water after which the bird hovers momentarily then plunges up to one meter in the water with their sharp talons. Ospreys are a top level predator in Lake Pontchartrain primarily feeding on striped mullet (*Mugil cephalus*) and Gulf menhaden (*Brevoortia patronus*).

Brown pelican (*Pelecanus occidentalis*) – One of the more recognizable seabirds of Lake Pontchartrain, this fish eating bird reaches four feet in length with a six to eight foot wingspan. The brown pelican’s head is white in front and dark brown behind with a silver-gray colored body. Pelicans sight their prey while soaring over the water after which it plunges with its 18 inch bill first 30-60 feet in the water, scooping approximately 2.5 gallons of water. Once the water is drained the bird tosses its head back to swallow the fish. Brown pelicans are a top level predator in Lake Pontchartrain primarily feeding on striped mullet (*Mugil cephalus*) and Gulf menhaden (*Brevoortia patronus*).

Bald Eagle (*Haliaeetus leucocephalus*) – The national bird and symbol of the United States, the bald eagle is the most recognizable bird in North America. Commonly known as the “sea eagle” this raptor has a brown body and white head and tail while reaching three feet in length with a six to eight foot wingspan. Bald eagles primarily feed on fish near seacoasts, rivers, large lakes, and oceans by swooping down and snatching fish out of the water with their large, sharp talons. Bald eagles are a top level predator in Lake Pontchartrain primarily feeding on striped mullet (*Mugil cephalus*) and Gulf menhaden (*Brevoortia patronus*).

Loggerhead sea turtle (*Caretta caretta*) – Named for their relatively large head, loggerhead sea turtles have a reddish brown carapace and reddish brown to pale yellow skin. Loggerheads have large powerful jaws used to crush prey items. The turtles nest on ocean beaches and estuarine shorelines and live in a variety of habitats including bays, lagoons, estuaries, salt marshes, creeks, ship channels and mouth of large rivers. Loggerhead sea turtles are a top level predator in Lake Pontchartrain primarily feeding on benthic invertebrates especially white shrimp (*Penaeus setiferus*) and blue crabs (*Callinectes sapidus*).

Bull shark (*Carcharhinus leucas*) – The bull shark is a common coastal shark in the Northern Gulf of Mexico especially in shallow water bays, estuaries, rivers and lakes. Bull sharks have a unique ability to tolerate freshwater enabling them to travel up rivers and hypersaline bays particularly when they are young providing with them name “river shark”. They are gray in color with two triangular black tipped fins on the dorsal side and white on the ventral side. Reaching a maximum length of 3.5 m they are solitary hunters feeding primarily on bony fishes. Bull sharks are considered one of the top predators since it is one of the largest and carnivorous to the predatory species in the shallow and deeper waters of Lake Pontchartrain primarily feeding on striped mullet (*Mugil cephalus*) and Atlantic croaker (*Micropogonius undulatus*).

Spotted seatrout (*Cynoscion nebulosus*) – Commonly referred to as the “speckled seatrout” it is a common estuary fish in the Northern Gulf of Mexico that can be found in virtually any inshore waters, from the surf of outside islands to far up coastal rivers and lakes. Spotted seatrout prefer shallow bays and estuaries with oyster beds and seagrass flats that attract prey during the spring and summer while traveling to deeper bay waters and the Gulf of Mexico as water temperatures decline in the fall. Contrary to its name the speckled seatrout is a member of the drum family (*Sciaenidae*) and grow on average to 19-25 inches in length weighing up to 2-3 lbs. These fish possess large, prominent canine teeth and have a dark back with gray or silvery sides marked with scattered oscillated black spots of varying sizes. Spotted seatrout are top level predators in Lake Pontchartrain primarily feeding on Atlantic croaker (*Micropogonius undulatus*) and bay anchovy (*Anchoa mitchilli*).

Spotted Gar (*Lepisosteus productus*) – Primitive freshwater fish the spotted gar prefer clear, quiet, vegetated waters of streams, swamps, and lakes but are known to inhabit brackish waters along the Gulf coast. Spotted gar grow to a length of 1 m, weighing up to 8 lbs and have long, cylindrical bodies with brown to olive coloration and olive-brown to black spots that help camouflage the fish. Voracious predators, spotted gar have an elongated mouth with many strong, sharp teeth used to capture prey. Spotted gar are top level predators in Lake Pontchartrain primarily feeding on blue crabs (*Callinectes sapidus*).

Red Drum (*Sciaenops ocellatus*) – Commonly referred to as “red fish” it prefers shallow waters along the edges of bays with submerged aquatic vegetation. Red drum can be found in many different types of habitat including estuaries, lakes, rivers, coves, points, jetties and old pier pilings with varying bottom types of soft mud, oyster reefs and seagrass flats. Red drum range from a deep blackish, coppery color to nearly silver although reddish-bronze is the most common and has a distinguishing black spot on the upper part of the base of the tail with other multiple black spots. Red fish are fast growing fishes reaching two feet in length and 6-8 lbs in three years. Red drum are top level predators primarily feeding on rangia clams (*Rangia cuneata*), white shrimp (*Penaeus setiferus*) and blue crabs (*Callinectes sapidus*) and most notably are important commercially, recreationally, and ecologically to the Lake Pontchartrain basin.

White Trout (*Cynoscion arenarius*) – Commonly referred to as “sand trout” it is found in bay and estuarine waters along the Northern Gulf of Mexico in the surf or shallow water with sand or mud bottoms. This elongated fish has a silver body with a yellowish coloration on their top and fins and reaches lengths of two feet and weigh up to 3-5 lbs. Sand trout are voracious predators utilizing a mouth full of sharp teeth to capture their prey. White trout are top level predators in Lake Pontchartrain primarily feeding on bay anchovy (*Anchoa mitchilli*) and Gulf menhaden (*Brevoortia patronus*).

Tarpon (*Megalops atlanticus*) – Commonly referred to as “silver king” it inhabits coastal waters, estuaries, lagoons, rivers, lakes and marsh channels. This large, unmistakable fish is greenish or bluish on top and silver on the sides with a large, bony upturned jaw and an elongated dorsal fin that nearly reaches the tail. Tarpon reach almost 7 feet in length and weigh up to 350 lbs and have the ability to breathe air from the surface in oxygen poor waters. As well as being a prized angler fish, tarpon are top level predators in Lake Pontchartrain primarily feeding on striped mullet (*Mugil cephalus*) and pinfish (*Lagodon rhomboides*).

Jack crevalle (*Caranx hippos*) – Known as the “common jack” it inhabits shallow flats, sandy bays, beaches, seagrass beds, lagoons, estuaries and lakes. This large, fast swimming fish run in large schools early on in life but become solitary as they get older. It has a large, round, blunt shaped head, a dark silvery body that shows hints of blue-green to green-gold, large eyes, and scutes running down the caudal peduncle. Jack crevalle can grow to more than three feet in length although most are between one to two and a half feet and can weigh between 15-30 lbs. Jack crevalle are powerful, top level predators in Lake Pontchartrain primarily feeding on striped mullet (*Mugil cephalus*) and Gulf menhaden (*Brevoortia patronus*).

Predators

Spot (*Leiostomus xanthurus*) – Commonly referred to as “flat croaker or spot croaker” it primarily inhabits estuarine and coastal waters. Spot are bluish to brownish on top and white below with a distinctive spot on behind the gills on the shoulder called a humeral spot. They grow to a maximum size of 14 inches and are the only member of the drum family with a distinctively forked tail. Spot are considered to be nocturnal opportunistic feeders and serve as a major regulator of invertebrate species. Spot play an important role in the structure and function of Lake Pontchartrain earning them the role of predators, primarily feeding on rangia clams (*Rangia cuneata*) and polychaeta worms and other detritus in the sediment.

Southern flounder (*Paralichthys lethostigma*) – Primarily a bottom dwelling fish, the southern flounder resides in the silt and mud bays, riverines and estuaries along the Northern Gulf of Mexico. These “left handed” laterally compressed or flat fish spends most of its life lying and swimming along the bottom of their side. The top or “up” side is light to dark brown with diffuse non-ocellated dark spots and blotches that provides a cryptic coloration that matches their surrounding environment. The bottom or “blindside” is white to dusky in coloration. Southern flounder reach a maximum size of 3 feet and weigh up to 24 lbs. Southern flounder have a rather large mouth with large sheathed teeth used to capture fish or crustaceans. Southern flounder are considered predators in Lake Pontchartrain primarily feeding on bay anchovy (*Anchoa mitchilli*) and blue crab (*Callinectes sapidus*).

Atlantic stingray (*Dasyatis sabina*) – Incredibly common in the Gulf of Mexico, the Atlantic stingray resides in numerous different habitats including bays, lagoons, estuaries, lakes and freshwater rivers. Primarily bottom dwelling, stingrays lie or swim on sand or silt bottoms. Atlantic stingray’s rhomboid disc appears teardrop in shape and is brown to yellowish brown in coloration becoming lighter towards the margins of the disc and are white or light gray underneath. Another distinguishing characteristic is the long whip-like tail with a poisonous, serrated spine or barb that is able to inflict a painful wound. Atlantic stingrays reach a maximum length of 2 feet and weigh up to 11 lbs. Atlantic stingrays utilize electroreception to detect prey items in the sediment and have rounded, flat, blunt surfaced teeth to grind up their food. Atlantic stingrays are predators in Lake Pontchartrain primarily feeding on rangia clams (*Rangia cuneata*) and white shrimp (*Penaeus setiferus*).

Hardhead catfish (*Arius felis*) – Commonly referred to as the “sea catfish” it is heavily abundant in bays, lakes, rivers, and estuaries in the Gulf of Mexico. Hardhead catfish are unscaled and contain a slimy, protective layering around their grayish top and white underside body. Sea catfish have hard, sharp, venomous spines in their dorsal and pectoral fins that can result in severe pain and swelling. Hardheads contain three pairs of barbels which help to detect prey items: maxillary barbels are set at the corner of their mouth and are nearly as long as the head and two pairs of barbels below the chin. Hardhead catfish reach an average size of 10 inches and weigh 2-3 lbs. Hardhead catfish are voracious, opportunistic feeders and are considered predators in Lake Pontchartrain primarily feeding on blue crabs (*Callinectes sapidus*).

Atlantic croaker (*Micropogonius undulatus*) – The second most common fish in Lake Pontchartrain and gets its name from the “croaking or drumming” vocalization they produce by vibrating their swim

bladders with special muscles as part of their spawning ritual. Atlantic croaker prefer estuaries and bays during the spring and summer and move offshore in the fall to breed. Atlantic croaker differ from spot in that they have three to five pairs of small barbels or “whiskers” on their chins to help them detect prey on the sea floor. Croaker are brassy yellow with hues of blue and brown on top with narrow, dark, vertically oriented bars and white on bottom with olive colored fins. Atlantic croaker grow up to 20 inches in length and weigh up to 2 lbs. Atlantic croaker is not only an important commercial fish species, but also ecologically important to its environment being a major regulator of invertebrate species and a food item for top predatory fish such as bull sharks (*Carcharhinus leucas*). Atlantic croaker are considered predators in Lake Pontchartrain primarily feeding on bay anchovy (*Anchoa mitchilli*) and blue crab (*Callinectes sapidus*).

Silver perch (*Bairdiella chrysura*) – Commonly known as “silver trout, silver croaker or yellowtail” it is found in coastal waters, estuaries, tidal creeks, rivers and marshes with seagrass beds or sand or mud bottoms. Silver perch are silvery with yellow fins with no chin barbels and unlike its seatrout cousins does not have any prominent teeth in its mouth. Yellowtail usually do not exceed 9 inches in length and can weigh up to 1 lb. Silver perch can become quite abundant in estuaries at certain times of the year, and therefore play a key role in the ecology of the system by likely becoming the prey of numerous piscivorous fish species. Silver perch feed upon many different food items in Lake Pontchartrain including bay anchovy (*Anchoa mitchilli*), inland silverside (*Menidia beryllina*), white shrimp (*Penaeus setiferus*) and blue crab (*Callinectes sapidus*) earning them the role of predators.

Black drum (*Pogonias cromis*) – Commonly referred to as the “sea drum or gray drum” it is the largest member of the drum family and is abundant throughout the Gulf of Mexico in bays, lagoons, lakes and estuaries in the clearest water of sand flats to the muddiest water of a flooding slough. They are attracted to extremely shallow water, freshwater runoff of creeks and rivers, and yet can still even live in water twice the salinity of the Gulf of Mexico. The black drum is a chunky, high-backed fish with many barbels under their lower jaw. The coloration of black drum varies greatly depending on age and habitat: younger fish have four or five dark vertical bars on their sides that disappear with age; fish from Gulf waters often lack color and are silvery or light gray while those living in muddy bay waters are dark gray or bronze colored while others can be jet black in color. Black drum grow very quickly reaching 12 inches by two years. Although black drum have been recorded weighing over 100lbs, most weigh between 30-40 lbs. Black primarily feed on the bottom using their cobblestone-like teeth to crush rangia clams (*Rangia cuneata*) in Lake Pontchartrain earning them the role of predators.

Northern largemouth bass (*Micropterus salmoides*) – Commonly referred to as “black bass, green trout, bigmouth or bucketmouth” it is found in both fresh and brackish water environments and calm and turbid waters seeking protective cover under logs, rock ledges, vegetation and man-made structures. Largemouth bass are usually green with dark blotches that form a horizontal stripe along the middle of the fish on either side with the underside ranging from light green to almost white. They have a nearly divided dorsal fin with the anterior portion containing nine spines and posterior portion containing 12 to 13 soft rays. Largemouth bass range from 15-25 inches in length and weigh up to 10-20 lbs. Largemouth bass are ambush predators feeding upon small fish and invertebrates in aquatic

ecosystems. Northern largemouth bass are regarded as predators in Lake Pontchartrain primarily feeding on white shrimp (*Penaeus setiferus*) and blue crab (*Callinectes sapidus*).

Gulf sheepshead (*Archosargus probatocephalus*) – Commonly referred to as the “convict fish” it is common in bays, lakes, and estuaries around seawalls, jetties, piers, oyster reefs, breakwaters, muddy shallows, seagrass flats, wrecks, and inshore beaches. Gulf sheepshead are easily identifiable by their deep-bodied, compressed form with 5-7 wide, grayish-black vertical bars set on a light gray or white background. The dorsal and anal fins have large, very sharp spines. Sheepshead reach 3 feet in length and weigh up to 20 lbs but are more common between 2-8 lbs. Sheepshead have incisor like teeth that look incredibly similar to humans and sheep that are used to eat a wide variety of food items. Gulf sheepshead in Lake Pontchartrain are generalists primarily feeding on bay barnacles (*Balanus improvisus*), rangia clams (*Rangia cuneata*), sponge (*Spongillus lacustris*), and seagrass (*Vallisneria Americana*).

Filter Feeders

Bay anchovy (*Anchoa mitchilli*) – The most abundant fish in Lake Pontchartrain, it is common and extremely abundant in bays, estuaries and shallow tidal areas with muddy bottoms and brackish waters. Bay anchovy are silvery gray with a silvery stripe on the side and have a short head with a short snout, single dorsal fin set far back on the body, silvery belly and a long jaw. Bay anchovy reach only 4 inches in length. Bay anchovy are ecologically important because they serve as prey for many piscivorous fishes including Atlantic croaker (*Micropogonius undulatus*), spotted seatrout (*Cynoscion nebulosus*) and silver perch (*Bairdiella chrysura*) as well as feeding on zooplankton in Lake Pontchartrain earning them the role of filter feeders.

Striped mullet (*Mugil cephalus*) – Commonly referred to as “sea mullet, flathead mullet or gray mullet” it can be found in everything from extremely salty water to freshwater, spending most of their time close to shore around the mouths of streams and rivers, brackish bays and lakes as well as inlets and lagoons with seagrass beds or sand and mud bottoms. Striped mullet have an irregularly round head, silvery body, dark bluish green back, dark longitudinal stripes and a small mouth. Typically reaching anywhere from 10-20 inches in length and weighing up to 4 oz. striped mullet are commercially important for their roe (eggs) and ecologically important as prey for many piscivorous fishes including bull sharks (*Carcharhinus leucas*) and tarpon (*Megalops atlanticus*) as well as piscivorous birds including ospreys (*Pandion haliaetus*) and brown pelicans (*Pelecanus occidentalis*). Striped mullet are often seen in large schools and jumping out of the water to evade predators. Striped mullet are considered filter feeders in Lake Pontchartrain primarily feeding on zooplankton and detritus from the bottom.

Gulf menhaden (*Brevoortia patronus*) – Commonly referred to as “pogy” it is abundant throughout the Gulf of Mexico in nearshore waters, lower bays and fresh and brackish water estuaries and rivers. Gulf menhaden are dull silver with a greenish back and a prominent black spot behind the gill cover followed by a row of smaller spots along with yellowish fins. Gulf menhaden grow to 8-12 inches in length and are a tremendously important commercial fishing industry Gulf-wide. Pogys are even more valuable ecologically in Lake Pontchartrain as prey for many piscivorous fishes including white trout (*Cynoscion arenarius*) as well as many piscivorous birds including ospreys (*Pandion haliaetus*) and brown pelicans (*Pelecanus occidentalis*). Gulf menhaden are filter feeder in Lake Pontchartrain primarily feeding on phytoplankton which is strained through their gill rakers.

Inland silverside (*Menidia beryllina*) – Abundant throughout the Gulf of Mexico, it is common in the shallows of estuaries, bays, lakes and rivers with sand or gravel bottoms. Inland silverside are silvery on the sides with a yellowish back and translucent greenish on the underside. They are elongated fish with lengths 6 to 7 times the depth, large eyes, considerably upturned mouth and a noticeably flattened head on top. Inland silverside are small only growing to 4-6 inches in length and are often seen in large schools trying to avoid predation from piscivorous fishes. Inland silverside are filter feeders in Lake Pontchartrain primarily feeding on zooplankton.

Rangia clam (*Rangia cuneata*) – Commonly found in subtidal, intertidal, and low salinity estuaries as well as tidal freshwater habitats with vegetation, sand or muddy substrates. Rangia clams have a

rough, thick, oval shaped white shell. The inside of the shell is glossy white with a blue-gray tinge. Rangia clams grow up to 2.5 inches and are commercially and ecologically valuable. Rangia clams are food for many aquatic species including black drum (*Pogonias cromis*), red drum (*Sciaenops ocellatus*) and blue crab (*Callinectes sapidus*). The presence of rangia clams in Lake Pontchartrain as filter feeders of phytoplankton tremendously helps water quality and clarity.

Bay barnacle (*Balanus improvisus*) – Commonly found in bays, estuaries, lakes and freshwater outputs cemented on rocks, jetties, pilings, grasses, piers, boat bottoms and other hard surfaces . Bay barnacles have a white or grayish white smooth calcareous shell formed by six overlapping plates with a flat base and an opening at the top. The top opening have two valves, or “trap doors” that open and close causing several feathery appendages to emerge from inside allowing them to feed. Bay barnacles grow to 10-20 mm in circumference with a maximum height of 6 mm and are often fed upon by Gulf sheepshead (*Archosargus probatocephalus*). Bay barnacles are filter feeders in Lake Pontchartrain primarily feeding on phytoplankton and zooplankton.

Herbivores

West Indian manatee (*Trichechus manatus*) – Although uncommon and rare in Lake Pontchartrain, manatees occasionally wander into the shallow waters of inshore estuaries, bays, canals, lakes and rivers. West Indian manatees are large, gray aquatic mammals with two forelimbs or flippers and a body that tapers to a flat, paddle-shaped tail. Their head and face are wrinkled with whiskers on the snout. Manatees are gentle, slow moving mammals that spend most of their eating, resting and in travel. Manatees average 10 feet long and weigh between 800-1,200 lbs. Manatees are completely herbivorous and can consume 10-15% of their body weight daily in vegetation. Manatees are often seen resting or grazing on the bottom or just below the surface resulting in collisions with watercrafts or man-made structures leading to injuries and mortalities. Manatees are herbivores primarily feeding on algae, plants and seagrass (*Vallisneria americana*) in Lake Pontchartrain.

Pinfish (*Lagodon rhomboides*) – Commonly referred to as “pin perch or sand perch” it is common in coastal bays and estuaries with rocky bottoms, jetties, seagrass beds, pilings and mangroves. Pinfish have a compressed and oval-shaped body olivaceous above, bluish-silver along the sides with thin yellow stripes running longitudinally, six broad diffuse vertical dark bars, a dark shoulder spot and yellowish fins. The 12 pin-like spines running along the anterior portion of the dorsal gives this fish its common name. Pinfish grow to around 4.5 inches in length and are often prey items for piscivorous fish including tarpon (*Megalops atlanticus*). Pinfish can become seasonally abundant in some areas resulting in alterations of the composition of estuarine epifaunal seagrass communities due to their foraging. Pinfish are herbivores primarily feeding on algae and seagrass (*Vallisneria americana*) in Lake Pontchartrain.

Benthic Omnivores

White shrimp (*Penaeus setiferus*) – Commonly referred to as “lake shrimp, fall shrimp or green-tailed shrimp” it commonly inhabits estuaries, lakes, inner littoral zones along coasts with muddy bottoms and brackish wetlands with connections to shallow coastal areas. White shrimp are bluish-white speckled with black with pink sides. White shrimp grow to maximum lengths between 7-8 inches. The antennae are significantly longer than the body, and may reach 2.5-3 times the body length. White shrimp were the first species of commercially important shrimp in the United States dating back to 1709 and continues to be just as vital today. White shrimp are also an important food source for many aquatic species including red drum (*Sciaenops ocellatus*) and loggerhead sea turtles (*Caretta caretta*). White shrimp are considered benthic omnivores primarily feed on seagrass (*Vallisneria americana*) and detritus from the bottom in Lake Pontchartrain.

Blue crab (*Callinectes sapidus*) – Commonly found dwelling on the bottom of back bays and estuaries, these crustaceans are vital to their aquatic environment in numerous ways. The crabs have a darker blue or brownish green back with a white lower abdomen and legs. Blue crabs have five pairs of legs with the first pair being modified as pinchers which and the last four for walking. Claws are typically blue except for females which are red-tipped. The blue crab’s carapace (shell) grows to a maximum size of 8 inches wide and 4 inches long and weigh up to 1-2 lbs. The harvesting of blue crabs in the United States remains one of the most important commercial fishing industries especially in Lake Pontchartrain. Blue crabs serve as food for many fishes including red drum (*Sciaenops ocellatus*), Atlantic croaker (*Micropogonius undulatus*), spotted gar (*Lepisosteus productus*) and hardhead catfish (*Arius felis*). Blue crabs are benthic omnivores in Lake Pontchartrain feeding upon a variety of food items including rangia clams (*Rangia cuneata*), seagrass (*Vallisneria americana*), carrion, and detritus off the bottom.

Naked goby (*Gobiosoma bosc*) – Commonly found in bays, estuaries, tidepools and subtidal areas with oyster reefs, saltmarsh, or bare sand and mud substrate. Naked goby are cryptic in color ranging from light tan, greenish, brown or nearly black blending in with the ground with 9-10 vertical bars separated by narrow lighter interspaces and dusky colored fins. Their short and stout body grow to a maximum size of 2.5 inches resting on the bottom avoiding predation from piscivorous fishes. Naked goby are considered benthic omnivores in Lake Pontchartrain primarily feeding on epiphytes and small crustaceans on the seagrass (*Vallisneria americana*) and detritus off the bottom.

Microorganisms

Zooplankton – heterotrophic type of plankton that drift in the water column of oceans, seas and bodies of freshwater feeding on phytoplankton and zooplankton. Zooplankton can range in size from microscopic protozoans such as dinoflagellates to large metazoans such as cnidarians like jellyfish or crustaceans like copepods. Zooplankton plays an important role in the food web of Lake Pontchartrain both as a resource for consumers including bay anchovy (*Anchoa mitchilli*), inland silverside (*Menidia beryllina*) and bay barnacle (*Balanus improvises*) and consumers of phytoplankton.

Phytoplankton – the autotrophic type of plankton that drifts in the water column of oceans, seas, and bodies of freshwater producing much of the oxygen in the Earth's atmosphere. Phytoplankton accounts for half of all photosynthetic activity on Earth and serve as the basis for the vast majority of oceanic and freshwater food webs. Phytoplankton provides an essential ecological function for all aquatic life. Phytoplankton are responsible for all of the biological activity in Lake Pontchartrain as producers of oxygen and food for many aquatic organisms including rangia clams (*Rangia cuneata*), Gulf menhaden (*Brevoortia patronus*) and striped mullet (*Mugil cephalus*) which are relied upon as food by higher consumers and subsequently create the entire food web.

Bottom

American wildcelery (*Vallisneria americana*) – Commonly referred to as “American eelgrass, tapegrass, or water celery” serves as submerged aquatic vegetation in Lake Pontchartrain. This underwater perennial herb has long, narrow, green to sometimes reddish, ribbon-like leaves. Eelgrass in Lake Pontchartrain is used to monitor water pollution levels, provides habitat for many fish and invertebrate species and serves as food for blue crab (*Callinectes sapidus*), white shrimp (*Penaeus setiferus*) and West Indian manatee (*Trichechus manatus*).

Spongilla alba – A freshwater sponge found in lakes and slow streams that attaches to rocks and logs filtering water for microscopic organisms such as protozoa and bacteria. The freshwater sponge has the ability to withstand more adverse and variable environmental conditions as opposed to marine sponges. *Spongilla alba* not only filters out planktonic organisms in Lake Pontchartrain but also serves as food for the Gulf sheepshead (*Archosargus probatocephalus*).

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Explanation of figures:

Figures 1 and 2 present the primary organisms that play a significant role in the generalized food web of Lake Pontchartrain. These figures attempt to show a comprehensive diagram of the food web dynamics occurring in Lake Pontchartrain. Organisms are separated based on the trophic level they are found in. The arrows point to the prey or food item consumed by that specific species. Note that figure two substitutes different organisms than figure one because they share similar trophic roles within the food web of Lake Pontchartrain. Following figures demonstrate each individual organism's particular food web sequence. Note that not all species and trophic relationships in Lake Pontchartrain are included.

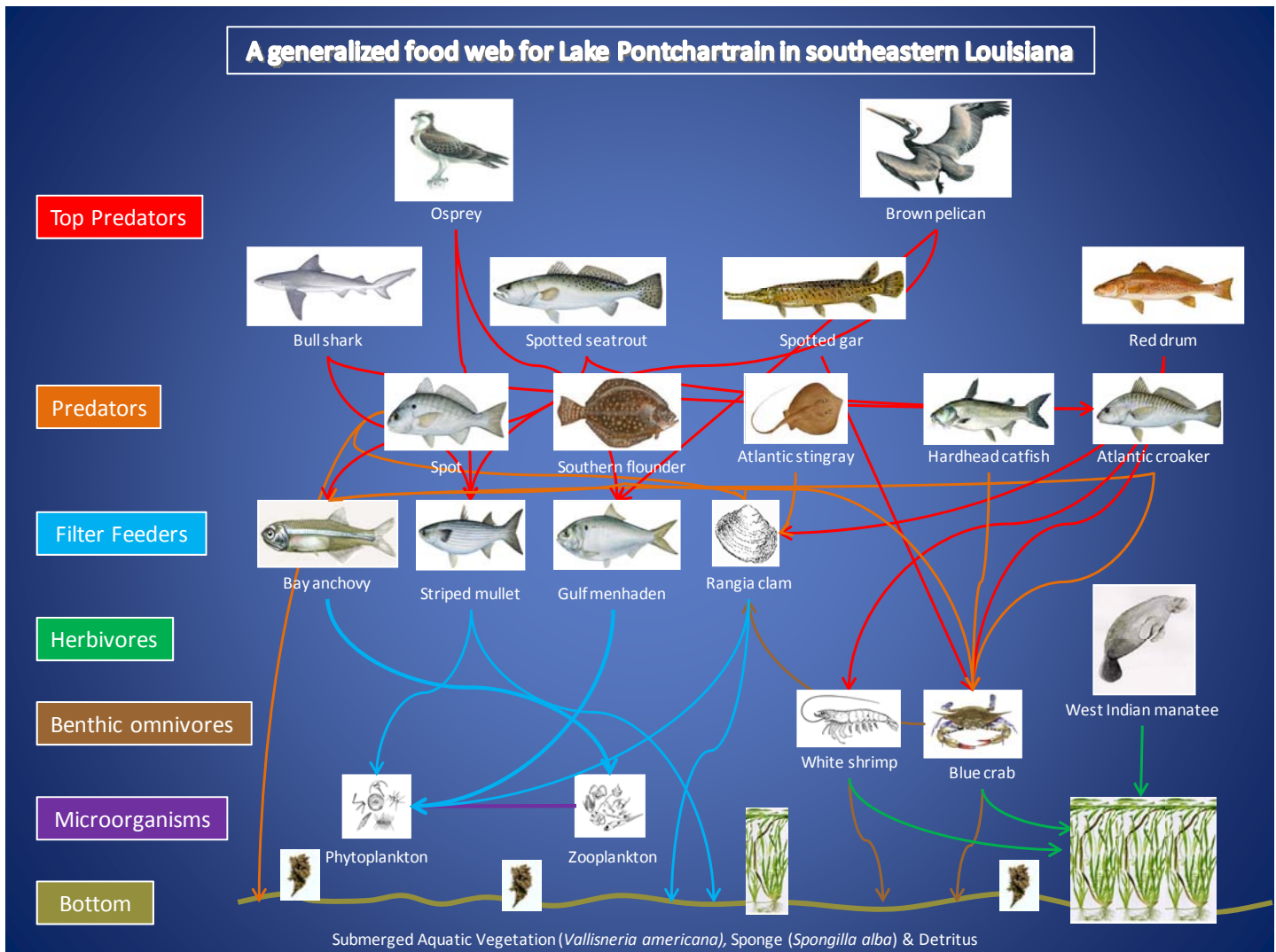


Figure 1

A generalized food web for Lake Pontchartrain in southeastern Louisiana

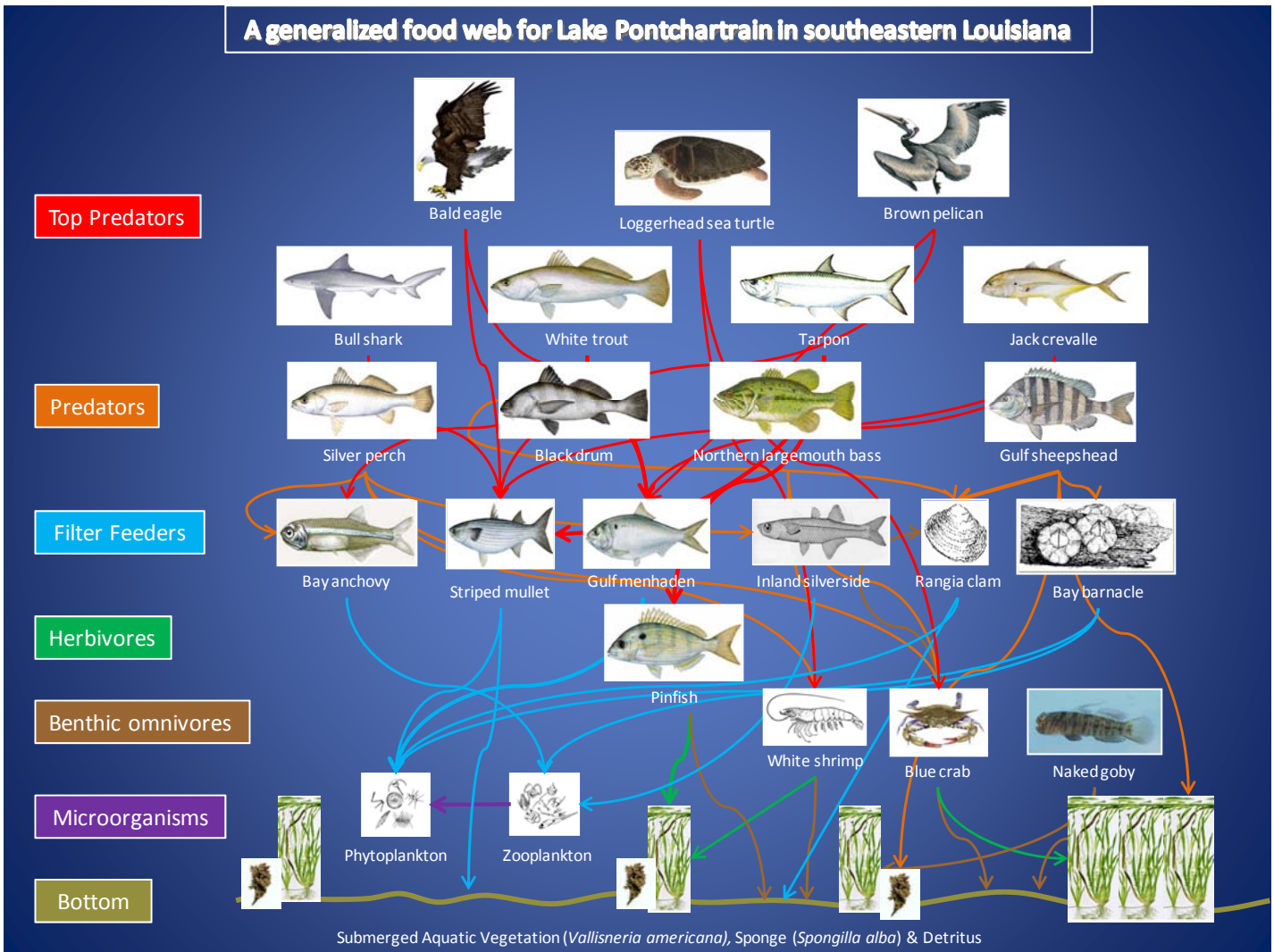


Figure 2

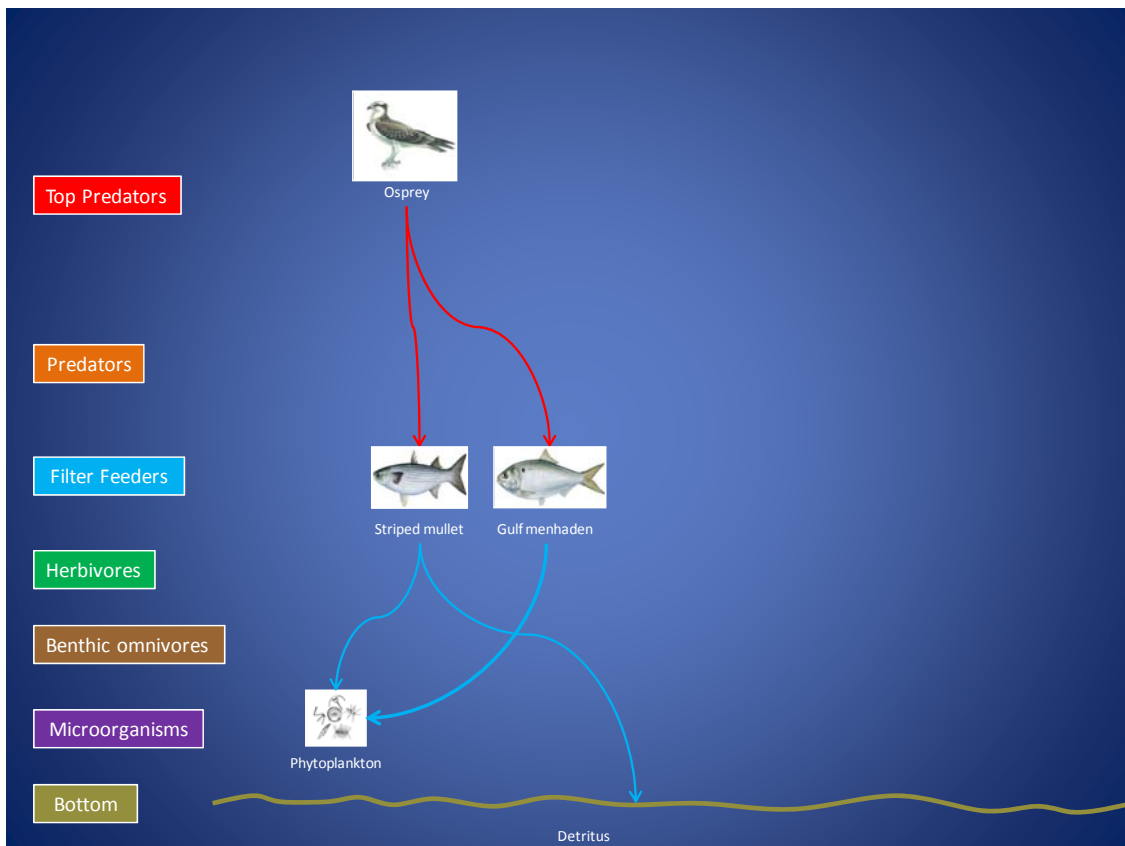


Figure 3

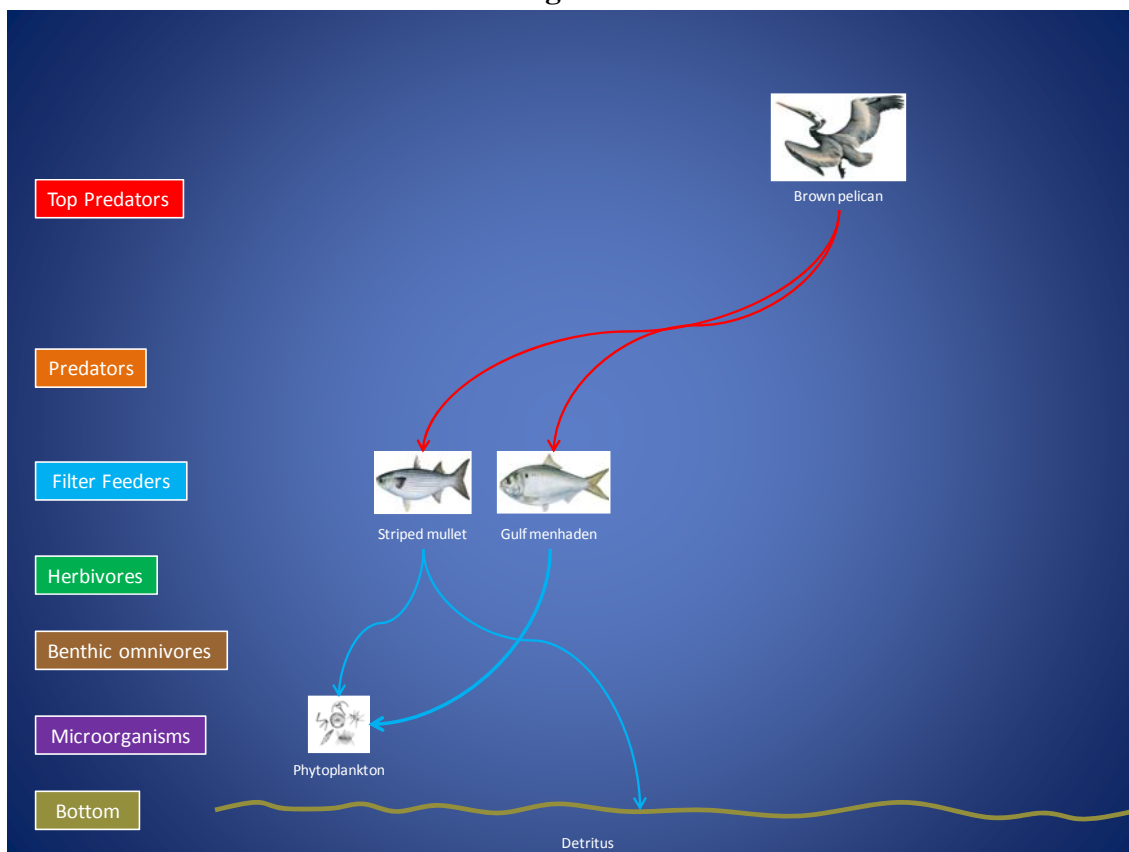


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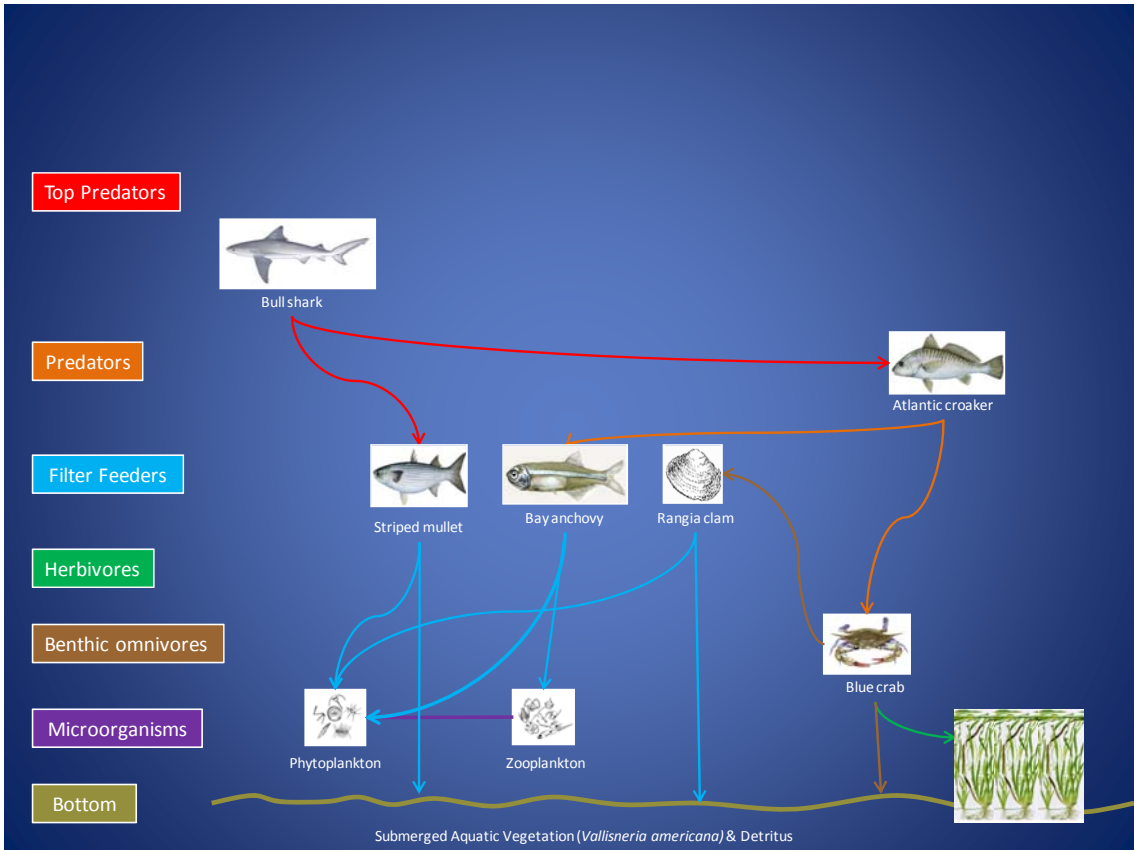


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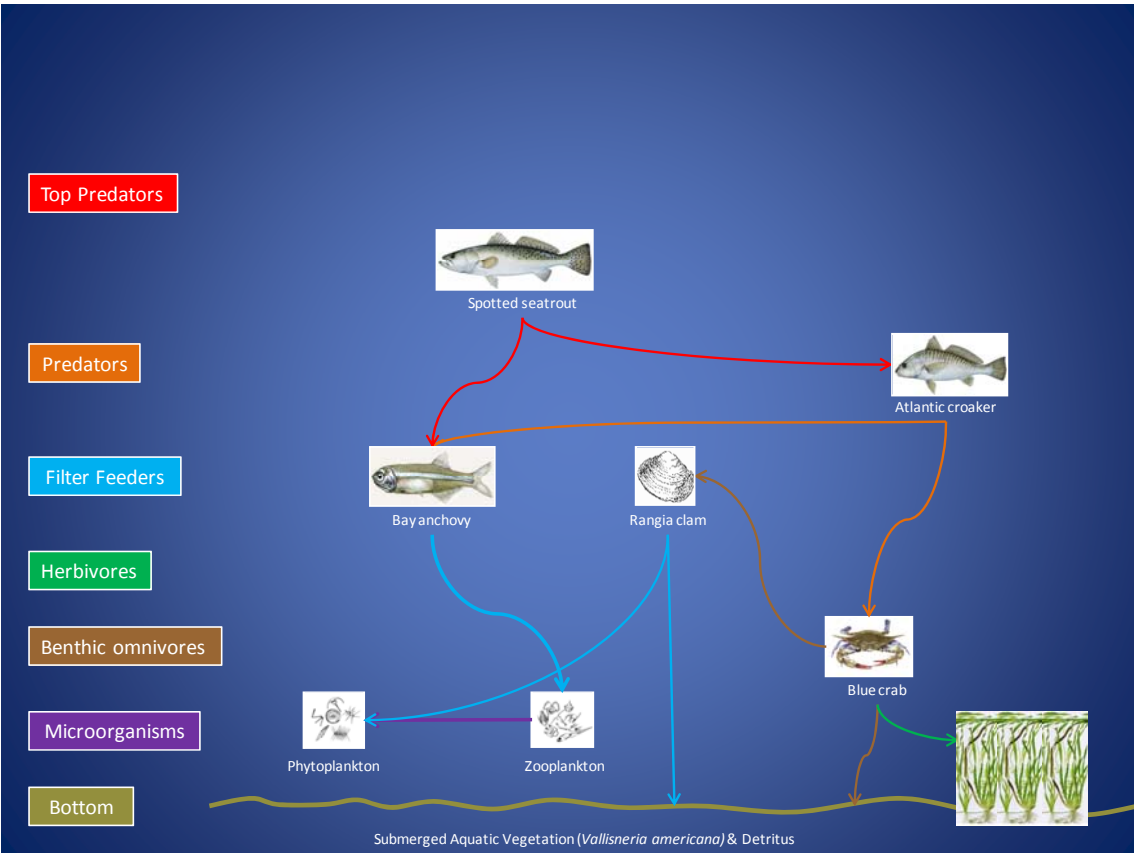


Figure 6

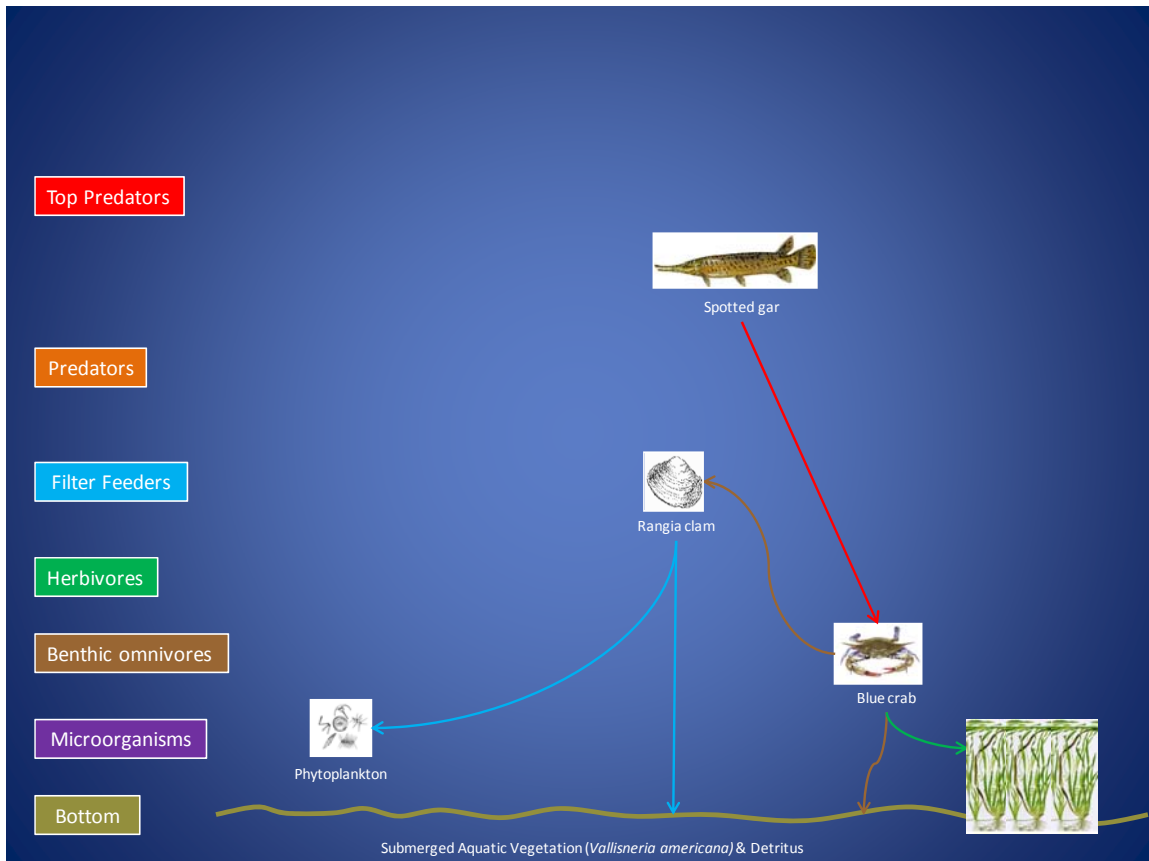


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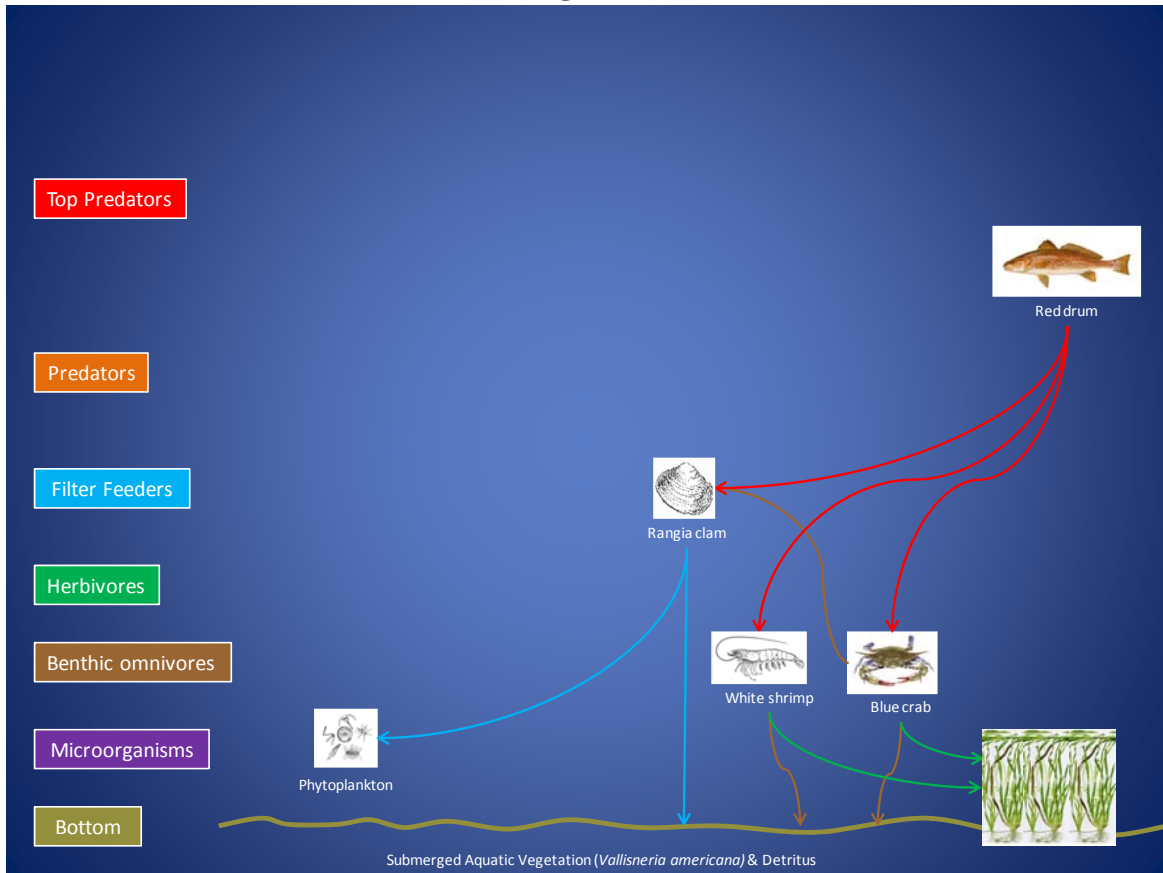


Figure 8



Figure 9

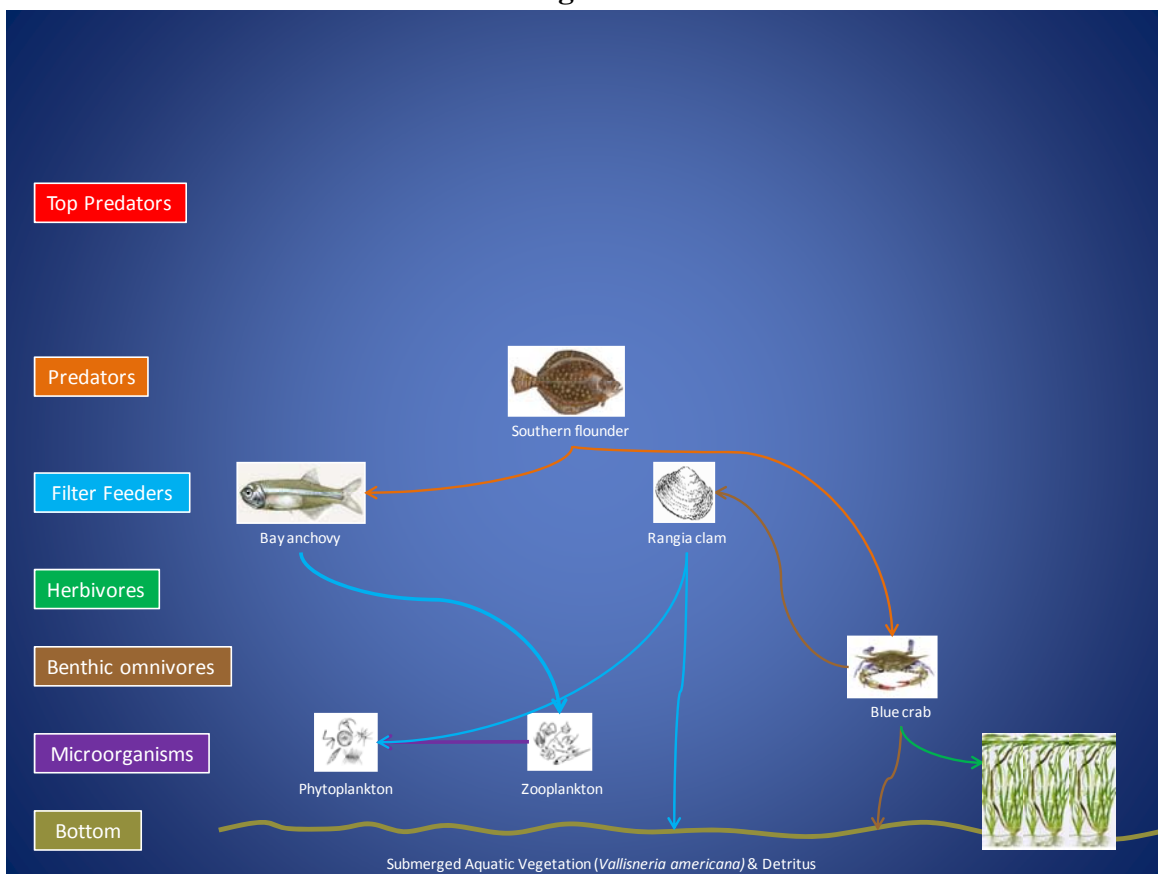


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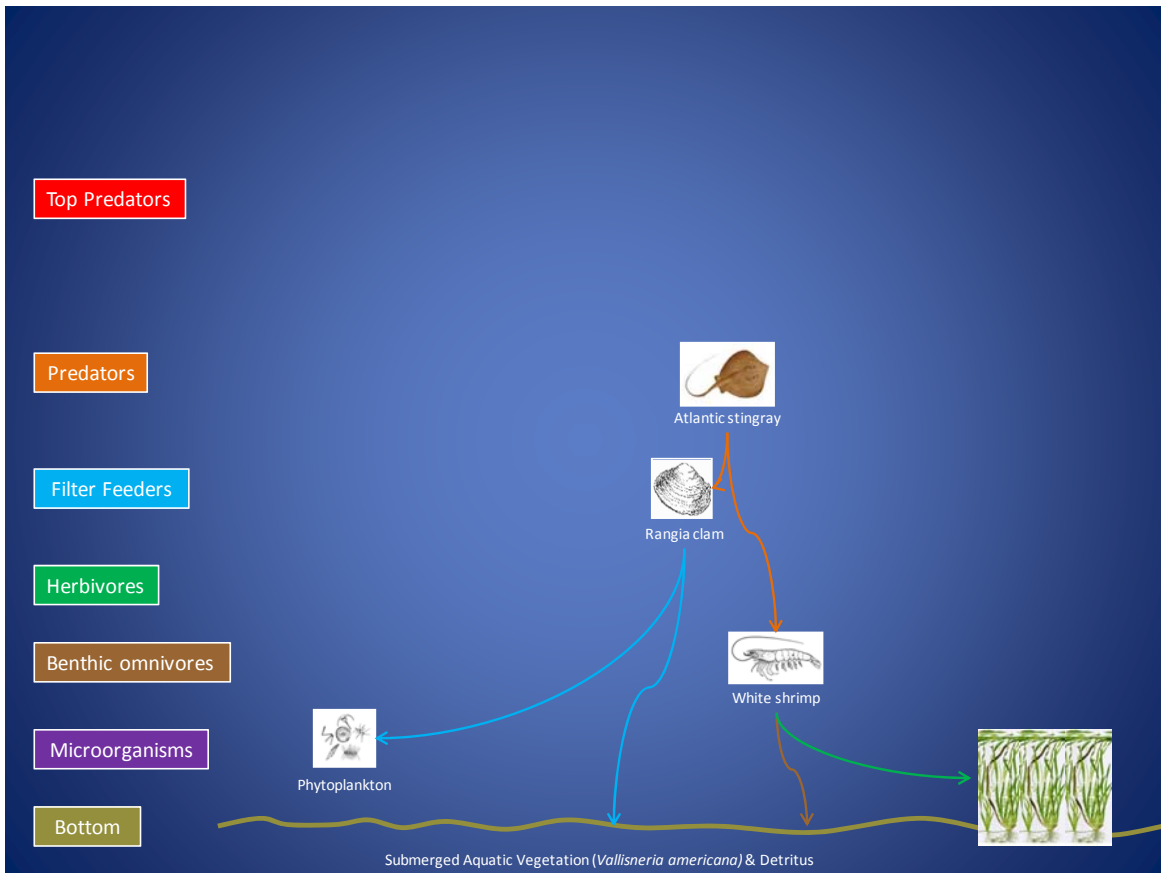


Figure 11



Figure 12

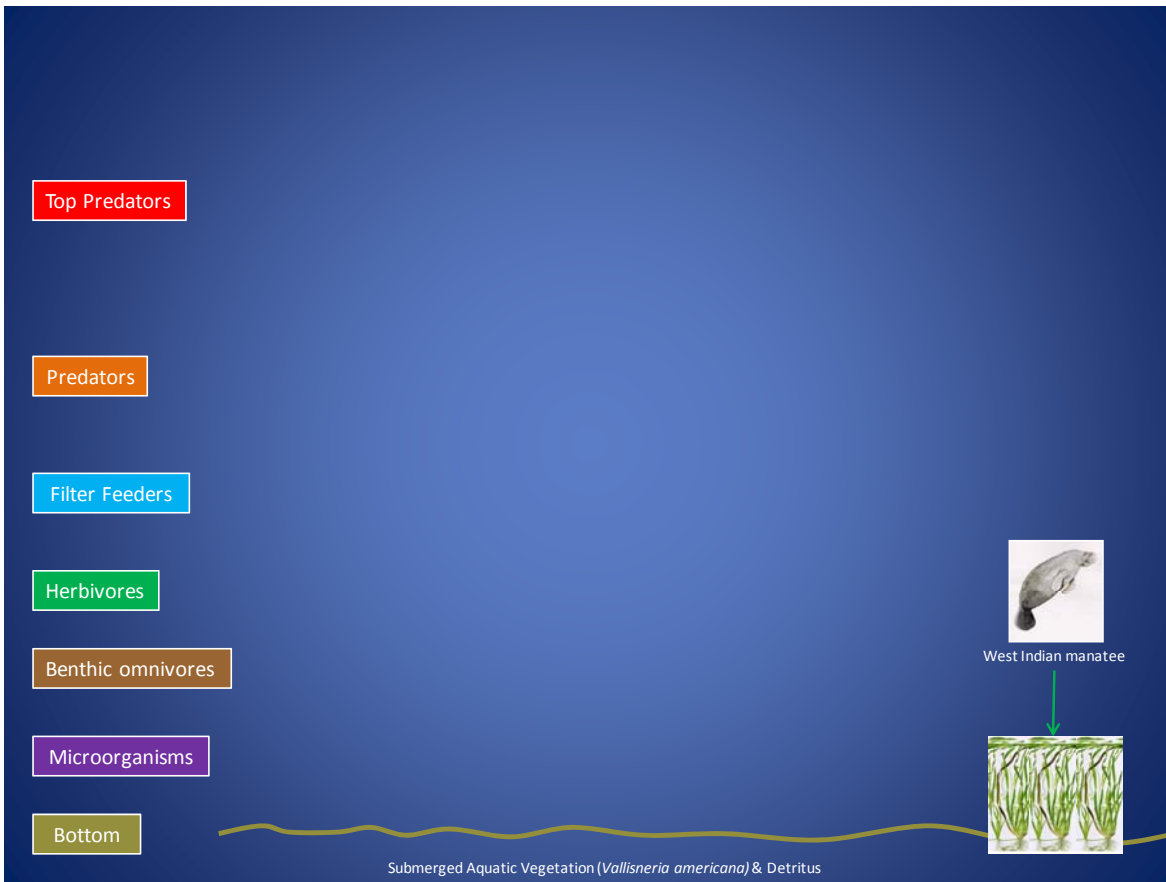


Figure 13

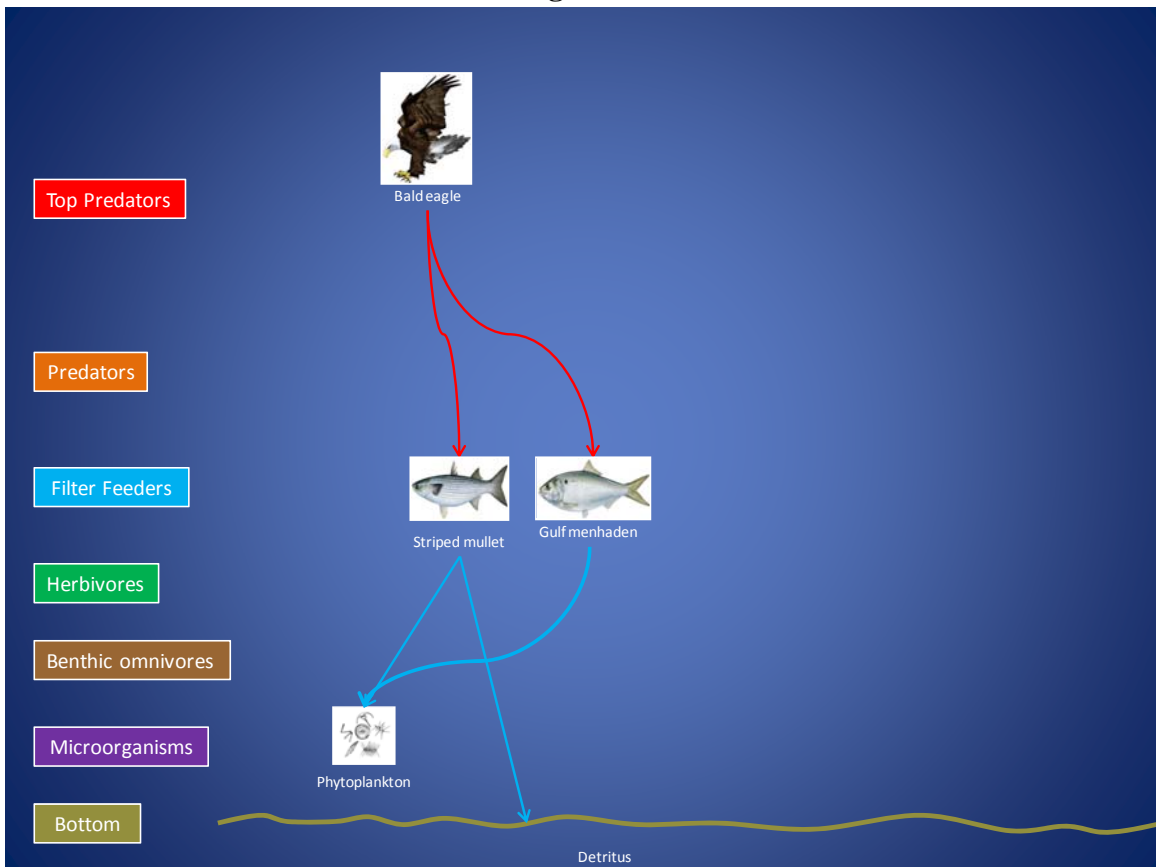


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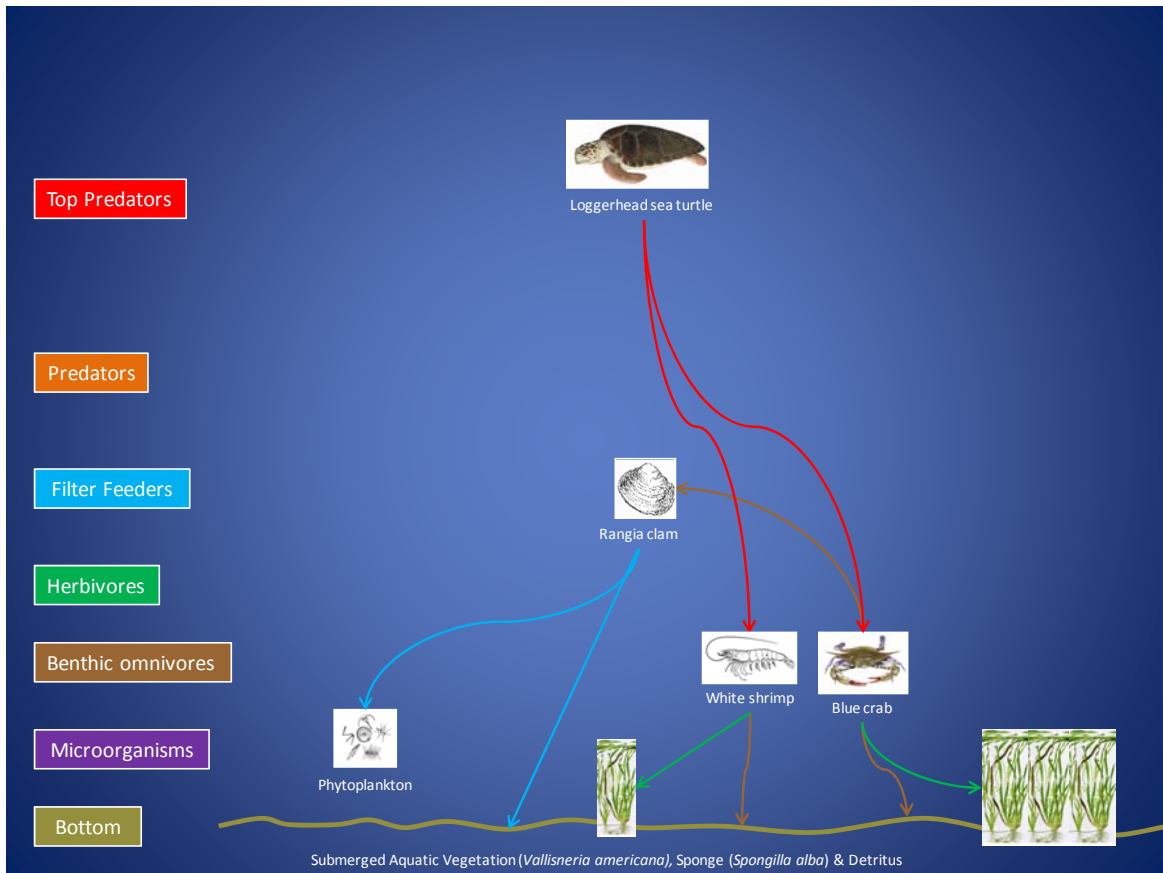


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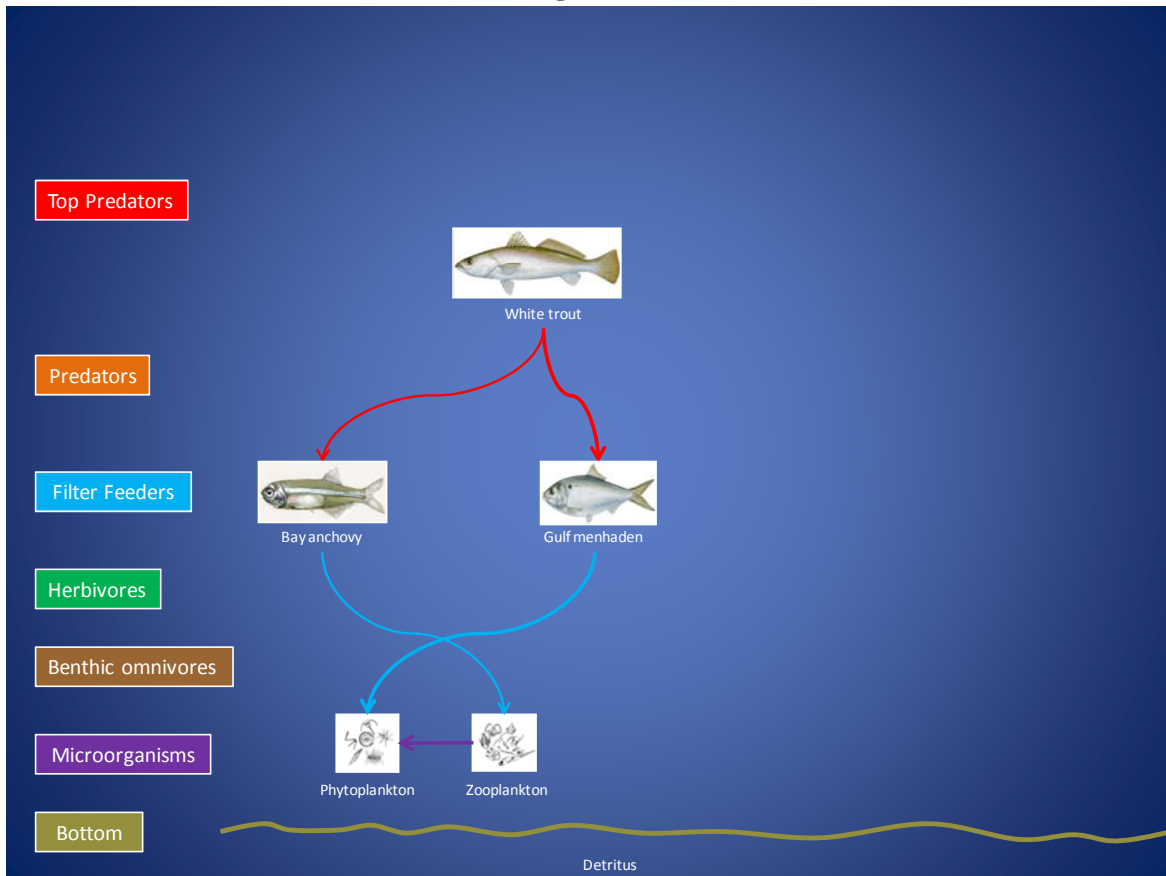


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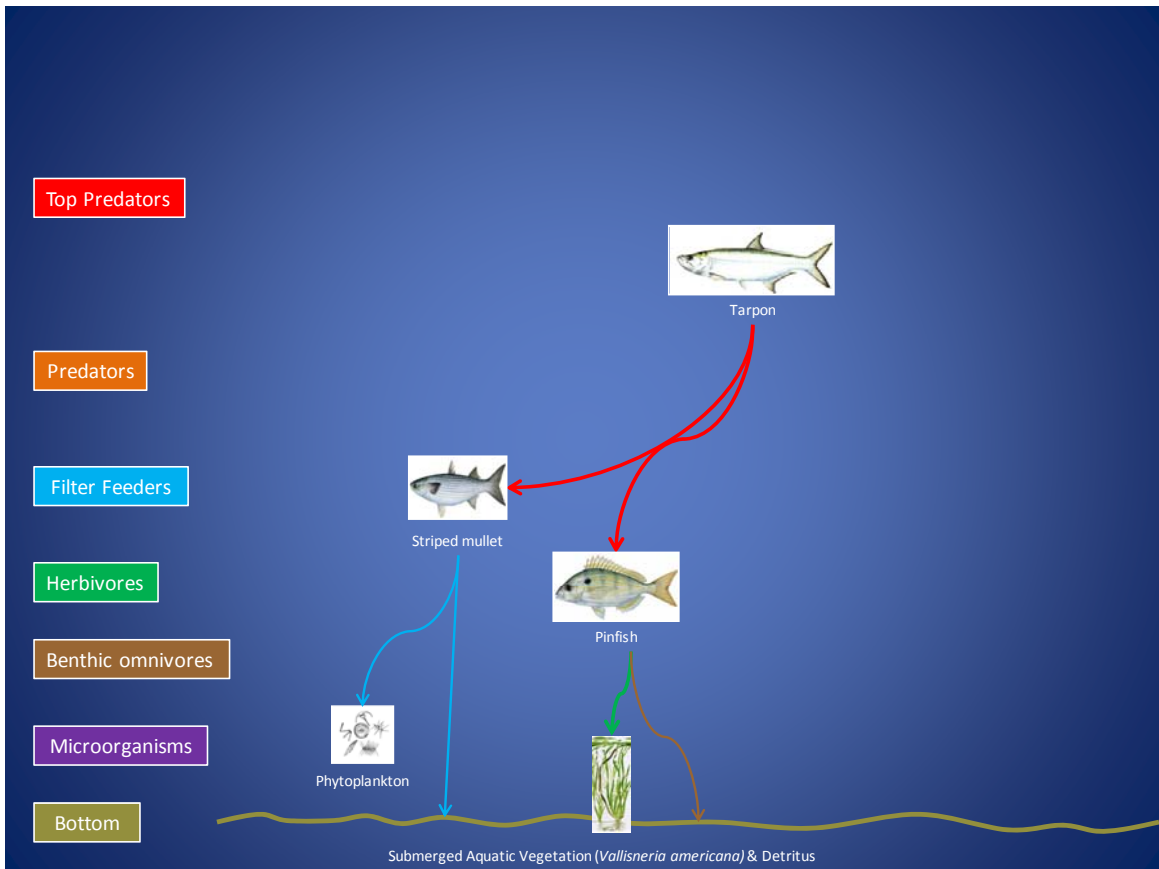


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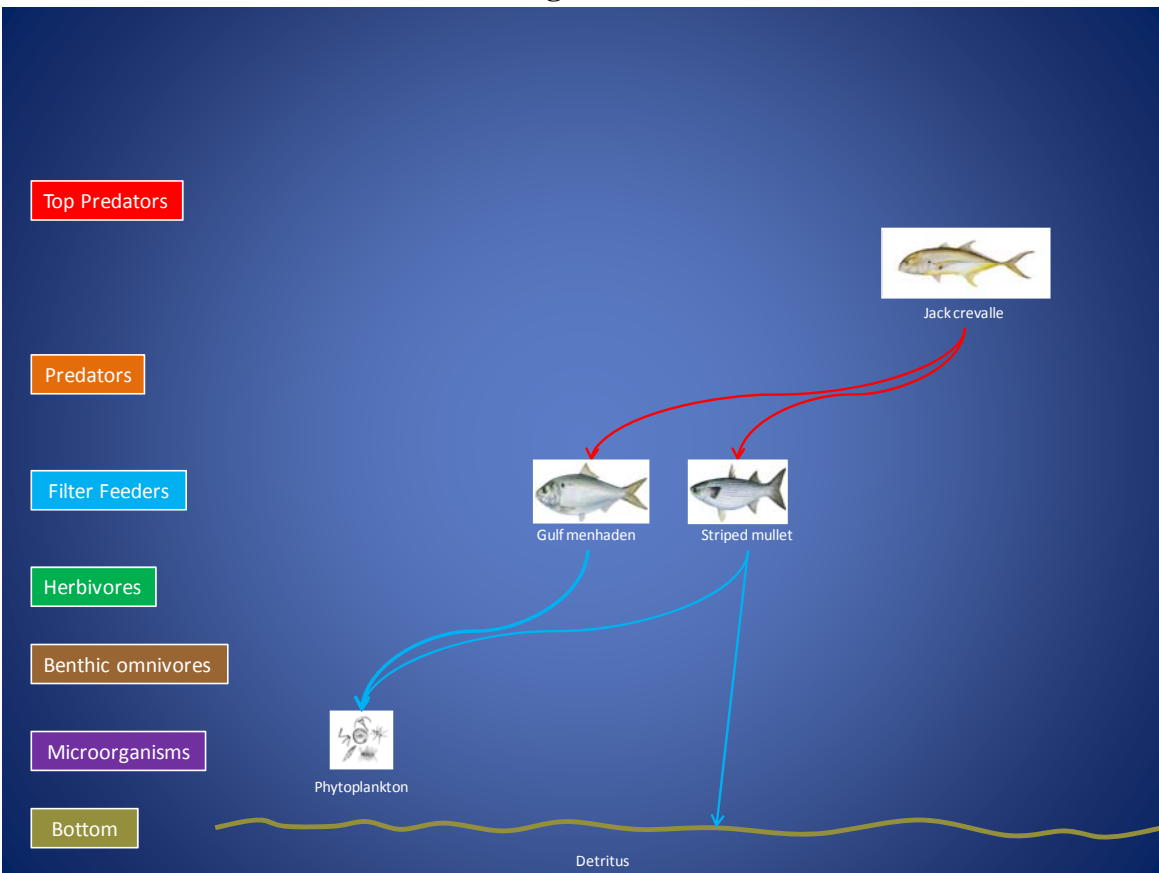


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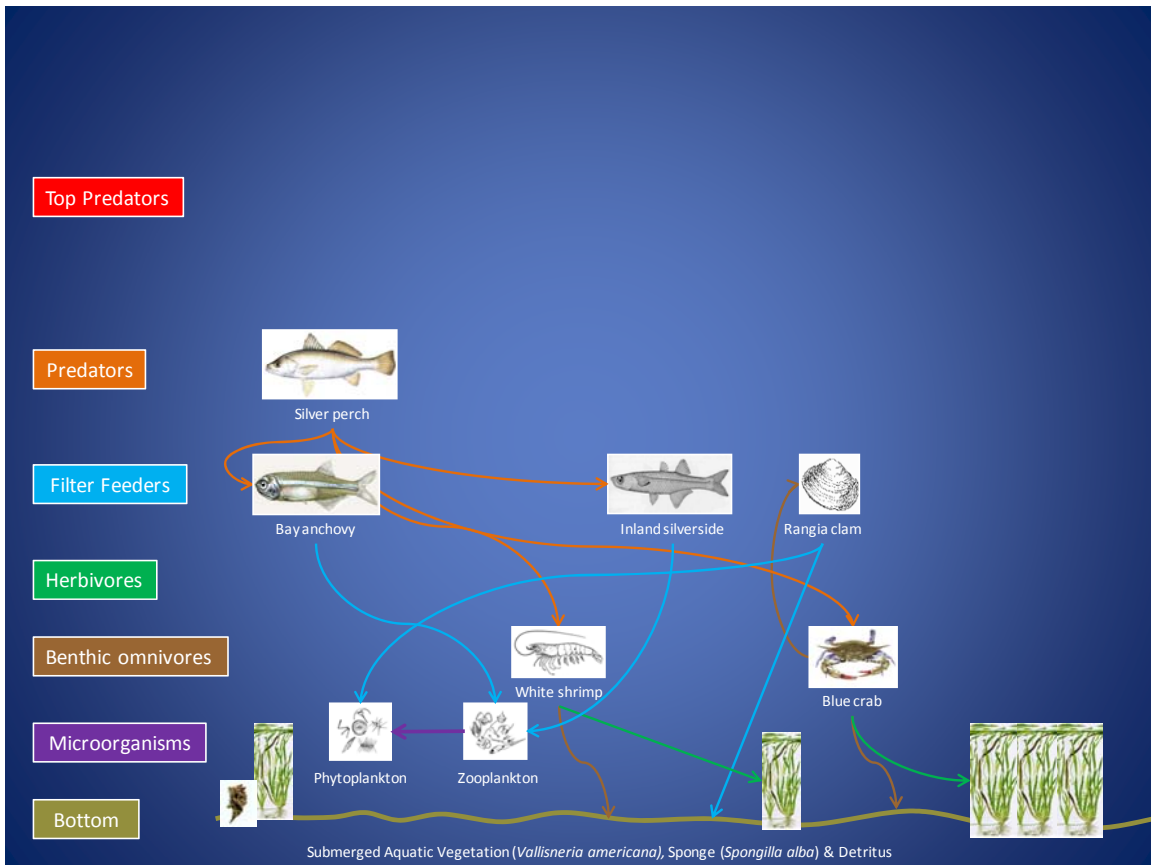


Figure 19



Figure 20

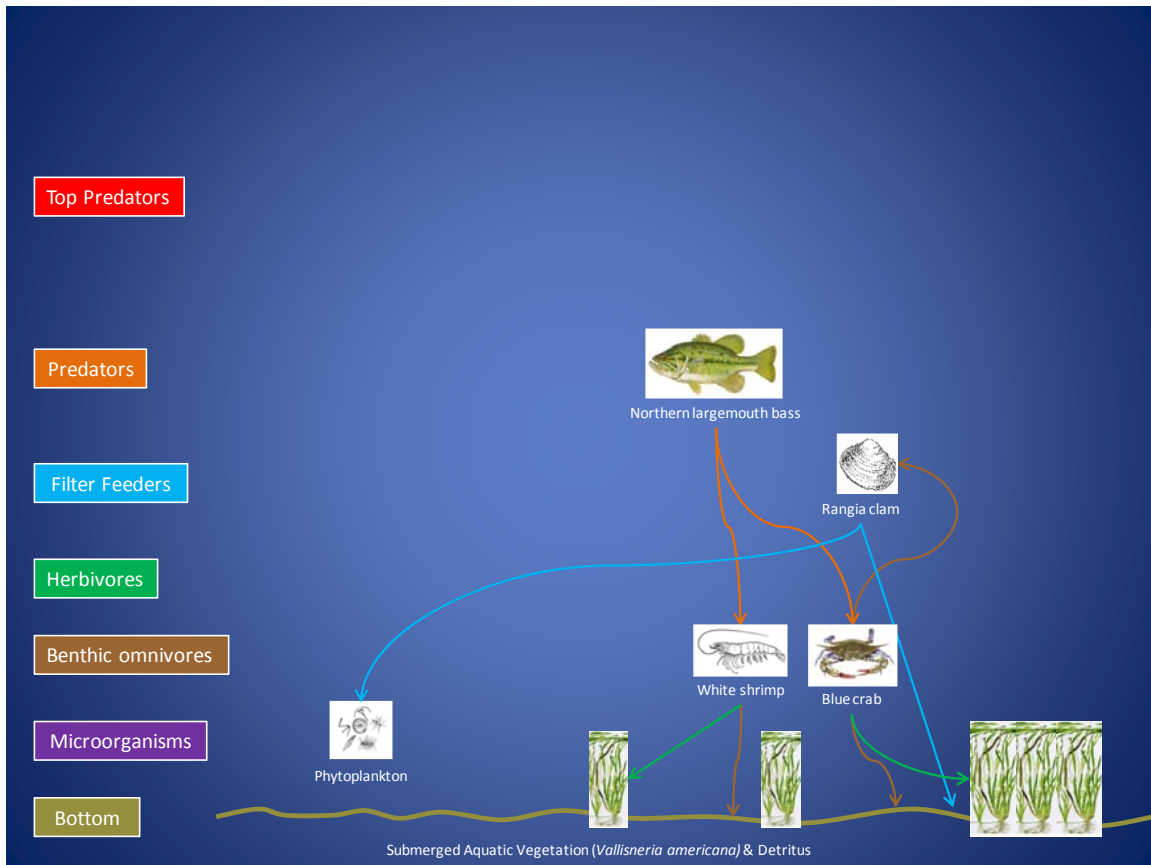


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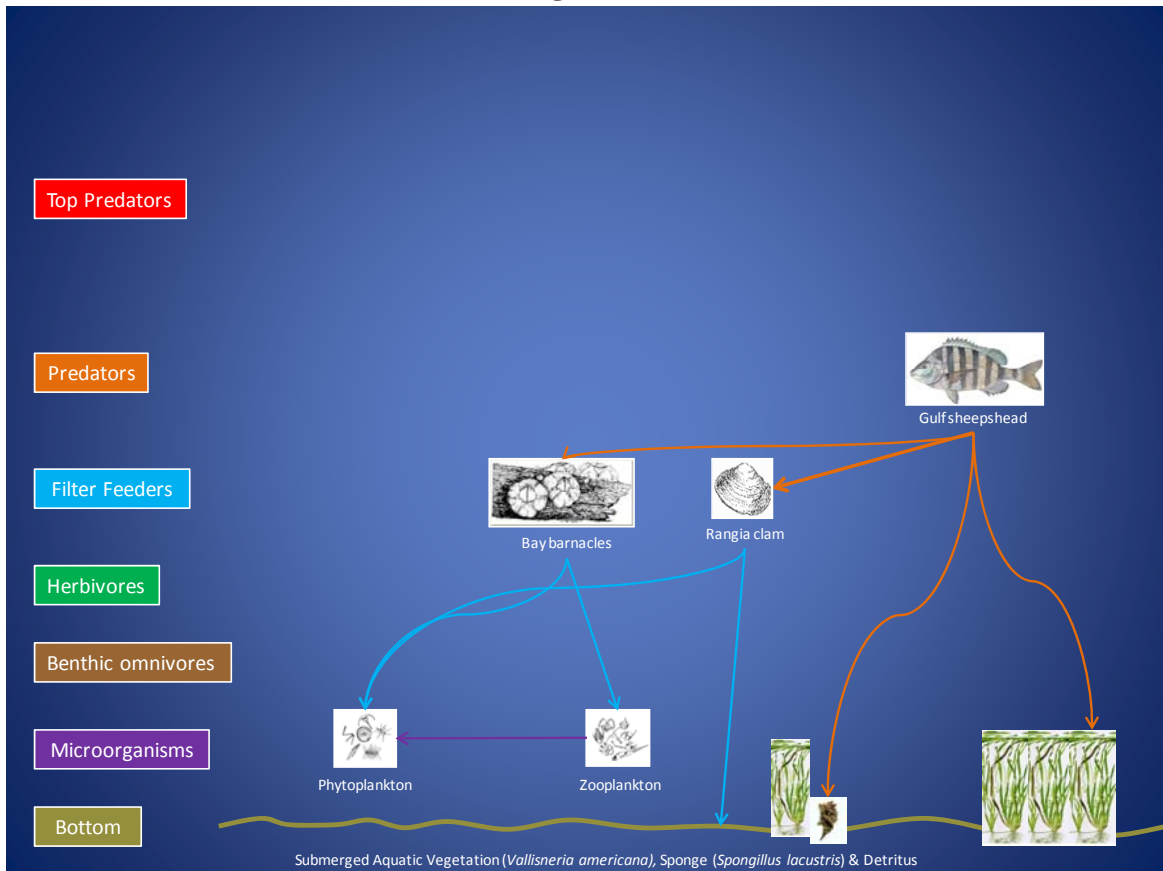


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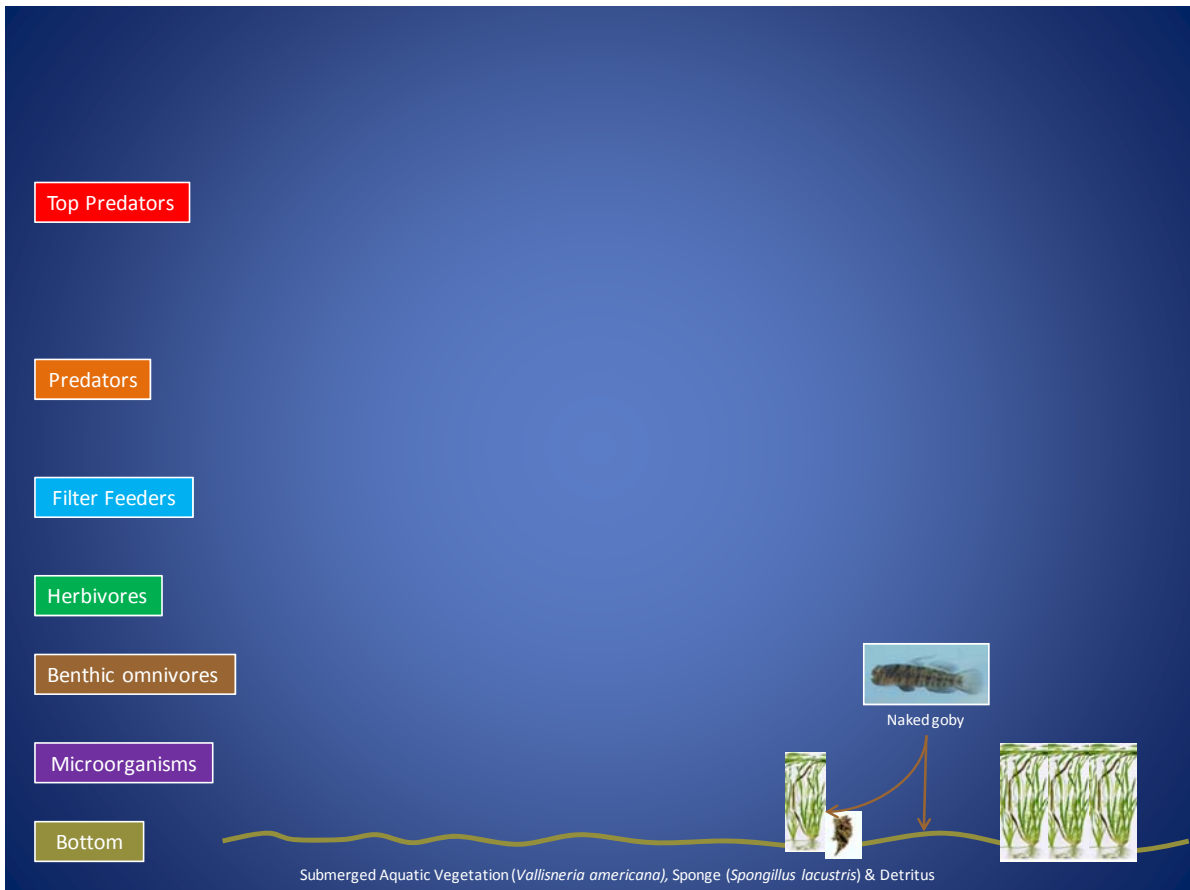


Figure 23