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DOHENY'S TIDE POOLS

The gravitational pull of both the moon and the sun on the earth's oceans causes tides. Most bodies of salt water experience a tidal change approximately every six hours. The tide may change up to seven feet and, along California's rocky shoreline, a low tide exposes places where marine plants and animals live. Not only do tides change by the day, but there are also times during the month when the tidal change is greater.

In addition, the moon's revolving around the earth and the earth's revolving around the sun affect tides at different times of the year. Early summer (June-July) and early winter (December-January) are the months of the year with the greatest tidal change. There are many days at Doheny when there is not enough tidal change to uncover our rocky reef and expose tide pools.

Doheny's tide pools are different from the tide pools found along a rocky shoreline. San Juan Creek empties into the ocean through our park. It's flow creates a southward current in front of our campground and south day use area. The steep drop-off in this area causes the surf to break right on the sand making wave riding impossible here. The area directly north of San Juan Creek is rocky because the creek's flow causes the sand to move south. The area north of the creek is where tide pools are found at Doheny. When the tide recedes, pools are created in the uneven rocky bottom. It is here to look for the tide pool animals outlined below.

ARTHROPODS

Barnacles



Barnacles are actually part of the same group of animals, called crustaceans, as crabs, lobster, and shrimp. Adult barnacles look very different from their crustacean relatives. After birth, barnacle larvae look just like larvae of other crustaceans; however, when a barnacle metamorphoses, it attaches it self to a hard surface head first and creates a cone around its body made of calcium. Its modified legs, called cirri, filter water for plankton and detritus like little nets.

These organisms are the highest living intertidal marine species. Most species can easily spend half of their lives out of water. Some species only need to be wetted with ocean spray making them well adapted for life along California's rocky, wave swept shoreline. Since these organisms are sessile, males may become female and vice versa in some species in order to reproduce.

Some of the species found at Doheny are the common **Acorn Barnacle** (*Balanus glandus*) that would be found on rocks in the surf zone.

Red Thatched Barnacles (*Tetraclita rubescens*) live alone rather than in groups. They are brick red in color with only four sides instead of the usual six, and they like to live under the ledges of rocks.

Little Brown Barnacles (*Chthamalus dalli*) live on rocks in groups with up to 60,000 individuals per square yard.

The **Red Striped Acorn Barnacle** (*Balanus pacificus*) attaches it self to other marine life, especially sand dollars. They can live to a depth of 240 feet. They are smooth in texture and pink to purple striped in color.

Another barnacle that likes to attach to other marine life is the **White-Ribbed Barnacle** (*Megabalanus californicus*). It is similar to the Red Striped Barnacle in that it has pink to red stripes. These barnacles prefer to attach to crabs, kelp, mussels, and pier pilings.

Pacific Goose Barnacles (*Pollicipes polymers*) are found in mussel beds only when the tide is the lowest at Doheny. These barnacles look different from other barnacles because their cupped feeding appendages are on 3½-inch stalks. The stalks are edible and are eaten in Spain and Portugal.



Crabs

Blue Banded Hermit Crab – (*Pagurus samuelis*): The bright blue bands on their walking legs easily identify these little hermit crabs. They also have bright red antennae. They live in abandoned black turban and striped dog winkle shells which is why shells should not be collected anywhere along California's coastline. They are strictly an outer coast species found in the rocky high intertidal areas. Blue Banded Hermit

Crabs have compound eyes that adapt to both day and night. These crabs feed at night on brown algae and dead animals. Pile Perch, Sheephead, and Kelpfish love to eat them.



Porcelain Crabs - There are several different species of porcelain crabs found at Doheny. These are flat little crabs that easily slip under the rocks to hide, so you won't find them unless you look under a rock. This is the most prolific crab in terms of overall numbers in our tide pools. A study in Pacific Grove, California, found nearly 900 animals per square meter. They are small, up to ¾ of an inch, with long antennae. Some rocks at Doheny may have hundreds under them. They live in the high to mid-intertidal areas of our rocky reef. Porcelain crabs are filter feeders or feed on detritus -- decaying plant and animal matter. This is one of many species that relies on the protection of the rocks for its livelihood, so never leave a rock overturned after you look under it.



Striped Shore Crab - (*Pachygrapsus crassipes*): These green to red or purple crabs with black stripes are active during daylight hours. They are so well adapted to living out of water that they spend at least half of the time that way. They have excellent eyesight which adapts well to both day and night. For the most part, these crabs feed on land on diatoms and algae. Occasionally they will prey on hermit crabs and Black Turban snails, and they've even been observed capturing kelp flies with their very dexterous claws. Seagulls, raccoons, and octopus love to prey on these crabs.

Because they are well adapted to life on land, Striped Shore Crabs will be found in the rocks along the jetty. But be careful; these crabs may pinch when handled, so avoid picking them up. Never place them in a container as they will die and then smell. Although these crabs are native to Western North America, scientists believe they may have been introduced to the Orient in the 1890's in merchant ships' hulls. These hulls may have contained the swimming planktonic form of this crab in the trapped seawater found in them.

CINDARIANS



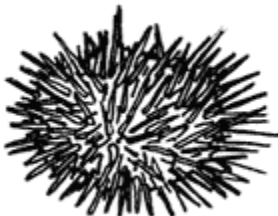
Solitary Green Anemone – (*Amthopleura xanthogrammica*): Sea anemones are members of the phylum *Cnidaria* that is the same phylum as jellyfish and corals because they have stinging cells. These organisms look like flowers with a central foot and mouth, as well as multiple tentacles that are used to capture food ranging from small fish to plankton to detritus. The tentacles are equipped with specialized cells called nematocysts. Nematocysts are like mini spear guns that can harpoon and paralyze prey allowing it to be digested with ease. The stinging cells are too small to

penetrate human skin.

There are three ways a sea anemone can reproduce. First, they can reproduce by releasing male and female gametes into the water column. Secondly, they can divide in half, similar to the way a single cell divides. And thirdly, they can reproduce by budding. This involves growing a whole new anemone on the side of their body which will eventually fall off and become a clone of the original anemone.

Anemones have a water vascular system, which means they control their movement by either inhaling or exhaling water. Solitary Green Anemones are common along California's rocky shoreline; however, they are not found very often on Doheny's flat reef.

ECHINODERMS



Purple Sea Urchin – (*Strongylocentrotus purpuratus*): These animals are completely covered with sharp, brightly colored purple spines making them easy to recognize. Purple Urchins are only found during the lowest tides at the farthest

edge of our reef. They need highly oxygenated water to survive, so they are well adapted to living in the surf. In fact, some excavate an impression in the rocks with their sharp spines for protection from predators and strong surf. They are able to regenerate their spines when they break off.

If you look at a Purple Urchin carefully in the water you'll notice tube feet extending beyond the spines. These tube feet are used to snag pieces of kelp, their favorite food.

Purple Urchins can do damage to kelp forests when they become overpopulated. They eat all algae in site and create an urchin barren which is an area of denuded rocks covered with Purple Urchins. This happens because only Sea Otters, sea stars, and Sheephead feed on these animals. Since Sea Otters are no longer found in the waters off Doheny or anywhere south of Point Conception, Purple Urchins can easily overpopulate an area.



Sea Stars

Bat Star - (*Patiria miniata*): Commonly found in the intertidal zone to depths of about 870 feet. These sea stars are also found between Sitka, Alaska and Islas de Revillagigedo, Mexico. These stars are not very large sea stars; in fact, their arm radius is only four inches. They usually have five arms but they can have as few as four or as many as nine. They can be almost any color. Bat Stars are

omnivores and scavengers, which means they will try to eat almost anything they can get their tube feet on. Spawning usually occurs in May and July when the males and females release their gametes into the water column. This is where the eggs are fertilized. When the sea stars hatch, they are plankton. A week or two after they hatch they settle to the bottom where they will spend the rest of their lives.



Brittle Star – Brittle Stars belong to the class *Ophiuroidea*, which consists of over 2,000 different species. Of those, only 16 species frequent the California coastline. They range from shallow water species to extremely dense populations that live in deep water along the continental shelf. Brittle stars are easily distinguished from other sea stars because of their thin, segmented rays and their round central disk. They also have the ability to lose arms when disturbed and regenerate them quickly. Not much is known about brittle stars as they haven't been studied yet. However, depending on the

species, it is known that they can be herbivorous, carnivorous, omnivorous, scavengers or even detritus feeders. Brittle stars are often found in masses under rocks in areas of Doheny's reef that are usually covered with water. They are best found on a minus tide.



Knobby Star - (*Pisaster giganteus*): The Knobby Star is a relatively large sea star that can reach 24 inches across. They are found from Vancouver Island, Canada to Baja California in depths ranging from the intertidal zone to almost 300 feet. These sea stars are active predators. They have been known to eat bivalves (mussels, clams, scallops and oysters), chitons, snails, and barnacles. When they eat, they use their extremely strong tube feet to pull open their bivalves and then digest their prey outside of their bodies. Spawning occurs between March and April. An interesting side note;

these sea stars are actually trainable. In laboratories, they have been trained to associate food with a certain light.

FISH



Northern Clingfish – (*Gobiesox maeandricus*): The northern clingfish is also known as the flathead clingfish, the common clingfish or scientifically, *Gobiesox maeandricus*. The clingfish is an oddly shaped fish that looks similar to a tadpole. They are commonly found from Guadalupe Island, Baja California to Revillagigedo Island, southern Alaska. These fish are very common in the tide pools off Doheny though they are rarely seen because they hide under rocks that are exposed only during the lowest tides of the year.

These small fish have the ability to literally cling to the rocks by using their specialized pelvic fin as a suction cup. The largest northern Clingfish on record was 6.5 inches long. They will feed on small snails, worms and shrimp. Because of its small size the northern clingfish has no real economic use, so no one fishes for it.



Tide Pool Sculpin – (*Oligocottus maculosus*): The tide pool sculpin, also known as *Oligocottus maculosus*, is a very common fish from the Sea of Okhotsk, Russia to the Bering Sea, Alaska, and down the Eastern Pacific to Southern California. Though these fish only reach about 3.5 inches and live a maximum of five years, they thrive in the turbulent waters of the intertidal zone. They also have the ability to withstand very cold-water temperatures. In the Bering Sea they have been known to live in temperatures as low as 33

degrees Fahrenheit. Other interesting characteristics of this species, is their uncanny ability to find their way back to their favorite tide pool as well as the fact they have no scales. Tide pool sculpin survive by eating isopods, amphipods, shrimp and worms. In turn, they are often eaten by larger fish like the kelp greenling. They range in coloration from gray to brown and even green with multi-colored speckles.

They are oviparous, meaning they lay eggs. The coloration of the eggs seems to depend on where they are laid. Eggs laid in protected areas tend to be a greenish color,

but eggs subject to a lot of water movement will be a pinkish color. During the lowest tides at Doheny you can look for these fish in the pools left behind as the ocean recedes.

MOLLUSCS



Abalone - The abalone is a gastropod mollusk that lives under its ear-like shell. Historically the three most common species of abalone around Dana Point were the Black, Pink and Green Abalone. The black abalone was the most common abalone found in the tide pools and surf areas, while the pink and green abalones were normally found below the tidal line.

Unfortunately, abalones have suffered greatly in recent years. Due to over harvesting, poaching and a disease that spread through the different species, their numbers are just a fraction of what they were 25 years ago. The black abalone has taken the biggest hit, with approximately 1% of its former population remaining. Several years ago, to protect the remaining stocks, the California Department of Fish and Game made it illegal to take any abalone South of San Francisco. The remaining population has been slow to recover.

Abalones are herbivores, feasting on the many different algae types found in the area. The different species come in different sizes with blacks being the smallest and greens being the largest. The largest abalone along the California coast is the cold-water loving red abalone, with some individuals growing to 10 or more inches across.

Abalones are slow growing and a full size green abalone of 7 or 8 inches might be 15 years old or more. Abalones reproduce sexually by releasing male and female gametes into the water to meet by chance for fertilization. The newly formed planktonic abalones eventually settle onto something hard to live their lives. Abalones are not big travelers, often moving less than ten feet over a period of months.

There is a host of animals that prey on abalones including crabs, lobster, octopus, starfish, cabezon, sea otter and, of course, humans. If you are lucky enough to see an abalone in the tide pools, please always place the rock back as you found. This will ensure others will have that chance and the abalone will have a chance to grow to maturity and reproduce to replenish the wild stocks.



Chama - (*Chama arcane*): The Chama is a type of bivalve -- a class of mollusk with two shells -- that cements itself onto the underside of rocks on Doheny's reef. They live the majority of their lives attached to these rocks, only opening their shell enough to extend a siphon to filter out very fine food particles from the water. They range from Oregon south to Bahia San Juanico, Baja California. Usually these animals can be found in small groups, but in some areas they will be so densely populated they will literally be cemented on top of each other. Nothing is known about their reproductive lives

other than there are two genders.



Chitons - Perhaps the most mispronounced animal in the ocean is the chiton. It is pronounced with a hard “k” sound. Chitons are a type of mollusk that identified by eight shell plates held together by an outside oval of tissue called a girdle. Most chitons are light sensitive so they’ll be found under rocks. Some species are brightly colored while others are well camouflaged. Chitons are found almost everywhere

in the ocean – from the high intertidal zone to as deep as 4000 meters. They are at home in cold arctic seas as well as in the warm tropical waters near the Equator. Most chitons are vegetarians, but some are carnivorous.

Some species found at Doheny are the **California Spiny Chiton** (*Nuttallina californica*). California Spiny Chitons are up to two inches long with a narrow body. The body length is two to three times the width. These chitons live in depressions in the rocks of Doheny’s reef. At high tide they feed on a type of red algae called Corallina which often grow right on their shell plates. Western Sea Gulls eat these chitons when the tide is low.

The **Southern Spiny Chiton** (*Nuttallina scalora*) doesn’t retreat from sunlight and is colorful. Body color varies from green to brown to black. They are up to an inch in length with a life span of up to twenty or more years.

Hairy Chitons (*Mopalia ciliata*) are covered in soft hairs and are similar to the Mossy Chiton. The hair makes them more tolerant of daylight; however, they feed on diatoms at night and stay put during low tide. Their radula, which is the mouth mechanism for scraping algae off rocks, can pick up magnetite from the rocks making their mouth magnetic.

A similar looking species, the **Mossy Chiton** (*Mopalia muscoa*), is covered in stiff hairs making it look fuzzy. They may be found on the topsides of rocks during low tide, especially if it is overcast. At night, they feed on red or green algae. Other marine life may be found living on their bodies.



Limpets - There are several different species of limpets in the Doheny area. Limpets are mollusks closely related to abalones. They range in size from 1/2 inch to 3 inches with the **Owl Limpet** second only to the **Giant Keyhole Limpet** in size. The Owl Limpet gets its name from the muscle scar found on the inside of its shell. This scar resembles the silhouette of a Great Horned Owl.

Limpets are herbivores that feed on algae. The shape of their shells often helps them stay affixed to the rocks in the surf zone. At low tide, the limpet will grip tight to the rocks and trap small amounts of water under the shell which the animal will use until water is available again at the next tidal change.

About half of all limpets species display homing tendencies. This means that during high tide when water is covering the animal it will range over a meter or so of rock in search of food. As the tide recedes, the limpet will return to its original place on the rock to remain until the next high tide.

Predators of the limpet include sea stars, crabs, octopus and man. Be careful when you're in the tide pools not to crush limpets by stepping on them or turning rocks on top of them.



Navanax - The navanax is a medium-sized sea slug with two distinct color forms. One is dark, the other light. Both have striations of blue, yellow, orange and white down the length of their body. They can be found in sandy or muddy bodies of water where it is calm, although they are often spotted in the tide pools at Doheny nearest lifeguard tower 13.

This sea slug is carnivorous, feeding on other sea snails and slugs. The navanax will follow its prey's mucus trails for its dinner. One of the navanax's favorite meals is the Bubble snail. The navanax will often have so many inside of its soft body that when you pick it up it will feel very lumpy. This is where its nickname "bag of marbles snail" comes from.

Although not preyed upon by too many animals, if disturbed, the navanax will extrude a bright yellow fluid similar to the purple fluid released by the sea hare. Also like its cousin the sea hare, each navanax will release millions of eggs every spring in a clump, similar in color and size to spaghetti.

Sea Hares



Black Sea Hare or California Black Sea Hare – (*Aplysia vaccaria*): Sea hares are large mollusks that lack an external shell, and they get their name because their antennae resemble rabbit ears. These sea hares are very similar to the **Brown Sea Hare** and are identified by their uniform black to dark brown coloration. The most distinguishing feature of these sea hares is their size as they are the world's largest gastropod weighing up to 35 pounds.

They, too, are found along the water's edge at Doheny to a depth of 60 feet. They feed exclusively on brown feather boa kelp so they don't produce purple ink.

They are also hermaphrodites like Brown Sea Hares except their eggs are tangled pinkish-white egg strings.

Brown Sea Hare or California Sea Hare – (*Aplysia californica*): These sea hares are reddish brown to greenish brown with some mottling. They have two elongated flaps with an internal shell. They begin to appear on Doheny's rocky reef from May through the summer months living near the water's edge to a depth of sixty feet. These animals are active during the day making them easy to spot in spring and summer.

Sea hares are herbivores, feeding primarily on red algae. They have a complicated digestive system with three stomachs. Purple ink, which is their defense system, is derived from the algae they eat. Be careful when handling, as the ink will stain clothing.

Living only for a year, these sea hares are hermaphrodites having both male and female reproductive organs. All they have to do is locate another sea hare of the same species. They lay up to a million eggs that look like yellowish spaghetti. The eggs hatch

in 12 days. After hatching, the larvae swim for about a month before settling on red algae. They then gorge themselves in order to double their weight every ten days for the next three months.



Snails

Black Turban Snail – (*Tegula funebris*): The Black Turban snail is a common snail at Doheny with a distinctive black shell found in the upper intertidal zone. In size, its shell is about 1 to 1¼ inches or 3 centimeters in diameter. Black Turbans eat a variety of algae, especially the microscopic film that grows on the surface of rocks. If you examine the snail's shell closely, you might find a small **Black Limpet**, called *Collisella asmi*, living on it. Tiny algae live on the Black Turban's shell that these Black Limpets eat. During low tide, Black Turbans will often group together and during this time the Black Limpets will move from shell to shell. **Blue-banded Hermit Crabs** love to live in the abandoned Black Turban shells so never collect shells when you visit Doheny or any other tide pool.



Cloudy Bubble Snail – (*Bulla gouldiana*): This is an abundant snail found from Morro Bay, California south to Ecuador. Living solely in mud and silt substrates, they are generally believed to be herbivores though this is not well known. This is the largest species of bubble snail off our coast reaching a maximum size of 5.5 cm and living about a year. These snails cover their shell with their mantels so the shell will be free from other growth. Believe it or not, it is not uncommon to find other organisms living in or on these snails. The **pea crab** and the **crepidula snail** can be found in the mantle cavity of the bubble snail. If you can't find a bubble snail, they leave distinctive tracks in the sand. Follow the tracks, and you might find the snail.

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