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DRAFT LEGISLATIVE BILL

DESIGNATING THE RED ABALONE (*HALIOTIS RUFESCENS*) THE CALIFORNIA STATE MOLLUSK

Assembly Bill XXX, as introduced, XXXXXX, State Marine Mollusk: Red abalone, (*Haliotis rufescens*).

CALIFORNIA LAW

Chapter 2 of the General Provisions of Division 2 of the California Government Code establishes the state flag and the state's emblems. A number of categories are provided under the State's emblems including the State animal, bird, flower, insect, gemstone, mineral, reptile, tree and marine life including marine fish, marine mammal and marine reptile. This Legislative bill proposes a new category, "marine mollusk" and would establish the red abalone (*Haliotis rufescens*) as the official state marine mollusk.

INTRODUCTION

The red abalone (*Haliotis rufescens*) can be found along the west coast of North America ranging from the California/Oregon border to Mexico. Red abalones live in rocky areas with kelp, primarily feeding on bull kelp and giant kelp. They reside in the shallow water intertidal zone to depths greater than 180 m (~590 ft.) deep, but are most common between 6 and 40 m (~20 and ~130 ft.). The red abalone's shell length can reach a maximum of 31 cm (just over 12 inches), making it the largest species of abalone in the world. The shell is large, thick, and dome-shaped typically having three or four oval holes or respiratory pores along one side. The exterior of the shell is usually a brick red color and the inside of the shell is strongly iridescent.

"THE PEOPLE OF THE STATE OF CALIFORNIA DO ENACT AS FOLLOWS:

SECTION 1. The Legislature finds and declares all of the following:

(a) The red abalone, *Haliotis rufescens*, is the largest species of abalone in the world, is endemic to the Pacific coast of the United States ranging from southern Oregon through California to northern Baja California in Mexico and is the most common abalone found in northern California;

(b) The red abalone has been harvested as a food source since prehistoric times by the indigenous people of California as evidenced by the large number of red abalone shells in Chumash Indian middens of the Northern Channel Islands dating back 7,500 years and today, farming of red abalone is a growing industry in California;

(c) The red abalone is rooted in California history dating to the 1850s when it was fished intertidally by Chinese-Americans, and in the early 1900s when Japanese-American began fishing virgin stocks of subtidal red abalone as free divers from surface floats and later as hard-hat divers;

(d) The red abalone is particularly well known for its size and flavor becoming a major component of the California abalone fishery from the 1950s through 1997 when the commercial fishery was closed due to declining populations of all seven species of abalone found in California waters;

(e) Beginning in the 1960s the red abalone is the only abalone species that has been successfully cultured and farmed north of Point Conception, developing into a successful mariculture business by the 1980s;

(f) The red abalone is the only abalone species in California that has been fished recreationally since 1911 and successfully continues today due to responsible management and fishing regulations;

(g) Recreational red abalone sport fishing is a popular activity in northern California where free divers with a state issued license and report card may only take abalone above a specified size;

(h) Declaring the red abalone as the official state marine mollusk will acknowledge the species' important place in the ecology, culture, and history of California, as well as broadcast and reinforce the state's commitment to protecting recreational red abalone sports fishing and increased awareness of responsible management; and

(i) California's over 150 year history with the red abalone has made this endemic mollusk an iconic symbol of California and an important reason for making the red abalone an emblem of the State of California."

SECTION 2. Section XXX.X is added to the Government Code, to read:
"XXX.X. The red abalone, *Haliotis rufescens*, is the state marine mollusk"

1. Emblems

People, by their nature, tend to associate with items and things that are unique and personal to them; their grandfather's watch, mom's special recipe for apple pie or a ring passed down through the generations. They also associate with groups or events because of where they live or because the event holds a special memory. These might include a favorite sports team, attending a concert of a favorite singer or an anniversary. No matter what they may be, these things have special significance to people. It is this desire that has inspired our state and federal governments to celebrate their uniqueness by adopting emblems that, in time, become the icons of a state or country.

In America, the states began adopting emblems after the 1893 World's Fair in Chicago (see Figure 2) where a "National Garland of Flowers" was created that displayed flowers from each state. These flowers soon became emblems of their respective states and started a trend to adopt other Official emblems that were uniquely representative of their region.

Emblems that have been adopted include things such as a coat of arms, a saying like "Don't tread on me", or a state's flag. These items have been chosen or created because they are unique to a particular region and recognized by their residents.

Symbols of nature are particularly popular as emblems. Besides flowers, most states have adopted a variety of living things such as trees, mammals, amphibians and the like.

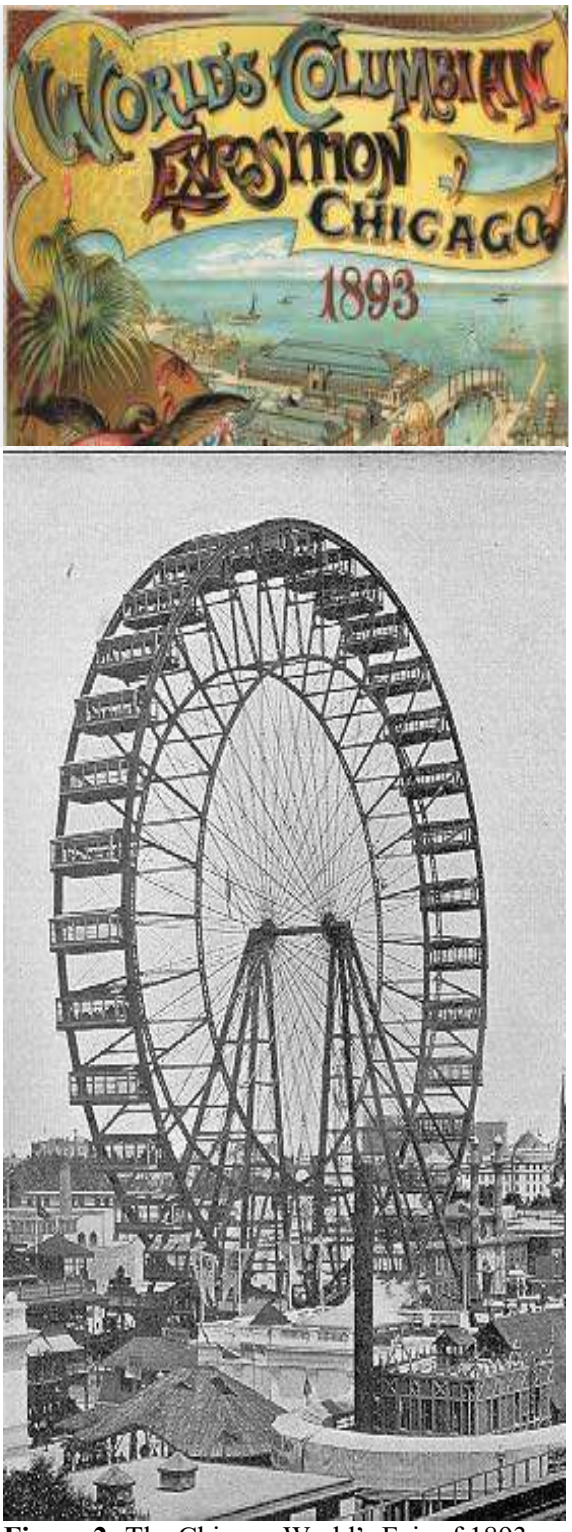


Figure 2: The Chicago World's Fair of 1893 also referred to as the Columbian Exposition.

Figure 3: California Emblems, Giant Redwood (*Sequoiadendron giganteum*), California Poppy (*Eschscholzia californica*), Grizzly Bear (*Ursus arctos californicus*), Red Legged Frog (*Rana draytonii*)

In California, we currently have 34 state emblems ranging from our official state colors, theater, ghost town, military museum, to our official folk dance as well as items of nature including our state mineral, rock, soil, grass, tree, insect, bird, mammal and amphibian (Figure 3).

In many states that border a river, lake or ocean like California, other animals such as fish, water mammals and shells have become part of a state's emblems. As one of the states with the longest continuous stretch of coast line, California is unique in having a large variety of sea life to select from for state emblems. Because of this, our state emblems include a marine mammal, marine reptile and marine fish (Figure 4). It is expected that, as Californians begin to find other new and uniquely Californian natural treasures, this list will grow.

One natural product from the sea, seashells, is a unique gem that California residents can find regularly on the beach. Those shells and the animals that live within are called mollusks. The dictionary defines mollusks as any invertebrate having a calcareous shell comprised of one or more pieces that wholly or partly enclose a soft, unsegmented body. These include snails (*e.g.,* Wavy turban), bivalves (*e.g.,* Pismo clam), abalone (*e.g.,* Red Abalone) squids, and octopuses. All state legislators can agree that this special group of the animal kingdom should be included in our state emblems.

There are a number of mollusks unique to the Pacific coast. However, only one raises above all others, the Red Abalone, *Haliotis rufescens* (Figure 1). It is the largest species of abalone in the world and is endemic to the Pacific coast of the United States ranging from southern Oregon through California to northern Baja California in Mexico.

The Red Abalone is the most common and well recognized abalone found in northern California and has been harvested as a food source since prehistoric times by the indigenous people of California. This is evidenced by the large number of Red Abalone shells in Chumash Indian middens of the Northern Channel Islands dating back 7,500 years.

It became rooted in California's history in the 1850s when it was fished intertidally by Chinese-Americans, and in the early 1900s when Japanese-Americans began fishing virgin stocks of subtidal Red Abalone as free divers from surface floats and later as hard-hat divers. In the mid-1950s, harvesting of abalone became a major component of California's fishing industry through 1997 when the commercial abalone fishery was closed due to declining populations.

Concerned about their decline, research began in the 1960s to repopulate the species. This effort developed into a successful mariculture business by the 1980s. Today, the Red Abalone is the only abalone species that has been successfully cultured and farmed north of Point Conception.

Since 1911, the Red Abalone continues to be the only abalone species in California that can be fished recreationally because of responsible management and fishing regulations.

It is California's over 150 year history with the Red Abalone that has made this endemic mollusk an iconic symbol of California and an important reason for making the Red Abalone the State marine mollusk.

Figure 4: California Marine Emblems, the Gray Whale (*Eschrichtius robustus*), the Leatherback Turtle (*Dermochelys coriacea*) and the Garibaldi (*Hypsypops rubicundus*).

2. Abalone

The California coastline supports eight of the fifty-seven species of abalone (Appendix) including eighteen subspecies currently recognized for this genus. The eight species found in California and their largest recorded sizes are listed in Table 1.

Table 1: California *Haliotis* Species

Species	Largest Size*
Haliotis rufescens Swainson, 1822 Red Abalone	~12.3" (313.0 mm)
Haliotis fulgens Philippi, 1845 Green Abalone	~10.0" (255.0 mm)
Haliotis corregata Wood, 1828 Pink Abalone	~9.8" (245.6 mm)
Haliotis sorenseni Bartsch, 1940 White Abalone	~9.0" (227 mm)
Haliotis cracherodii Leach, 1814 Black Abalone	~8.5" (216.5 mm)
Haliotis assimilis Dall, 1878 Threaded Abalone**	7.3" (184.7 mm)
Haliotis walellensis Stearns, 1899 Flat Abalone**	~7.0" (176.0 mm)
Haliotis kamtschatkana Jonas 1845 Pinto Abalone**	~6.3" (159.0 mm)

* Pisor, D.L. Registry of World Record Size Shells, 2008.
** Not commercially fished.

The distribution of these species along the western coast of the United States is shown in Figure 10 below.

Abalones attach to rocky substrate with a large foot and feed primarily on drift algae. Five species of abalones (red, green, pink, white and black) were popular sport and commercial species until southern California populations experienced severe declines during the 1960s through 1990s. These declines likely resulted from a combination of overharvesting, disease, and a long-term warming trend leading to poor recruitment coincident with enhanced storm activity, reduced kelp abundance, and increased competition with sea urchins (Leet *et al.* 1992; Engle 1994). One species that was significantly impacted, the white abalone, has been listed as endangered under the Endangered Species Act (ESA). However, a valuable Red Abalone recreational fishery still remains in northern California today.

Figure 5: Red Abalone (*Haliotis rufescens*)

A. Red abalone (*Haliotis rufescens*, Figure 5)

The Red Abalone, the largest abalone in the world, was previously an important fishery in California, with landings peaking in 1967 (Leet *et al.* 1992). In central and southern California, Red Abalone had declined the least of all five species by the time the fishery was closed in 1997 (Leet *et al.* 2001). Combined landings of Red Abalone declined during the period from 1969 to1982 stabilizing at 1/10 their historic average

during the 14-year period before the 1997 closure (Leet *et al*. 2001). From 1952 to1968 most Red Abalone were caught in central California, followed by southern mainland, Santa Cruz, Santa Rosa and San Miguel Islands (Leet *et al.* 2001). From 1983 to1996, catches decreased off these three islands to three percent for Santa Rosa and less than one percent for Santa Cruz and San Nicolas, of their respective peak catches by the 1997 closure (Leet *et al.* 2001). San Miguel Island and the north coast were the exceptions to this pattern. Catches from San Miguel Island, the farthest and most northern of the Channel Islands, and the north coast comprised 71 of the 87 tons landed in 1996 prior to the fishery closure in 1997 (Leet *et al.* 2001). A successful Red Abalone sport-only fishery continues to the north of San Francisco County, where SCUBA has always been prohibited and commercial take was only allowed for a three year period during World War II. Beginning in the 1960s, the free diving effort has increased in relation to shore harvesting (Leet *et al.* 2001). In 1960, an estimated 11,000 diver-days were expended to take 118,000 pounds of red and black abalone, compared with 29,000 diver-days to take 192,000 pounds in 1972 (Leet *et al.* 2001). By 1985 to 1989, average diver-days and shore harvesting-days per year were focused on Red Abalone in central and northern California. Estimated landings of Red Abalone in central and northern California for combined divers and shore harvesting reached a high of 3,472,000 pounds in 1986 and had decreased to 1,161,000 pounds by 1989 (Leet *et al.* 2001). In 1998, an abalone stamp was first sold to generate revenues for stock assessments. In 1998 and 1999, an average 33,000 stamps were sold showing free diving effort levels comparable to those estimated for the 1985 to 1989 period (Leet *et al.* 2001).

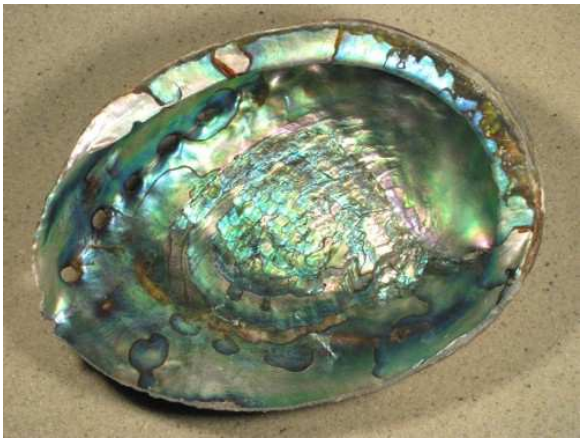


Figure 6: Green abalone (*Haliotis fulgens*)

B. Green abalone (*Haliotis fulgens,* Figure 6)

Green abalone supported an important fishery in California, with landings peaking in 1971 and rapidly declining thereafter (Leet *et al.* 1992). They were most common along the far southern mainland coast and at the southern Channel Islands, and were present at the northern Channel Islands.

Figure 7: Pink abalone (*Haliotis corrugata)*

C. Pink abalone (*Haliotis corrugata,* Figure 7)

In the early 1950s, pink abalone comprised the largest segment (about 75 percent) of the abalone fishery and were a significant

component of the total abalone landings. Commercial landings originated at the northeastern Channel Islands (Anacapa and Santa Cruz), and the southern Channel Islands (San Nicolas, Catalina Island, Santa Barbara, and San Clemente).

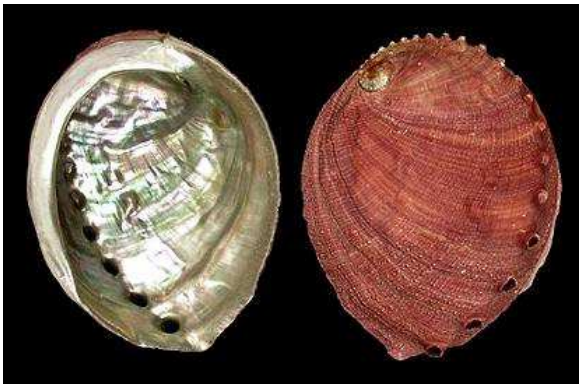


Figure 8: White abalone (*Haliotis sorenseni*)

D. White abalone (*Haliotis sorenseni,* Figure 8)

The white abalone fishery developed late due to their deep habitats, with the first reported commercial landings in1968. This species was popular for their tender meat. Abundances were highest at the southern and northeastern Channel Islands. Peak landings occurred in 1972 and decreased thereafter (Leet *et al.* 1992). The entire white abalone fishery has been closed since 1993, though densities have continued to fall (Carlton *et al.* 1999; Davis *et al.* 1998) due in part to sub-threshold breeding density and continued predation (by fish, octopus, sea stars and other species). Subsequently, in May 2001 the white abalone became the first marine invertebrate to receive Federal protection as an endangered species. Despite the progress reported in 2018 (White abalone Five-Year Status Review and Evaluation by National Marine Fisheries Service, July 2018), white abalone in the wild remain at low densities and are far from meeting the abundance, density, size and distribution needed for delisting.

Figure 9: Black abalone (*Haliotis cracherodii)*

A. Black abalone (*Haliotis cracherodii*, Figure 9)

Black abalone populations in southern California have suffered declines since the mid-1980s along mainland shores south of Point Conception (Miller and Lawrence-Miller 1993), as well as at many of the Channel Islands (Lafferty and Kuris 1993; Richards and Davis 1993). Mortality was associated with "withering syndrome" (WS), a condition that causes the foot to shrink and making affected individuals unable to secure themselves to rock surfaces (Antonio *et al.* 2000; Friedman *et al.* 1997; Gardner *et al.,*1995). Withering syndrome has been observed in abalone north of Point Conception. However, the disease is not widespread (Altstatt *et al.* 1996).

3. Abalone Fishery

The abalones native to the western coast of North America have been fished and collected from shore since before recorded history. At a time when the sea otter (a natural predator of abalone) ranged the entire coast of California, aboriginal peoples used the abalone for food, decoration, and trade (Cox 1962). By 1850, however, fur hunters had virtually eliminated sea otters along the California coast, removing one of the area's most voracious abalone predators. The resultant expansion of abalone populations likely contributed to the

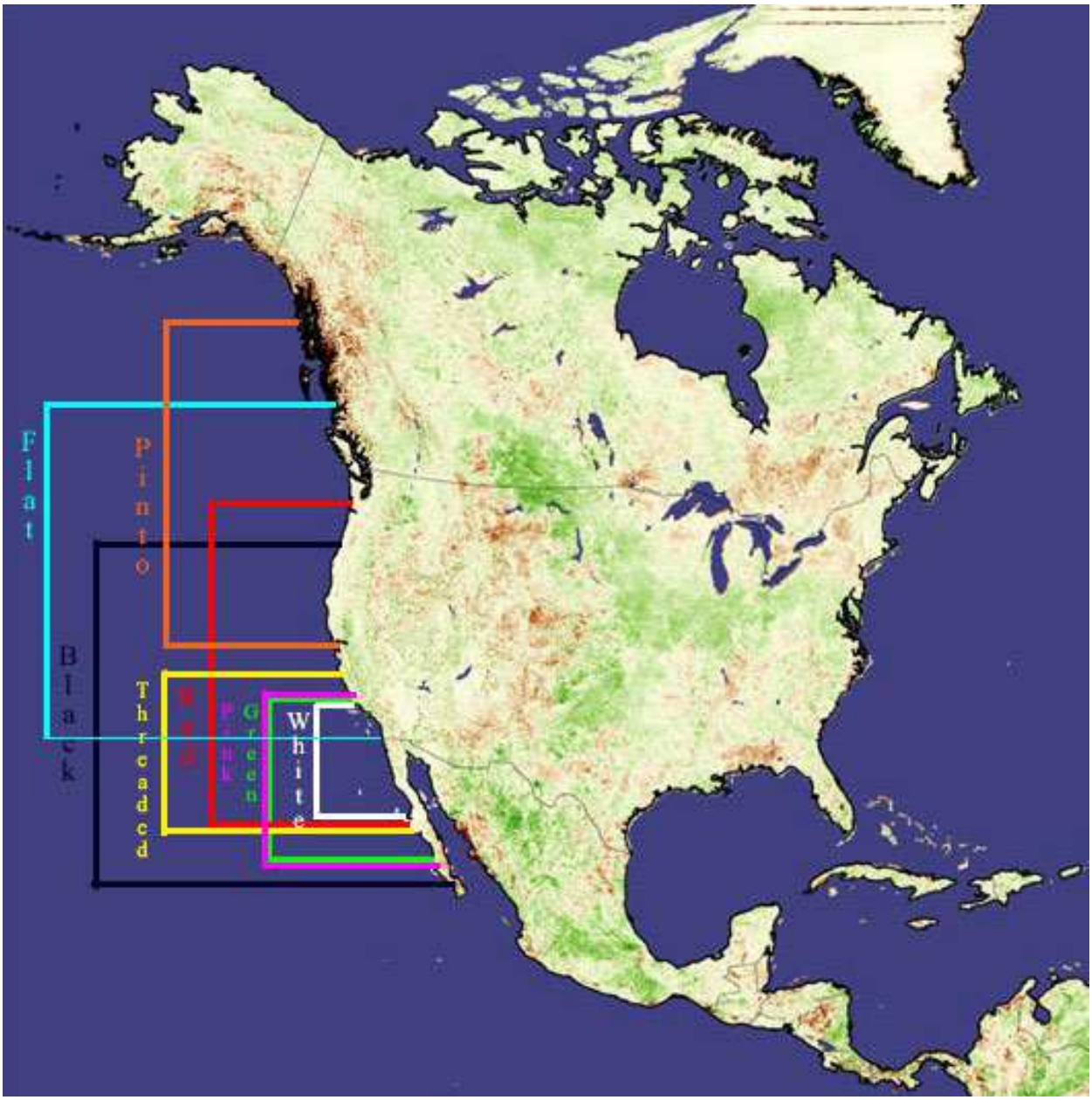


Figure 10: shows the distribution of the eight *Haliotis* species that occur along the Western seaboard. These are the flat abalone (*H. walellensis)* in light blue, the black abalone (*H. cracherodii)* in black, the pinto abalone (*H. kamtschatkana)* in orange, the threaded abalone (*H. assimilis)* in yellow, the Red Abalone (*H. rufescens)* in red, the pink abalone (*H. corregata)* in pink, the green abalone (*H. fulgens)* in green and the white abalone (*H. sorenseni*) in white.

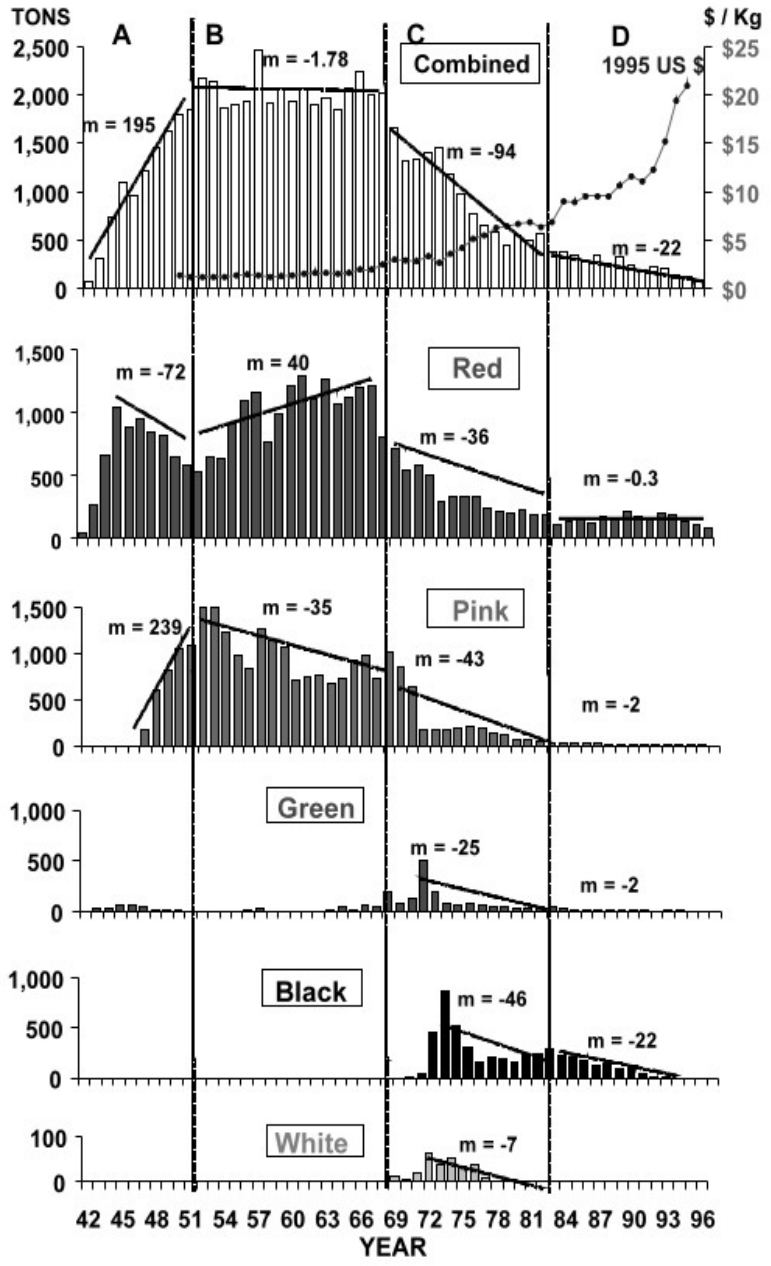


Figure 11: Commercial landings of abalone by California fisheries are shown by bars measured in metric tons with the combined catch top graph and individually in the proceeding graphs. The graphs are also divided into the period trends in the total fishery landings:

A. 1942 to 1951: The fishery was characterized by increased landings;
B. 1952 to 1968: Landings were relatively stable;
C. 1969 to 1982: A rapid decline in landings occurred; and
D. 1983 to 1996: A period of gradual and steady decline occurred.

development of commercial fisheries that thrived on the abundance of abalones. The commercial green and black abalone fisheries along the mainland reached their peaks in 1879 (Cox 1962; Cicin-Sain *et al.* 1977), and by 1913 these fisheries closed (Edwards 1913; Cox 1962). Over the past century, abalone fisheries have been opened and closed numerous times. During the past several decades, the abalone fishery south of San Francisco has suffered dramatic declines, resulting in a moratorium on take in both the commercial and recreational fishery in 1997. Closure of this major commercial fishery, which landed more than 2,000 metric tons during the 1950s and 1960s, occurred despite fishery management efforts. As the central California fishery was lost to the recovering sea otter population, fishery efforts became focused on southern California instead (Wendell personal communication). Overall, abalone populations have been reduced through fishing, outbreaks of withering syndrome and decades of climatic water temperature changes.

Data concerning the commercial fishing of abalone has been primarily derived from mandatory landing receipts for 1950 to 1996. Between 1942 and 1996, the trends in total commercial landings for all abalone species were marked by four distinct stages (Figure 11):

While the industry showed growth from 1942 to 1951, the combined landings leveled-off between 1952 through 1968 and as with many industries where regulation is required to maintain sustainable populations, the landings began to decrease. And by the beginning of the 1980's, landings had significantly decreased due to over fishing and increases in regulations to conserve and maintain existing populations.

4. Socio-Economic Factors

The socio-economic factors of the abalone fishery are presented by breaking the fishery into the two major use sectors (commercial and recreational). The economic value is derived for these two main sectors based on the unique characteristics and data that are available to each.

A. Commercial Sector

In general, the demand for abalone in the commercial sector far exceeds supply (Conte and McBride1996). Abalone products are marketed as a premium product and command high dollar values in international markets. Japanese Americans dominated the commercial abalone fishery in the early 1900s when abalone were boiled, then dried or canned. Dried abalone sold for approximately $0.20 per pound, and the shells sold for approximately $4 per ton (CDPR 1988). Commercial fishing peaked at an annual harvest of over 2,500 metric tons (t) in 1957. Thereafter about 2,000 t were harvested annually from 1957 to 1969, and commercial abalone landings and abalone abundance continued to decline after 1969. Commercial abalone landings in 1992, 1993, and 1994 were approximately 260, 230, and 140 t, respectively (Conte and McBride 1996). The 1995 California commercial abalone ex-vessel landings were 118 t valued at $2,515,467 ($2,792,070 in 2000 base year). This is a reduction in total ex-vessel value of the fishery since 1993, when the reported value was $3,154,147 (CDFG 1995b) ($3,601,141 in 2000 base year). Southern California abalone landings represented 73% of the total value in 1995. The remaining 17% came from central California commercial Red Abalone landings. A more inclusive account of the

socio-economic characteristics of the southern and central California abalone commercial fisheries prior to 1997 may be found in the following Department publications: *Final supplemental environmental document: Abalone sport fishing* (CDFG 1993b), *The red abalone (Haliotis rufescens) sport fishery in central and northern California from creel (1975-94), aerial (1975-1985), and telephone-based surveys* (CDFG 1995a), and *Draft environmental document: Pink, green and white abalone fishery closure* (CDFG 1995b).

B. Recreational Sector

Since the late 1980s, abalone fishing effort has concentrated in Mendocino and Sonoma counties, which now accounts for 96% of the annual recreational effort. This reflects an increase for these counties since 1989 when the average combined annual effort was only 76% (CDFG 2001b). Abalone permit report card returns for the year 2000 show that sport divers residing in Sonoma and Mendocino counties make up 22% of the total abalone trips originating in these two counties. Consequently, 78% of the total abalone trips were made by residents of other counties coming into the local communities and thus bringing an influx of new, or outside, dollars into the local economies. Travel costs and related expenditures can approximate what abalone sport divers are willing to pay in order to access and enjoy abalone resources. However, this travel-cost approach does not capture or estimate consumer surplus (the value of the activity in excess of the costs to engage in it). Consequently, expenditure information alone may underestimate the true value of the resource to the recreational user. Nonetheless, travel-cost data are often used as a means to estimate the economic value of a resource. Recreational abalone divers from outside Mendocino and Sonoma counties use a variety of goods and services from local businesses: bed-and-breakfast inns, motels, hotels, lodges, campgrounds, restaurants, dive shops, and boat launches, to name a few. Average direct expenditures by recreational abalone divers for food, lodging, and equipment are calculated at $49 (2000 base year) per trip. These direct expenditures are based on studies by USFWS for average expenditures by recreational Pismo clam divers in 1985 (USFWS 1987). Considering that northern California received an estimated 201,614 recreational abalone diving trips in 2000 (CDFG 2001b), these trips may represent as much as $9,879,086 in annual direct expenditures on recreational abalone diving activities (201,614 x $49). Subsequent re-spending by business sectors that cater to the needs of recreational abalone divers results in an economic multiplier effect which, when added to the direct expenditures, yields $17,187,633 (2000 base year) in final output demand for the local economies from recreational abalone fishing.

Other socio-economic values related to non-consumptive uses of abalone in California include for example, underwater photography and viewing abalone in Aquariums or on ecological diving trips which adds to the value of abalone to the economy of California.

5. Mariculture

Mariculture farms began raising abalone in the 1960s. Most of these mariculture attempts had little success. Adult animals were reasonably easy to obtain but getting them to spawn was nearly impossible. Artificially mixing the sperm or eggs harvested from mature

abalone did not produce fertile offspring and often sacrificed the adults. Large numbers of offspring could be produced from a single male and female of the species if their broadcast spawning could be induced and controlled. A single female abalone releases millions of eggs with each spawn and a single male releases trillions of sperm. The potential for a mariculture industry was possible but the biological information was not yet known.

In the 1970s, Dr. Daniel Morse began research on abalone spawning at the University of California at Santa Barbara (UCSB). Dr. Morse was a biochemist and investigated abalone spawning from his biochemical perspective. He focused his efforts in characterizing the tissues of spawning and non-spawning animals. This research found that spawning abalone release hydrogen peroxide into their tissues followed by a hormone (prostaglandin), which was then broadcast into the surrounding water approximately two to four hours after the presences of hydrogen peroxide was detected in the tissues. Something in nature provides the stimulus for abalone spawning (hydrogen peroxide release) but this has not as yet been determined. Dr. Morse experimented by adding hydrogen peroxide to ocean water in tanks where abalone were kept. This apparently 'fooled' the abalone and mistaking it for their own, they released hormone and initiated spawning. His landmark paper in Science Magazine (15 April 1977, *Hydrogen Peroxide Induces Spawning in Mollusks, with Activation of Prostaglandin Endoperoxide Synthetase*) provided information that was translated into a recipe by mariculturists that would induce abalone broadcast spawning in tanks. This significantly boosted the production of mariculture farms.

Mariculture farms began spawning hundreds of animals and produced millions of abalone veliger larvae in the late 1970s. However, they had little success in getting the larvae to

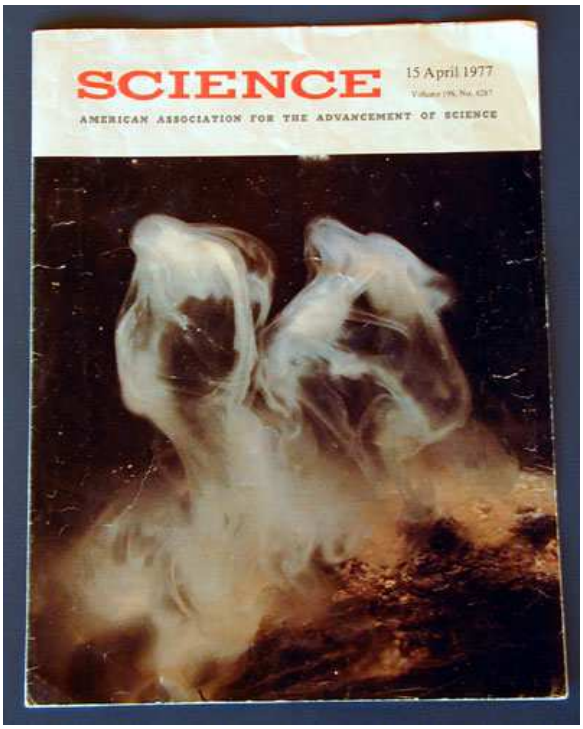


Figure 12: Landmark paper by Danial Morse on abalone spawning.

settle and metamorphose. Many of the farms contacted divers and fishermen to release large volumes of veliger larvae into the ocean in the hopes of increasing the natural abalone population. The success of this approach has not been determined.

In 1979, Dr. Morse discovered the process by which veliger abalone larvae settle for metamorphosis. His findings were published on 27 April in Science Magazine (*Gamma-Aminobutyric Acid, a Neurotransmitter, Induces Planktonic Abalone Larvae to Settle and Begin Metamorphosis,* Figure 12). He found that GABA (gamma-aminobutyric acid, a chemical in baby abalone's first food source) was the 'cue' to settlement. With a

specific concentration of GABA added to the ocean water veliger larvae would stop swimming within minutes, sink to the bottom, and begin benthic (bottom dwelling) life.

With this new information, abalone farms began producing abalone by the 1980s. Some of these farms utilized grow-out chambers located in the ocean and others used large tanks on land. Many of these farms continued and are providing maricultured abalone to restaurants in southern California today. Almost all of the mariculture farms are private enterprises.

Repopulation of abalone in the wild was conducted by 'planting' tagged abalone along the California coast in the 1980s and early 1990s. Many college groups and dive clubs took part as well as researchers and government agencies. Animals were tagged so that their success might be determined later. Tagging procedures included epoxy lumps with stainless steel tags, spaghetti tags, and letters or numbers affixed on the shell with super glue. A few of the tagged animals were later recovered (some alive, others as shells on the beach) but the majority were never seen again. Many of these were maricultured abalone of various sizes and a few were the wild-caught abalone that had been used for spawning research. Unfortunately, the success of these animals has never been determined.

In 2005, the California Abalone Association, a group of former commercial abalone divers, initiated a program to collect baseline information in the area of San Miguel Island in Southern California where stocks have been closed to fishing since 1997. Such data had never been collected on the Red Abalone population in this location. With the assistance of former abalone divers and divers from the California State Department of Fish and Game, the National Park Service and the University of California at Santa Barbara, this was one of the most cooperative data gathering projects in California. The two year research program revealed that abalone recovery has and is occurring at San Miguel.

6. Other Uses

The highly iridescent inner nacre layer of the shell of abalone has traditionally been used as a decorative item, in jewelry, buttons, and as inlay in furniture and in musical instruments such as guitars and the like (see Figure 14).

Abalone pearl jewelry is very popular in New Zealand and Australia (Figure 13). Unlike the Oriental Natural pearl, the Akoya pearl and the South Sea and Tahitian cultured pearls, abalone pearls are not primarily judged by their roundness. Their free-form shape and iridescence make them unique when compared to other types of pearls.

Figure 13: Abalone pearls.

7. Conclusion

While there are many mollusks considered to be unique to California, there is only one that stands out above the rest as one of the most beautiful and well-known

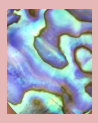
shells from California. It is the largest species in its family whose meat is consider a delicacy by so many that it created an entire fishing industry in the state and whose shell is highly prized, not only by the indigenous peoples of California and current shell collectors, but by jewelers and garment manufactures. It is because of this, that the people of California have requested that the Red Abalone (*H. rufescens*) be made California's state mollusk.

Figure 14: Abalone products.

The San Diego Shell Club

Our Club was founded in 1961 as a non-profit organization for educational and scientific purposes. More particularly, to enjoy and promote the study and conservation of Mollusca, and associated marine life through lectures, club meetings and field trips. Our membership is diverse and includes beginning collectors, amateurs, scientists, divers, underwater photographers and dealers.

The Festivus, is the Club's official quarterly publication distributed worldwide to its members and contains peer reviewed scientific articles as well as articles of general interest to malacologists, conchologists and shell collectors of every level. For more information, please visit our website at: www.sandiegoshellclub.com or contact David Waller at (858) 768-1864.



Appendix

Name	Range
Haliotis alfredensis Bartsch, 1915	South Africa
Haliotis arabiensis Owen, Regter & Van Laethem, 2016	Yemen and Oman
Haliotis asinina Linnaeus, 1758	Philippines, Indonesia, Australia, Japan and Thailand
***Haliotis assimilis* Dall, 1878**	**California; Baja California and Mexico**
Haliotis australis Gmelin, 1791	New Zealand
Haliotis brazieri Angas, 1869	Eastern Australia
Haliotis clathrata Reeve, 1846	Seychelles, Comores, Madagascar, Mauritius and Kenya
Haliotis coccoradiata Reeve, 1846	Eastern Australia
***Haliotis corrugata* Wood, 1828**	**California, Baja California and Mexico**
***Haliotis cracherodii* Leach, 1814**	**California, Baja California and Mexico**
Haliotis cyclobates Péron & Lesueur, 1816	Southern Australia
Haliotis dalli Henderson, 1915	Galapagos Islands
Haliotis discus Reeve, 1846	Japan and South Korea
Haliotis dissona (Iredale, 1929)	Australia and New Caledonia

Name	Range
Haliotis diversicolor Reeve, 1846	Japan, Australia and Southeast Asia
Haliotis drogini Owen & Reitz, 2012	Cocos Island, Costa Rica and Galapagos Islands
Haliotis elegans Koch & Philippi, 1844	Western Australia
Haliotis exigua Dunker, R.W., 1877	Japan
Haliotis fatui Geiger, 1999	Tonga Mariana Islands
***Haliotis fulgens* Philippi, 1845**	**California, Baja California and Mexico**
Haliotis geigeri Owen, 2014	São Tomé y Principe
Haliotis gigantea Gmelin, 1791	Japan
Haliotis glabra Gmelin, 1791	Philippines
Haliotis iris Gmelin, 1791	New Zealand and Vanuatu
Haliotis jacnensis Reeve, 1846	Japan, Nicobar Islands, Ryukyu Islands and Pacific Islands
***Haliotis kamtschatkana* Jonas, 1845**	**Western North America**
Haliotis laevigata Donovan, 1808	South Australia and Tasmania
Haliotis madaka (Habe, 1977)	Japan and South Korea
Haliotis mariae Wood, 1828	Oman and Yemen
Haliotis marmorata Linnaeus, 1758	Liberia, Ivory Coast and Ghana

Name	Range
Haliotis melculus (Iredale, 1927)	Australia (New South Wales & Queensland)
Haliotis midae Linnaeus, 1758	South Africa
Haliotis mykonosensis Owen, Hanavan & Hall, 2001	Greece, Turkey and Tunisia
Haliotis ovina Gmelin, 1791	Thailand, southern part of the Pacific Ocean, Andaman Islands, Maldives and Ryukyu Islands
Haliotis parva Linnaeus, 1758	South Africa and Angola
Haliotis planata G. B. Sowerby II, 1882	Ryukyu Islands, Sri Lanka, Indonesia, Fiji and Andaman Sea
Haliotis pourtalesii Dall, 1881	Gulf of Mexico, Eastern South America and Northern Colombia
Haliotis pulcherrima Gmelin, 1791	Polynesia
Haliotis queketti E.A. Smith, 1910	South Africa, Kenya and Mozambique
Haliotis roei Gray, 1826	Australia
Haliotis rubiginosa Reeve, 1846	Lord Howe and Malakula Islands
Haliotis rubra Leach, 1814	Southern and Eastern Australia
***Haliotis rufescens* Swainson, 1822**	**Western North America**
Haliotis rugosa Lamarck, 1822	South Africa, Madagascar, Red Sea and Mauritius

Name	Range
Haliotis scalaris (Leach, 1814)	Southern and Western Australia
Haliotis semiplicata Menke, 1843	Western Australia
***Haliotis sorenseni* Bartsch, 1940**	**California, Baja California and Mexico**
Haliotis spadicea Donovan, 1808	South Africa
Haliotis speciosa Reeve, 1846	Eastern South Africa
Haliotis squamosa Gray, 1826	Madagascar, Eastern Australia and Okinawa
Haliotis stomatiaeformis Reeve, 1846	Malta and Pacific Islands
Haliotis supertexta Lischke, 1870	Japan and Sao Tome
Haliotis thailandis Dekker & Patamakanthin, 2001	Andaman Sea
Haliotis tuberculata Linnaeus, 1758	Ireland (introduced), Channel Islands, Azores, Canary Islands, Japan, Madeira, Brittany and Great Britain
Haliotis unilateralis Lamarck, 1822	Gulf of Aqaba, East Africa and Seychelles
Haliotis varia Linnaeus, 1758	Mascarene basin, Red Sea, Sri Lanka and Western Pacific
Haliotis virginea Gmelin, 1791	New Zealand, Chatham; Auckland, Campbell and Fiji Islands
***Haliotis walallensis* Stearns, 1899**	**Western North America**

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