

CDFW Marine Management News

"Perfect Storm" Decimates Northern California Kelp Forests

□ [March 30, 2016](#)[December 7, 2017](#)

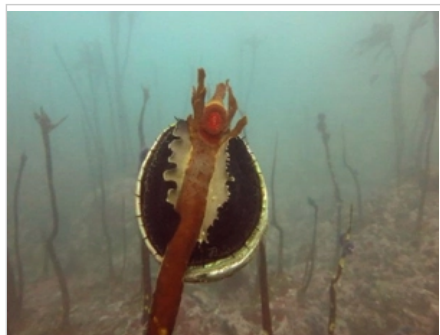


photo by A. Maguire

Northern California kelp forests have been reduced to an all-time low due to a "perfect storm" of large-scale ecological impacts. The California Department of Fish and Wildlife (CDFW) marine invertebrate management team has conducted annual ecosystem surveys of kelp forests in Sonoma and Mendocino counties since the late 1990s, and recent observations have caused concern about the state of the kelp forests. The severe reduction in kelp has already impacted the recreational red abalone fishery and commercial red urchin fishery, two economically important fisheries in northern California.

Abalone and Urchins Starving

Bull kelp (*Nereocystis luetkeana*), usually common on the northern California coast, has declined dramatically since 2014. Kelp forests are now 93 percent smaller compared to previous years, creating starvation conditions for herbivores.



https://cdfwmarine.files.wordpress.com/2016/03/abalone-climbing-stalk_k-joe.jpg

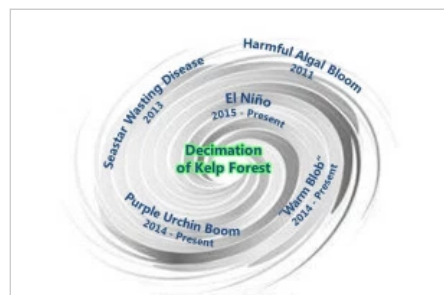
Unusual foraging behavior near Elk in Mendocino County: a large red abalone climbing a bare kelp stalk trying to reach fronds that are not there.

photo by K. Joe

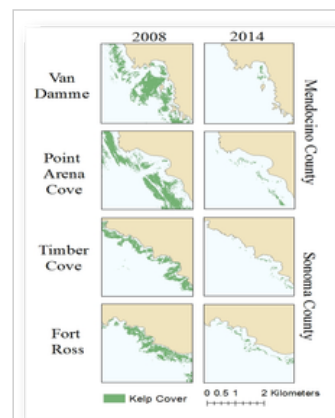
Abalone and sea urchins are both herbivores that depend on healthy kelp forest ecosystems for food and habitat. With the recent loss of kelp and the ensuing starvation conditions, researchers have documented unusual behavior for both abalone and urchins. Large abalone are now more commonly observed climbing stalks in search of kelp blades, and small abalone have abandoned the protection of rocky crevices in search of food. Other invertebrates and fish species, such as rockfish, also depend on the shrinking kelp forest ecosystem for food and protection from predation.

The Perfect Storm

A series of large-scale catastrophic events recently combined into a "perfect storm" of ecological impacts that



<https://cdfwmarine.files.wordpress.com/2016/03/perfectstorm->



<https://cdfwmarine.files.wordpress.com/2014.png>

Comparison of kelp cover at four important abalone fishery sites in 2008 and 2014. Green indicates kelp canopy observed. Maps created from data collected during CDFW aerial surveys. (Data: M. Fredle)

triggered dramatic shifts in the kelp forest ecosystem on the

north coast. Environmental stressors included impacts from a toxic algae bloom off the Sonoma coast in 2011, a widespread sea star disease in 2013 that was followed by an explosion in the sea urchin population, and the warm water conditions that have persisted offshore since 2014.

[graphic.jpg](#)

The "perfect storm" of ecological impacts *illustration by A. Amrhein*



<https://cdfwmarine.files.wordpress.com/2016/03/habaftermath-nate-buck1.jpg>

Aftermath of the harmful algal bloom: dead abalone and other invertebrates washed up on shore at Fort Ross in 2011.

photo by N. Buck

Harmful Algal Bloom

The first major impact to the region occurred in August 2011 when a harmful algal bloom released a toxin into Sonoma County waters, killing large numbers of marine invertebrates. The California Fish and Game Commission responded to this unprecedented event by instituting a temporary emergency closure of the abalone fishery in Sonoma County, followed by reductions in the annual abalone catch limits starting in 2014. This event marked the beginning of a set of ecological stressors that would impact multiple invertebrate fisheries on California's north coast.

Sea Star Wasting Disease

Two years later in 2013, [Sea Star Wasting Disease](http://www.piscoweb.org/research/rocky-shores/seastar-wasting) (<http://www.piscoweb.org/research/rocky-shores/seastar-wasting>) killed large numbers of sea stars on the West Coast of North America, from Mexico to Alaska. Sea stars are important predators of invertebrates that live in the kelp forests. The loss of these predators added another stressor that would later contribute to a sea urchin population expansion.

Purple Sea Urchin Population Boom

CDFW researchers have discovered that purple sea urchin densities are now greater than 60 times their historic density in northern California. This unprecedented expansion of urchin populations spans hundreds of miles of coastline. Purple sea urchins are voracious consumers of kelp. In large numbers, these small but hardy herbivores can easily wipe out vast expanses of kelp and other algae, changing the landscape from a lush and diverse kelp forest ecosystem to what is known as an "urchin barren".

More sunlight reaches the sea floor in urchin barrens, because the light is no longer filtered through thick fronds of kelp canopy and

sub-canopy – similar to the way sunlight is filtered through a rain forest canopy on land. Fish and other species that normally hide in the shade of these fronds are no longer protected from the hungry eyes of larger predators.



<https://cdfwmarine.files.wordpress.com/2016/03/urchinscrawling-kelp-andrew-weltz.png>

Purple urchins grazing a desolate kelp forest, Fort Ross, 2015.

photo by A. Weltz

In urchin barrens, the sea floor is dominated by the purple and red spines of urchins as they scour the rocks for food. Only the hard, calcified, pink crustose algae can withstand the high-impact grazing pressure currently observed in northern California. The urchin barren conditions may persist until the presence of sufficient predators, disease, or storms reduce the exploding urchin population.

Unprecedented Warm Water

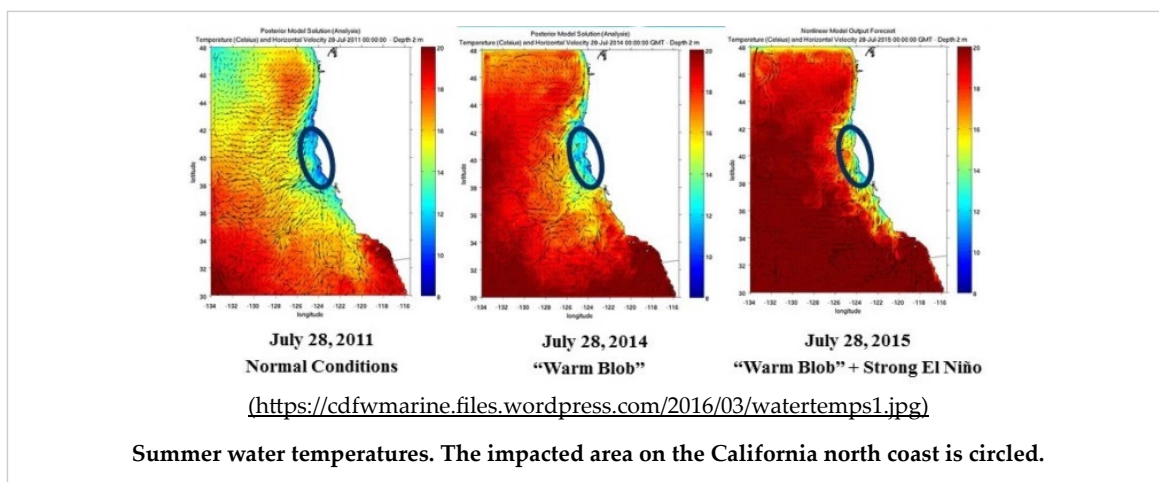
The kelp forest ecosystem suffered another series of shocks in 2014 and 2015, when coastal water temperatures along the West Coast rocketed upwards due to a combination of oceanographic features: the "Warm Blob" (https://www.nwfsc.noaa.gov/news/features/food_chain/) in 2014, combined with a strong [El Niño](https://www.climate.gov/enso) (<https://www.climate.gov/enso>) that began in 2015. Kelp and many other marine species are very sensitive to changes in water temperature, and warm water holds few of the nutrients required for kelp growth.



<https://cdfwmarine.files.wordpress.com/2016/03/urchinscrawling-kelp-andrew-weltz.png>

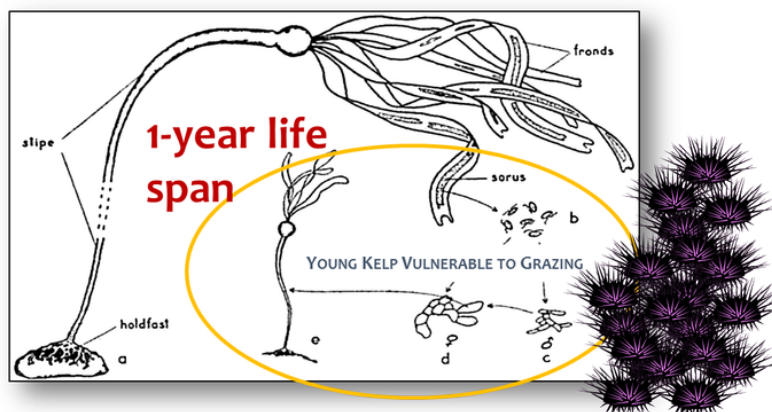
Large aggregations of purple urchins are wiping out kelp forests, creating pink barrens and out-competing other species, such as abalone, for space and food.

photo by A. Maguire



Challenges to Kelp Recovery

The recovery of canopy-forming bull kelp is a critical concern for many of the nearshore commercial fisheries in California. The lack of kelp and associated loss of species diversity may also reduce recreational fishery enjoyment in affected areas. Bull kelp, common on the north coast, is very sensitive to warm water, and can die in water temperatures above 63°F (17°C). Bull kelp recovery may be limited even if ocean temperatures cool because kelp spores are vulnerable to intense urchin grazing, which can prevent the re-establishment of kelp beds. Successful re-establishment of new kelp every year is critical, because bull kelp is an annual species that lives for only one year. Without successful reproduction every year, the kelp forest may be unable to grow back to its full potential.



(<https://cdfwmarine.files.wordpress.com/2016/03/bullkelpifehistoryandurchins.png>)

Bull kelp spores are vulnerable to grazing during persistent urchin foraging.
diagram from "The Oceans, Their Physics, Chemistry, and General Biology", 1942

Consequences for Local Fisheries

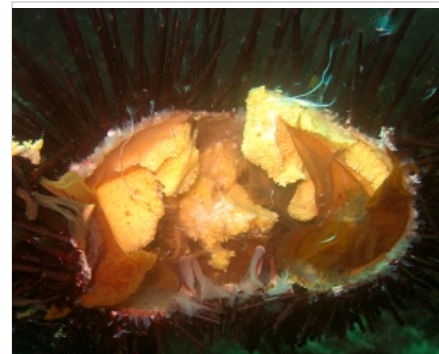
Coastal communities are already experiencing socioeconomic impacts from this environmental disaster. The recreational red abalone fishery and the commercial red sea urchin fishery are economically very important to the north coast region. The recreational abalone fishery was recently assessed at a value of \$44 million to the fishermen (non-market value). The north coast sea urchin fishery, which mainly targets urchin roe for export, has been valued at \$3 million (ex-vessel value) per year.

In 2015, the commercial red urchin fishery experienced a 66 percent drop in catch and economic value due to the poor quality of the urchin roe. Red urchins are the primary target of the fishery (not purple urchins) since they are larger and more marketable.

Recreational divers and rock pickers reported shrunken and weakened abalone in fall 2015, which may also decrease the red abalone catch. Recreational abalone fishing on the north coast is a time-honored tradition, but people are less inclined to search for abalone if the meat is not worth the effort, or if people choose not to pursue abalone fishing due to concerns about the health of the resource.

CDFW Tracks Ecosystem Impacts

These rapid and dramatic changes over a large area of the coast are a primary concern for marine resource managers in California. Alerting the public, policymakers, scientific community and other stakeholders to these issues is a high priority for CDFW.



(<https://cdfwmarine.files.wordpress.com/2016/03/healthy-red-urchin-roe.jpg>)

Healthy red urchin roe
photo by D. Rudie



(https://cdfwmarine.files.wordpress.com/2016/03/smallab_s-holmes.jpg)

Shrunk abalone due to lack of food.
The foot (meat) of the abalone should be roughly the same size as its shell.
photo taken in Oct. 2015 by abalone fisherman S. Holmes.

Volunteer, or contact CDFW directly (contact information below) for more information about volunteering on projects related to north coast kelp forest recovery research.

CDFW will prioritize research and monitoring of the situation to improve our understanding of the impacts hitting the affected fisheries, and to find methods that may help the kelp forest ecosystem recover. CDFW's marine invertebrate management team is partnering with the fishing industry and the scientific community to identify opportunities to assess kelp forest recovery potential under various conditions. CDFW researchers will also continue the long-term ecosystem monitoring program that will track changes in ocean conditions, and hopefully the progress of kelp forest recovery.

Continued assessments of abalone health and reproduction on the fishing grounds will also improve researchers' understanding of the magnitude of impacts to our fisheries. The CDFW [Marine Region website](http://www.wildlife.ca.gov/regions/marine) (<http://www.wildlife.ca.gov/regions/marine>) and Marine Management News blog will be updated periodically with results and developments from these efforts as they occur.

What Can You Do?

Here are a few ways to become involved:

- Share this blog post on your social media accounts. This is an important message. Please help spread the word!
- Volunteer with CDFW: Volunteers are needed to help with research and data collection. You can [sign up](https://www.wildlife.ca.gov/Explore/Volunteering/NRVP) (<https://www.wildlife.ca.gov/Explore/Volunteering/NRVP>) as a CDFW Natural Resource

Dr. Cynthia Catton
 Environmental Scientist
 California Department of Fish and Wildlife
 Email: Cynthia.Catton@wildlife.ca.gov (mailto:Cynthia.Catton@wildlife.ca.gov)
 Phone: 707-875-2072

- Report Observations: If you have observed related events, and would like to share your observations and photos, please contact CDFW's marine invertebrate team (contact information above). The most helpful information for research will include the date, location, and depth of your observations.

Learn more:

Read [Northern California Abalone Numbers Crashing, Recreational Season May Shutter](http://www.santacruzsentinel.com/article/NE/20171205/NEWS/171209832) (<http://www.santacruzsentinel.com/article/NE/20171205/NEWS/171209832>) by Santa Cruz Sentinel journalist Alex Fox (12/5/2017)
[Listen to Dr. Catton and sport diver Josh Russo's interview on KRCB's World Cafe program](http://radio.krcb.org/post/struggle-survival-ocean-floor#stream/0) (<http://radio.krcb.org/post/struggle-survival-ocean-floor#stream/0>) (11/7/2016)
 Read [North Coast Kelp Beds "Like a Desert" This Year](http://www.pressdemocrat.com/lifestyle/5815868-181/north-coast-kelp-beds-like) (<http://www.pressdemocrat.com/lifestyle/5815868-181/north-coast-kelp-beds-like>) by Santa Rosa Press Democrat journalist Mary Callahan (<http://sanfrancisco.cbslocal.com/video/category/news/3410850-kelp-deforestation-threatening-californias-coastline/>) (7/21/2016)
[Watch Kelp Deforestation Threatening California's Coastline](http://sanfrancisco.cbslocal.com/video/category/news/3410850-kelp-deforestation-threatening-californias-coastline/) (<http://sanfrancisco.cbslocal.com/video/category/news/3410850-kelp-deforestation-threatening-californias-coastline/>) on CBS San Francisco Bay Area News (6/4/2016)
[Listen to Dr. Catton's interview about abalone, kelp, and research on KZYX Mendocino Public Radio](https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=38840&inline) (<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=38840&inline>) (5/16/2016)
[Read Collapse of Kelp Forest Imperils North Coast Ocean Ecosystem](http://www.pressdemocrat.com/news/5487602-181/collapse-of-kelp-forest-imperils?artslide=0) (<http://www.pressdemocrat.com/news/5487602-181/collapse-of-kelp-forest-imperils?artslide=0>) by Santa Rosa Press Democrat journalist Mary Callahan (4/16/2016)
[Watch Dr. Catton's presentation to the California Fish and Game Commission](https://www.youtube.com/watch?v=P42Gm1AiWOw) (<https://www.youtube.com/watch?v=P42Gm1AiWOw>) on this topic (4/6/2016)
[Listen to Dr. Laura Rogers-Bennett describe environmental impacts on KCBS News Radio](https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=122457&inline) (<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=122457&inline>)

Harmful Algal Bloom

News:
[Abalone massacre pinned on microscopic coastal killer](https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=38840&inline) (<http://www.sfgate.com/science/article/Abalone-massacre-pinned-on-microscopic-coastal-5467283.php>), SF Gate, May 2014
[Abalone and Red Sea Urchins Die During Red Tide Bloom in Northern California](https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=38840&inline) (<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=38840&inline>), Marine Management News newsletter (pg. 4), October 2011

Scientific literature:

[Forensic genomics as a novel tool for identifying the causes of mass mortality events](http://www.nature.com/ncomms/2014/140416/ncomms4652/full/ncomms4652.html) (<http://www.nature.com/ncomms/2014/140416/ncomms4652/full/ncomms4652.html>), 2014
[Dinoflagellate bloom coincides with marine invertebrate mortalities in northern California](http://unesdoc.unesco.org/images/0022/002204/220400E.pdf) (<http://unesdoc.unesco.org/images/0022/002204/220400E.pdf>), 2012

Sea Star Wasting Disease

Current updates, information, & data:

[Partnership for Interdisciplinary Studies of Coastal Oceans \(PISCO\)](http://www.piscoweb.org/research/rocky-shores/seastar-wasting) (<http://www.piscoweb.org/research/rocky-shores/seastar-wasting>)

Pacific Rocky Intertidal Monitoring: Trends and Synthesis (<http://www.eeb.ucsc.edu/pacificrockyintertidal/data-products/sea-star-wasting/index.html>)

News:

Scientists now link massive starfish die-off, warming ocean (<http://www.seattletimes.com/seattle-news/environment/scientists-now-link-massive-starfish-die-off-warming-ocean/>) Seattle Times, February 2016

Scientific Literature:

Densovirus associated with sea-star wasting disease and mass mortality (<http://www.pnas.org/content/111/48/17278.full.pdf>) 2014

Urchin Barrens

Scientific Literature:

Sea urchin barrens as alternative stable states of collapsed kelp ecosystems (<http://www.int-res.com/articles/feature/m495p001.pdf>) 2014

Ocean Conditions

News:

Strong El Niño sets the stage for 2015-2016 winter weather (<http://www.noaanews.noaa.gov/stories2015/101515-noaa-strong-el-nino-sets-the-stage-for-2015-2016-winter-weather.html>) October 2015, NOAA

Unusual North Pacific warmth jostles marine food chain (https://www.nwfsc.noaa.gov/news/features/food_chain/) September 2014, NOAA

Web pages:

CeNCOOS El Niño (<http://www.cencoos.org/learn/el-nino>)

NOAA El Niño & La Niña (El Niño-Southern Oscillation) (<https://www.climate.gov/enso>)

Scientific Literature:

CalCOFI State of California Current (<http://www.calcofi.org/publications/calcofireports/v56/Vol56-SOTCC.web.31-69.pdf>) 2015

Current and historic data:

CeNCOOS Data Portal (<http://data.cencoos.org/>)

NOAA Climate Prediction Center (<http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/enso.shtml#current>)

California Kelp Forest Fisheries

Abalone (<https://www.wildlife.ca.gov/conservation/marine/invertebrates/abalone>), CDFW Website

Sea Urchin (<https://www.wildlife.ca.gov/Conservation/Marine/Invertebrates/Sea-Urchin>), CDFW Website

Kelp (<https://www.wildlife.ca.gov/Fishing/Commercial/Kelp>), CDFW Website

Kelp

Data: GIS Kelp survey data (ftp://ftp.dfg.ca.gov/R7_MR/BIOLOGICAL/Kelp/), CDFW, MarineBIOS

Maps: MarineBIOS (Biogeographic Information and Observation System) (<https://map.dfg.ca.gov/marine/>), CDFW

Post by Cynthia Catton, CDFW Marine Environmental Scientist; Laura Rogers-Bennett, CDFW Senior Environmental Scientist Specialist, and Alisan Amrhein, California Sea Grant Fellow

49 thoughts on “**Perfect Storm**” Decimates Northern California Kelp Forests”

1. **Richard Heimann** says:
March 31, 2016 at 12:06 pm

Well written, Cynthia!

Reply (<https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=948#respond>)

2. **abalonebay** says:
April 2, 2016 at 12:32 am

May I repost this article on my website? It will be credited appropriately

Reply (<https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=952#respond>)

- o **marinenews** says:
April 4, 2016 at 12:20 pm

Thank you for asking. Yes, you may, thank you for your assistance in spreading the word!

Reply (<https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=954#respond>)

3. **Jack Beallo** says:
April 4, 2016 at 6:34 pm

So what is your proposal to do about this issue? I was at three different spots diving for abalone last Friday, Saturday and Sunday. Two spots had abalone with small meat. And the third spot had very very meaty abalone. I don't think it's a good idea to approach the fishery with a blanket after looking at four high frequency spots. The north coast has a lot of variability and monitoring since the 1990s is a small window in time compared to the tens of thousands of years the abalone have been here. With that said what would closing down the fishery do exactly? I

hope this isn't a power grab to justify more closures. If the lack of kelp is killing abalone is it possible for divers to finish the job? Also abalone don't just eat kelp so please publish more information on the exact diets of abalone. Thank you for telling the whole truth and nothing but the truth so help you God.

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=955#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=955#respond)

- **marinenews** says:
[April 5, 2016 at 4:08 pm](#)

Thank you for your questions. The recreational red abalone fishery remains open on the north coast (Opening Day: April 1). CDFW will continue to monitor the health of the abalone resource as well as the environmental conditions that might limit future bull kelp recovery. These surveys will have broad spatial coverage to capture the variability along the coast and within sites. We will provide updates to the CDFW website and social media as more information is available.

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=961#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=961#respond)

- **David Leighton** says:
[April 7, 2016 at 1:48 am](#)

Abalone are algivorous. They feed upon marine algae of many species. Brown algae, which include kelps, red algae (many species), and green algae form the natural diet. Artificial foods are often used in culture. Sadly there is a bacterial disease called WS or withering foot syndrome which now infects native and aquaculture stocks of abalone throughout most of California. Pathologists with the CDFW and other labs are employing antibiotics to combat the disease in cultured abalone with improved success.

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=969#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=969#respond)

- **marinenews** says:
[April 12, 2016 at 2:46 pm](#)

Thank you for joining the conversation, Dave! Your long history and expertise with abalone aquaculture and kelp forest ecology is extremely valuable.

Abalone eat a variety of fleshy seaweed in the wild, but we have observed reductions in all of these species in the kelp forest recently. Bull kelp is the foundation of the ecosystem and is of particular concern because it is an annual species.

- **David Leighton** says:
[April 12, 2016 at 9:57 pm](#)

It would appear abalone on the northern coast are being impacted by scarcity of kelps and possibly other marine algae due in part to warmer water. Disease, notably WS, may also be exacerbated by higher than normal temperatures. WS has hit green abalone at the Carlsbad Aquafarm especially hard, killing almost all (many hundreds) of market-size abalone over the past five years. Any progeny from WS-infected broodstock have been grossly stunted. *Macrocystis* beds in southern California are currently in decline, apparently due to the warm water conditions. Sad state of affairs with declines kelps and diseases such as densovirus and WS RLO clobbering sea stars and abalone.

- **marinenews** says:
[April 13, 2016 at 3:32 pm](#)

The kelp forest and abalone dynamics in Southern California are pretty different from northern California. Giant kelp (*Macrocystis*) in Southern California is impacted by warm water and an invasive algal species (*Sargassum horneri*). Although sea star populations in Southern California were also impacted by the Densovirus, Southern California urchin populations contend with a suite of other predator species as well, including California sheephead (fish) and California spiny lobster. Withering Syndrome, which affects all abalone species, continues to be a threat to populations in Southern California. However, the disease agent has not yet spread to most of the areas within the abalone fishery in northern California. The shrunken animals we are observing in northern California are not succumbing to Withering Syndrome, but are showing signs of starvation.

- **Buzz Owen** says:
[August 24, 2016 at 12:11 pm](#)

"Abalone don't eat just kelp" you say? Aside from various species of red and brown algae – in addition to *Nereocystis* (Bull Kelp) – I was never aware of them consuming other items? If anyone knows of things other than algae abalone normally eat, please let us know. I have been studying abalone for 67 years now, and have written 76 papers on just family Haliotidae (the abalones). Any info one has on this, please pass it on.

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1273#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1273#respond)

- **David Leighton** says:
[August 29, 2016 at 9:42 pm](#)

Sure you're correct Buzz ! Abalone are herbivores and feed when young (postlarvae and early juveniles) on diatoms and other benthic microflora. As adults they feed on brown, red, and green algae.

4. **Joaquin Wright** says:
[April 5, 2016 at 2:27 pm](#)

Thank you for the very informative article. This is my/our backyard and play pen. Understanding the conditions and ways we can help keep it healthy promotes stewardship and sustainability of our great natural community. Perhaps we should be looking for ways to harvest an use the purple urchin as a manageable resource. Urchin spine garden fertilizer? Urchin spine road asphalt? Urchin protein pet food? Urchin tooth paste? Just throwing it out there!

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=960#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=960#respond)

- **marinenews** says:

[April 5, 2016 at 4:42 pm](#)

Thank you for your comments and creative brainstorming. The commercial urchin industry has targeted purple urchins in the past, but only the larger ones, and during a short window of time when the roe is most developed.

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=962#respond\)](#)

- o **Yakitation** says:

[April 13, 2016 at 2:31 pm](#)

Urchin roe toothpaste... Hmm, maybe for export?

Uni toothpaste could be big in Japan!

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=986#respond\)](#)

5. **California Dept of Fish and Wildlife Seeking Help to Monitor Effects of a "Perfect Storm in No. California" | Blue Planet Divers** says:

[April 9, 2016 at 9:33 am](#)

[...] CDFW's blog post on the situation can be read here. [...]

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=974#respond\)](#)

6. **What's Happening to the Kelp? | Ecology Hour on KZYX** says:

[June 14, 2016 at 4:45 pm](#)

[...] That's what someone asked me recently at the Farmer's Market. Kelp forests along the northern California coast are disappearing. We ask two researchers who have been studying kelp for years to explain what a "kelp forest" is, how it functions in the nearshore marine ecosystem, and what is causing the disappearance. [...]

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1121#respond\)](#)

7. **Karin** says:

[June 23, 2016 at 10:40 am](#)

I have a question regarding water temperature. The article says bull kelp is affected by water temps over 63 degrees but the water temp in Northern California is in the 50s. Is this just a statement or a concern for some reason?

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1130#respond\)](#)

- o **marinenews** says:

[June 30, 2016 at 7:35 pm](#)

During normal conditions, the seawater temperature on the northern California coast will not get warm enough to stress the kelp, averaging close to 53 degrees F. In the last two years, CDFW temperature records in the kelp forest have shown significantly increased water temperature, even at depths of 30 feet. A record high water temperature of 63 degrees F was recorded, which would impose substantial stress on the kelp forest. We are continuing to monitor the ocean and ecosystem conditions to track the recovery potential of the kelp forest.

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1141#respond\)](#)

8. **Mark Laszlo** says:

[July 9, 2016 at 4:55 pm](#)

If the kelp missed fertilization by a natural process, why not mix an appropriate, organic fertilizer & strew it from boats off the coast? Ingredients might include kelp & cannery wastes. If high water temperatures throw the coastal marine ecosystem out of whack, why not lower tanks of liquid nitrogen to the seafloor at intervals, fasten them to anchored bouys, attach perforated tubes to the tanks & let cold nitrogen percolate up through the water? Kelp being a plant; would be fertilized by the nitrogen gas. Liquid nitrogen, in seawater-ice encrusted tanks, would lower average, continental shelf, seawater temperatures. Not a complete strategy, but perhaps effective parts of one i hope experts & other coast residents would plan, calibrate, & maintain.

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1165#respond\)](#)

- o **marinenews** says:

[July 14, 2016 at 11:46 am](#)

Thank you for your suggestion. Artificially changing ocean chemistry in the short-term to support kelp growth would be a very difficult task, with unknown consequences for the other species in the ecosystem.

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1183#respond\)](#)

9. **Jim Wadsworth** says:

[August 17, 2016 at 11:36 am](#)

Thank you for these very insightful comments. I am a former urchin exporter from Maine and our kelp beds in Maine are flourishing since we cleaned up the urchins back in the 1990's. There is still a small urchin fishery in Maine, which is enough to prevent any significant buildup of urchin biomass. We found juvenile sea urchins have a hard time settling and surviving in healthy kelp beds due to micropredators living in the understory or "shag carpet" as some call it. Lobsters are the prime beneficiary. Economically, lobster is more important to the state than urchins so the situation is a win for now. Lack of groundfish predation is a big part of the lobster boom, as well. We have seen urchin die-offs during especially warm summers and that could happen out there.

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1247#respond\)](#)

- o **marinenews** says:

[August 23, 2016 at 2:51 pm](#)

Thank you for sharing your experiences and observations.

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1270#respond\)](#)

- o **David Leighton** says:

[August 23, 2016 at 10:36 pm](#)

Check out my report on kelp community revival (Kelp Forests from Deserts) in abalonedoc.com/kelp

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1272#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1272#respond)

10. **Adam bremer** says:

[September 15, 2016 at 7:49 am](#)

If the abalone are starving to death why not allow more of them to be harvested? Thin out the herd so to speak allowing the ones that are left more to eat there by making the population healthier.

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1367#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1367#respond)

o **marinenews** says:

[November 21, 2016 at 10:18 am](#)

The starvation conditions will persist even if the abalone population is "thinned" because urchin populations in the area are still very abundant. Removing more abalone will only provide more food to the urchins rather than to the remaining abalone. To address the overpopulation of urchins (particularly purple urchins), we are developing plans for targeted urchin population control to benefit the kelp forest and associated fisheries.

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1568#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1568#respond)

o **Buzz Owen** says:

[November 21, 2016 at 11:33 am](#)

@ Adam bremer: your comment couldn't be further off base or inaccurate!

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1570#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1570#respond)

11. **T Baker** says:

[October 2, 2016 at 11:46 am](#)

Once again, as was the case with the invasive sargassum weed that's wreaking havoc on southern kelp forests, CDFW has done nothing to prevent, or mitigate the situation except report on it once it's a full-blown disaster! Thanks CDFW!

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1404#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1404#respond)

o **marinenews** says:

[November 21, 2016 at 10:17 am](#)

Our ocean ecosystems are facing many challenges. We share your concern and are working diligently to track the changes as well as identify the most effective responses to these challenges. We are reaching out to many groups (government, academic, non-profit, and industry) and individuals to help us research, develop, and implement the needed actions to support recovery. We encourage you to get involved with this work by contacting Dr. Cynthia Catton at Cynthia.Catton@wildlife.ca.gov (<mailto:Cynthia.Catton@wildlife.ca.gov>).

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1567#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1567#respond)

o **mujerdenoyo** says:

[July 13, 2017 at 4:39 pm](#)

T Baker – It is extremely difficult to learn that entire ecosystems worldwide are rapidly collapsing, especially when one of them is near and dear to us, to which we bare witness. However, I have learned that if we are expecting solutions, to any problems, to come from some source outside of ourselves, we will never solve the problems. This one is no different.

We must find the courage to face the truth about global warming. It is human activity that has hurled planet Earth into her Sixth Mass Extinction Event. And of human activity around the globe, our American lifestyle of mass-consumption is the most destructive. The great news here is that we are more than capable of great change, as long as we take on the challenges in connection with others and focus our energy on the shared goal.

In Peace & Gratitude,
Tammy

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2403#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2403#respond)

12. **sailorsusie** says:

[October 28, 2016 at 7:24 pm](#)

Thank you Dave Rudie for informing us on this issue! We sure appreciate all you do, to protect our ocean and all the critters that live in it! With understanding comes hope. Your our ocean super hero! ❤️

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1475#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1475#respond)

13. **California Dept. of Fish & Wildlife Proposes Changes to Red Abalone Fishery | California Diver Magazine** says:

[November 10, 2016 at 6:06 pm](#)

[...] kelp forests have been reduced to an all-time low and abalone populations have suffered due to a "perfect storm" of large-scale ecological impacts. Environmental stressors include a toxic algae bloom off the [...]

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1519#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1519#respond)

14. **Changes In Order For North Coast Abalone Diving Season -** says:

[January 9, 2017 at 3:32 pm](#)

[...] The red abalone catch is being reduced because surveys conducted by the California Department of Fish and Wildlife (CDFW) found that red abalone populations in deeper waters are on the decline due to unfavorable environmental conditions. Over the past three years, growth of kelp — a major food source for abalone — has declined significantly. Dramatic increases in purple sea urchin populations have further

reduced the food available for abalone. Details can be found at <https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/> (<https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/>). [...]

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1752#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1752#respond)

15. **CDFW-North Coast Abalone Season Dates, Regulations Change – Humboldt Fish** says:
[January 9, 2017 at 6:16 pm](#)

[...] The red abalone catch is being reduced because surveys conducted by the California Department of Fish and Wildlife (CDFW) found that red abalone populations in deeper waters are on the decline due to unfavorable environmental conditions. Over the past three years, growth of kelp — a major food source for abalone — has declined significantly. Dramatic increases in purple sea urchin populations have further reduced the food available for abalone. Details can be found at <https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/> (<https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/>). [...]

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1754#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1754#respond)

16. **North Coast Abalone Season Shortened, Limits Reduced by CDFW | California Diver Magazine** says:
[January 10, 2017 at 5:05 pm](#)

[...] The red abalone catch is being reduced because surveys conducted by the California Department of Fish and Wildlife (CDFW) found that red abalone populations in deeper waters are on the decline due to unfavorable environmental conditions. Over the past three years, growth of kelp — a major food source for abalone — has declined significantly. Dramatic increases in purple sea urchin populations have further reduced the food available for abalone. Details can be found by clicking here. [...]

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1757#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1757#respond)

17. **California North Coast Abalone Season Dates, Regulations Change – Fishshootouts.net – Largest fishing tournament site !** says:
[January 21, 2017 at 6:29 am](#)

[...] The red abalone catch is being reduced because surveys conducted by the California Department of Fish and Wildlife (CDFW) found that red abalone populations in deeper waters are on the decline due to unfavorable environmental conditions. Over the past three years, growth of kelp — a major food source for abalone — has declined significantly. Dramatic increases in purple sea urchin populations have further reduced the food available for abalone. Details can be found at <https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/> (<https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/>). [...]

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1790#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1790#respond)

18. **California North Coast Abalone Season Dates, Regulations Change – Joes Outdoors** says:
[January 21, 2017 at 2:34 pm](#)

[...] The red abalone catch is being reduced because surveys conducted by the California Department of Fish and Wildlife (CDFW) found that red abalone populations in deeper waters are on the decline due to unfavorable environmental conditions. Over the past three years, growth of kelp — a major food source for abalone — has declined significantly. Dramatic increases in purple sea urchin populations have further reduced the food available for abalone. Details can be found at <https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/> (<https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/>). [...]

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1793#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1793#respond)

19. **Get Ready for Abalone Season 2017: New Regulations and Diving Sea Ranch** says:
[February 28, 2017 at 9:40 am](#)

[...] "Perfect Storm" Decimates Northern California Kelp Forests [...]

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1937#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1937#respond)

20. **Reminder: Abalone Season Opens May 1st After Commission Approves Emergency Regulations for 2017 | CDFW Marine Management News** says:
[March 14, 2017 at 1:23 pm](#)

[...] water surveys. An article published on CDFW's Marine Management News blogsite last spring, "Perfect Storm Decimates Northern California Kelp Forests," describes the complex reasons for the decline, including sea temperature change and competition [...]

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1987#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1987#respond)

21. **Reminder: Abalone Season Opens May 1 After Commission Approves Emergency Regulations for 2017 | CDFW Marine Management News** says:
[March 14, 2017 at 1:43 pm](#)

[...] water surveys. An article published on CDFW's Marine Management News blogsite last spring, "Perfect Storm Decimates Northern California Kelp Forests," describes the complex reasons for the decline, including sea temperature change and competition [...]

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1988#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=1988#respond)

22. **Gary Henry** says:
[March 20, 2017 at 2:41 pm](#)

I've tried to copy this article to spread the news but this site will not let me – Why don't you have a print selection under share this?

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2001#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2001#respond)

- o **marinenews** says:
[May 31, 2017 at 12:40 pm](#)

We have added a "Print" button at the bottom of the article, where the other "Share"-type buttons reside. Give that a try!

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2228#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2228#respond)

23. **CDFW Seeks Public Input to Study Abalone Management Preferences | CDFW News** says:
[March 30, 2017 at 4:02 pm](#)

[...] was conducted in 2015 (results available online) but CDFW is interested in learning if recent unprecedented environmental conditions have changed preferences on abalone management. The online survey is intended to reach a broad [...]

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2021#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2021#respond)

24. **CDFW Seeks Public Input To Study Abalone Management Preferences | The Daily Headline News** says:
[March 31, 2017 at 10:06 am](#)

[...] was conducted in 2015 (results available online) but CDFW is interested in learning if recent unprecedented environmental conditions have changed preferences on abalone [...]

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2024#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2024#respond)

25. **Red Abalone Public Opinion Survey Deadline Extended | CDFW Marine Management News** says:
[April 20, 2017 at 11:09 am](#)

[...] was conducted in 2015 (results available online) but CDFW is interested in learning if recent unprecedented environmental conditions have changed preferences on abalone management. To learn more about the fishery management plan [...]

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2066#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2066#respond)

26. **Abalone Survey Participation Deadline Extended | CDFW News** says:
[April 20, 2017 at 2:53 pm](#)

[...] available online. Marine biologists hope that the 2017 survey will help determine if and how recent unprecedented environmental conditions have changed preferences on abalone management. The online survey is intended to reach a broad [...]

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2067#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2067#respond)

27. **Bill Jenkins** says:
[May 26, 2017 at 8:42 am](#)

I've been diving the the north coast since the 80's I missed last year do to heath problems, I went Abalone diving in Mendocino last Monday and the visibility was fantastic but I was shocked the ocean looked like a desert. Hardly any bull kelp no star fish and the Abalone are hanging out on top of the reefs eating what's left. the Abalone are definitely starving. This is so sad is there anything I can do

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2196#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2196#respond)

- o **marinenews** says:
[June 6, 2017 at 11:29 am](#)

Thank you for sharing your observations. We will contact you directly regarding volunteer opportunities.

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2262#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2262#respond)

28. **David Hoyle** says:
[May 26, 2017 at 1:59 pm](#)

Question/comment; why not encourage divers to spend a little extra time underwater smashing purple urchin?

It seems that if an advertisement (similar to beach clean-ups) was made to a mass of people, we could all descend on a chosen area and irradiate a bunch of purple urchin. If nothing else, pick a control area and give it a go.

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2198#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2198#respond)

- o **marinenews** says:
[June 6, 2017 at 11:30 am](#)

Thank you for your enthusiasm! We are considering options for ways to effectively protect the remaining bull kelp and support greater kelp growth in strategic locations. We are currently working with the local commercial sea urchin fishery and other researchers to identify the most effective methods. If you are interested in helping us with our work, please contact Dr. Cynthia Catton (Cynthia.Catton@wildlife.ca.gov) for information on volunteer opportunities.

[Reply \(https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2263#respond\)](https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/?replytocom=2263#respond)