

# HELP THE KELP RECREATIONAL DIVER TRAINING

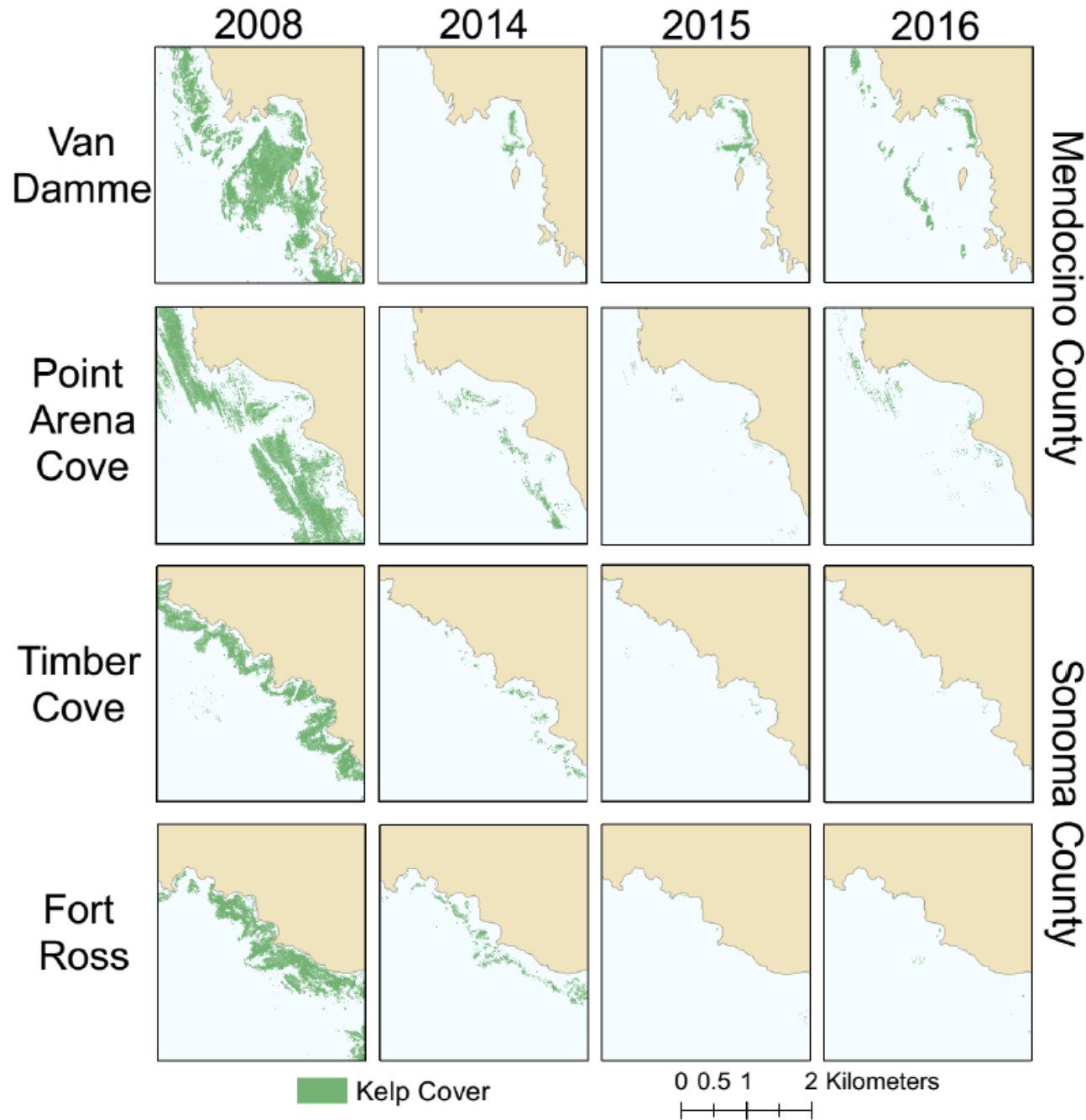
Supporting the widespread  
recovery of kelp to benefit  
ecosystems and fisheries



# KELP FORESTS

## Mendocino and Sonoma

(source: CDFW aerial surveys)



93% kelp loss in 2014

Additional 33% loss in 2015

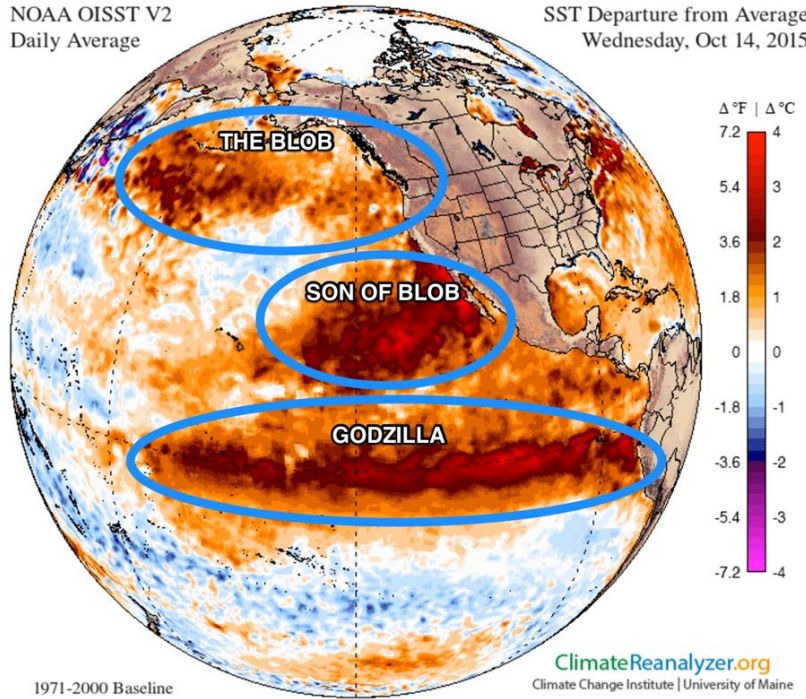
Very limited growth in 2016-18

HOW DID  
WE GET  
HERE?



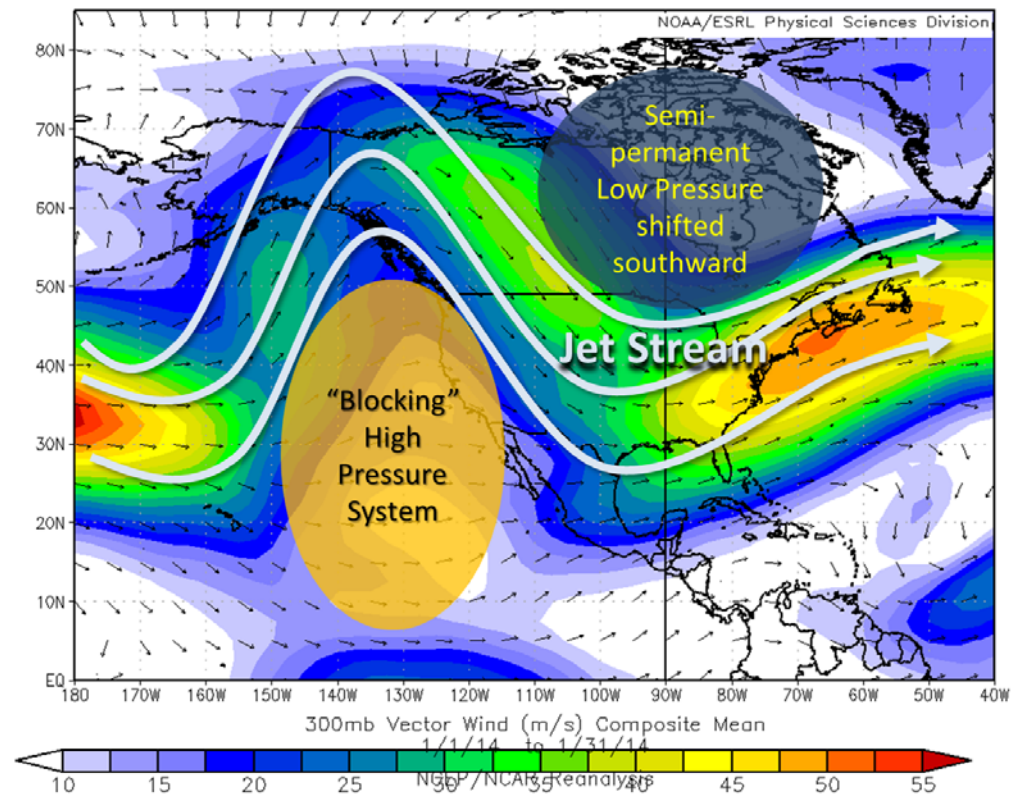
NOAA OISST V2  
Daily Average

SST Departure from Average  
Wednesday, Oct 14, 2015



1971-2000 Baseline

World	Northern Hemisphere	North Atlantic
+ 0.49 °C	+ 0.80 °C	+ 0.64 °C
Equatorial Pacific	Southern Hemisphere	North Pacific
+ 0.99 °C	+ 0.25 °C	+ 0.86 °C



# Marine Heat Wave and Changes to Normal Wind Patterns

Limit upwelling and create bad conditions for kelp growth

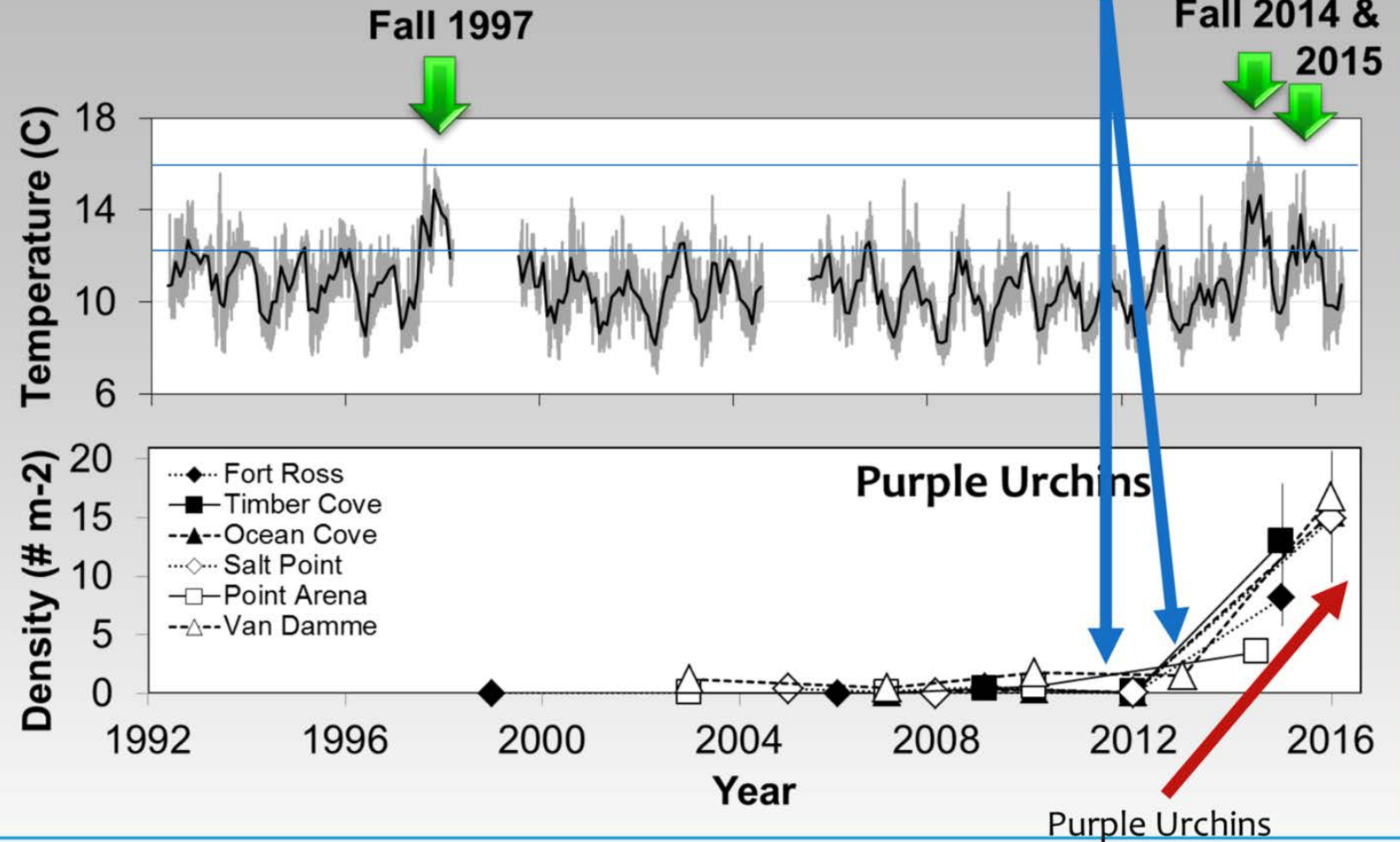
# Sea Star Wasting Disease: Alaska to Mexico



Sea stars are a keystone species that help keep the ecosystem in balance. Some species are voracious predators of the purple urchin.

Large Scale  
and Regional  
Stressors

## Increased Subtidal (10m) Temperature and Purple Urchin Populations

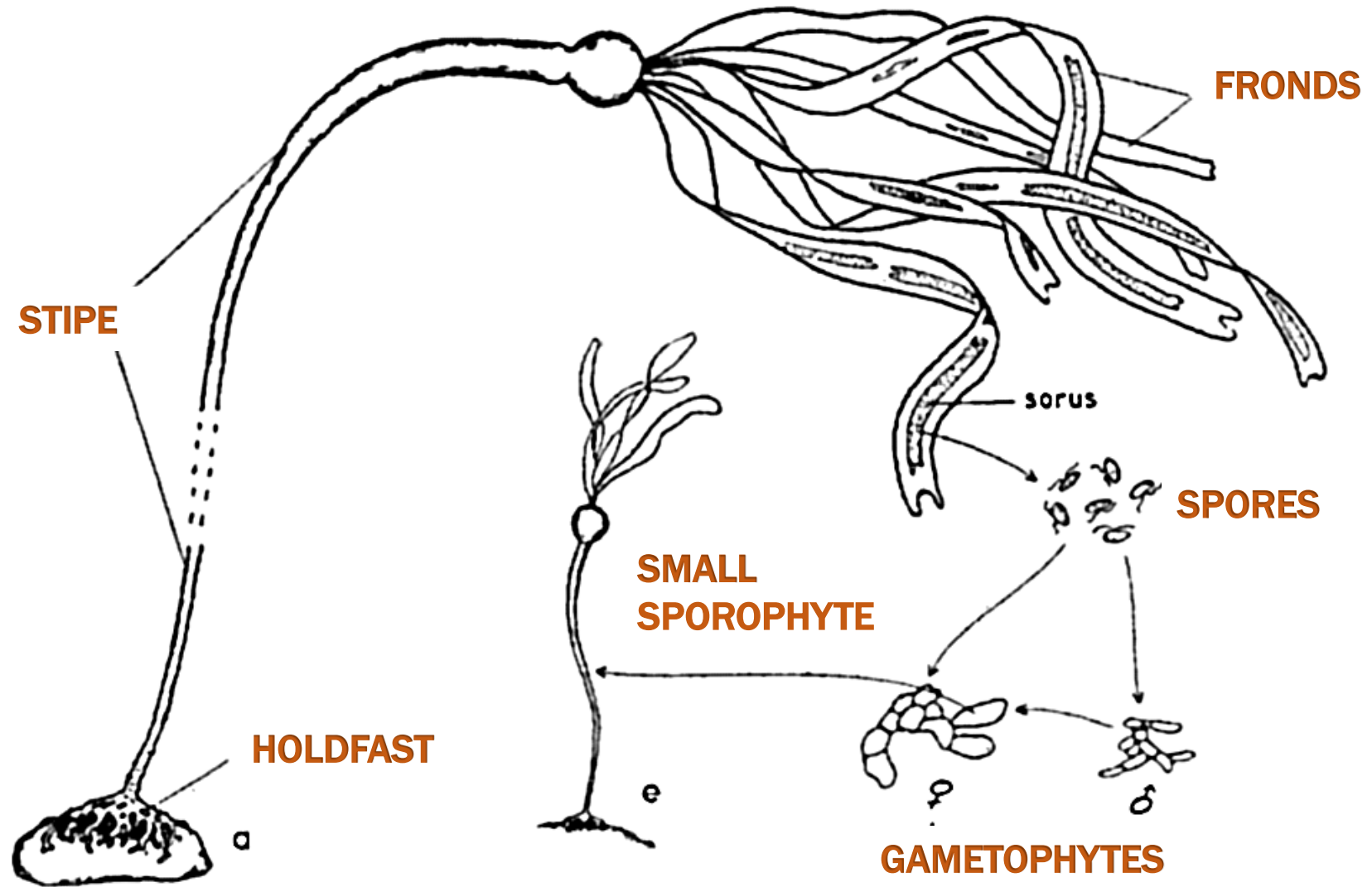


# Bull Kelp (*Nereocystis luetkeana*)

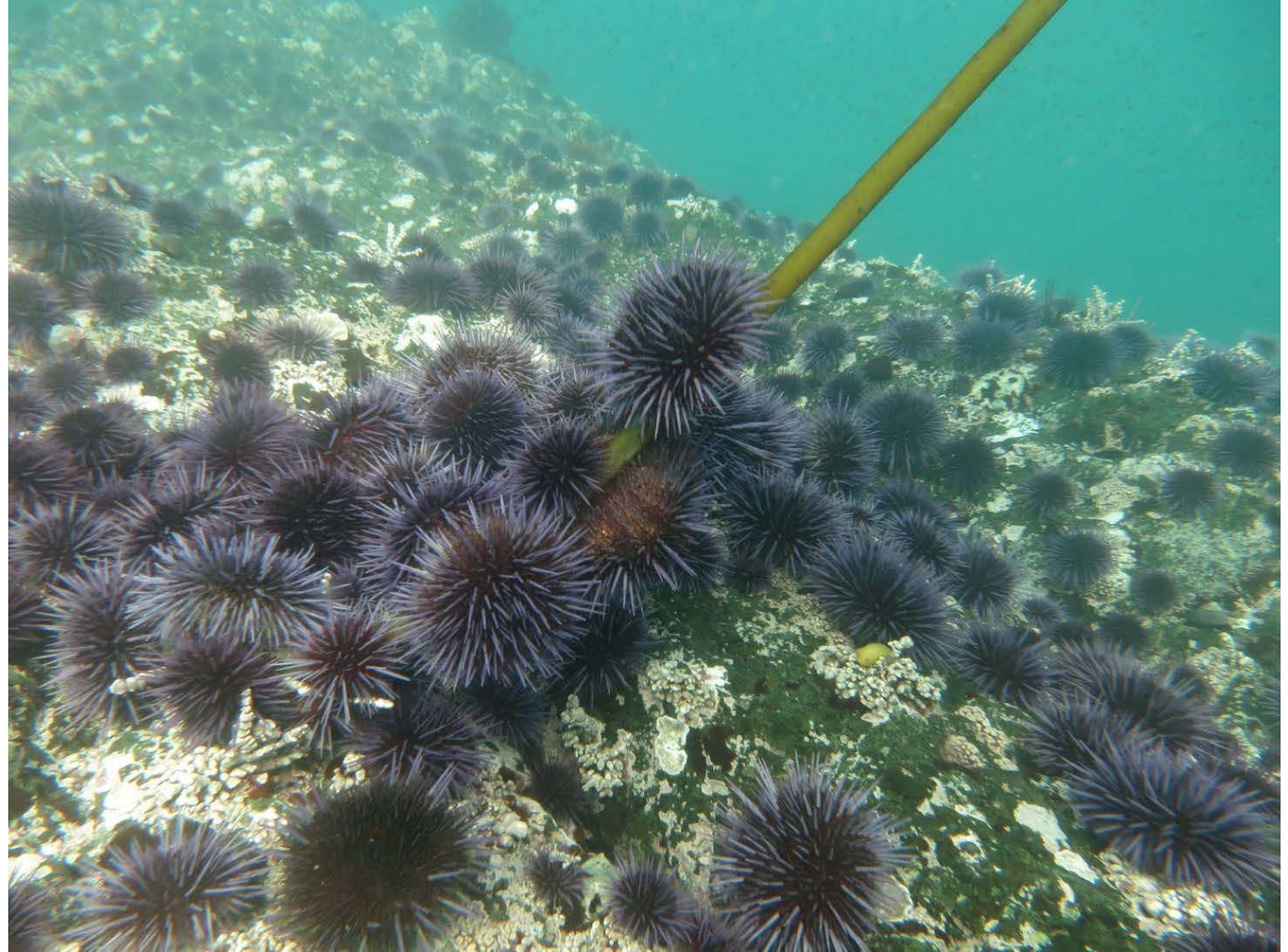
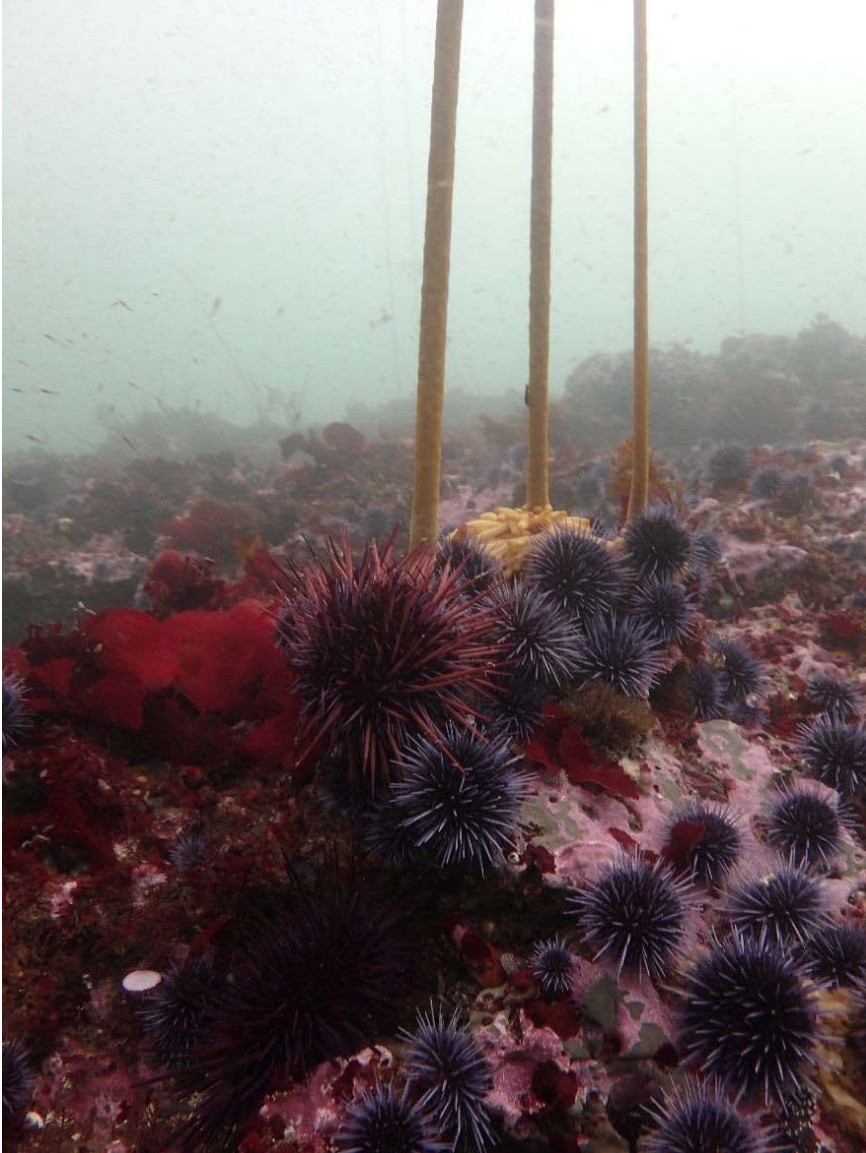
## Annual Life Cycle

As one of 2 giant kelp on our coast, bull kelp is very easy to recognize. They have long stipes that can grow over 30m long, one gas filled bulb at the top to keep it afloat, and long blades that spread out and eventually float on the surface.

Bull kelp is an *annual species*, and the stipes can grow up to 5 in per day. After summer growth, the blades or fronds begin to release spores, which grow into tiny gametophytes. The gametophytes shed sperm and eggs in winter and early spring. When fertilized, the eggs develop into sporophytes.



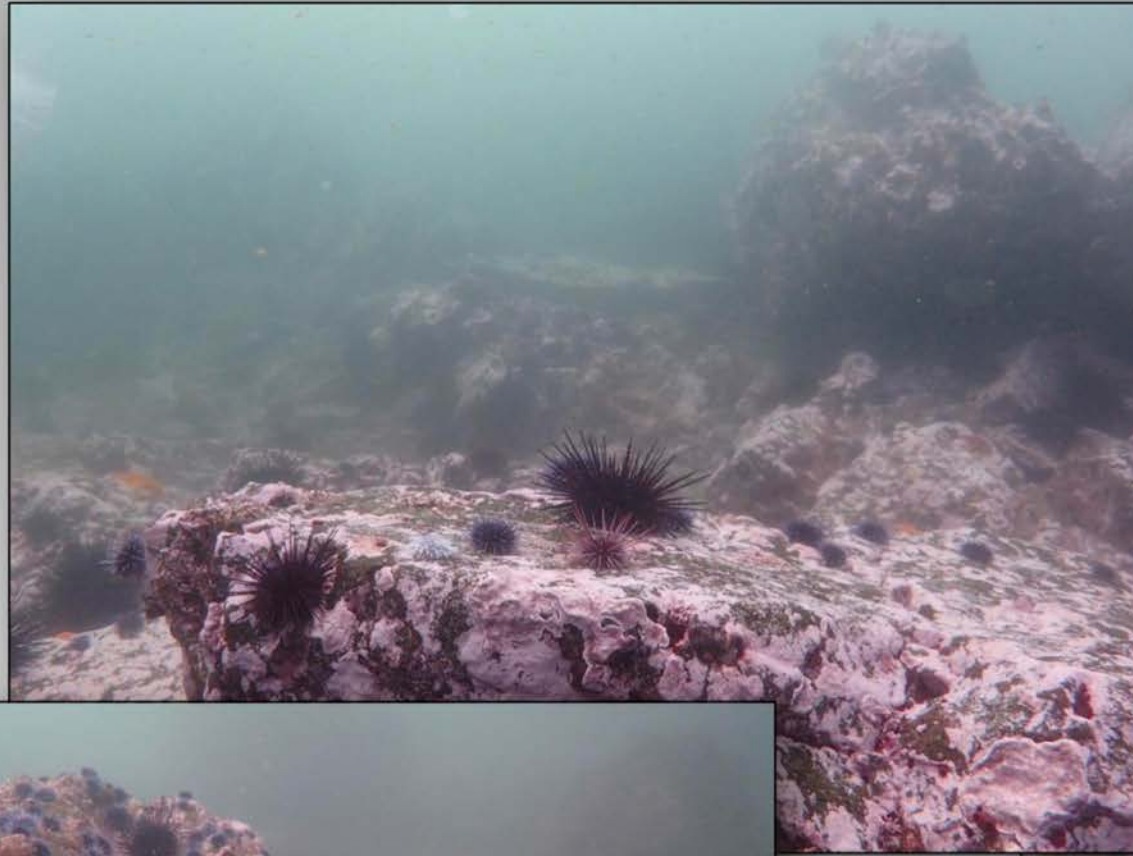
# URCHIN: Overgraze on holdfast until it breaks free





# URCHIN BARRENS

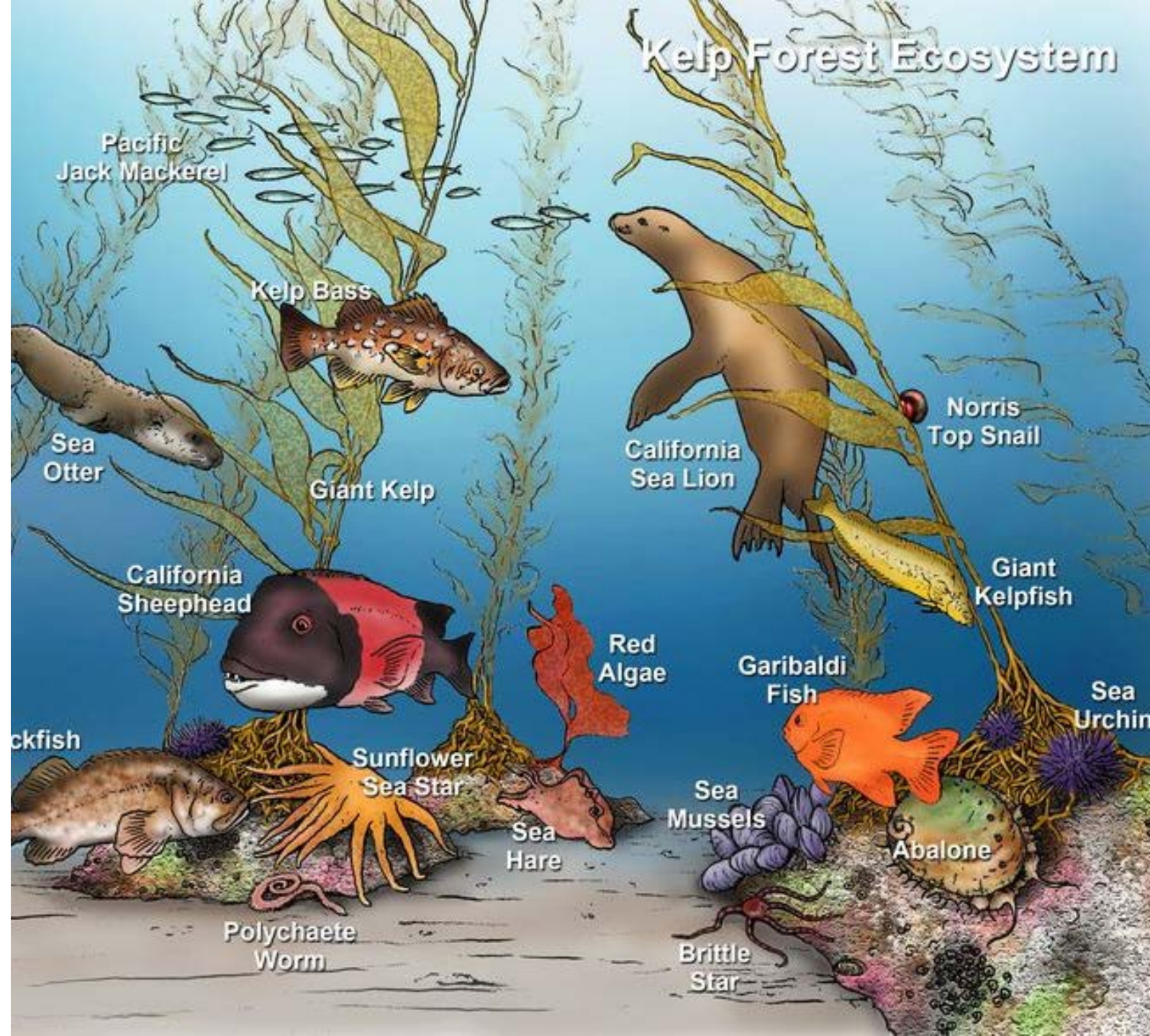
We now see  
up to 87%  
exposed  
bare rock  
where once  
there was a  
diversity of  
habitats



# An Ecosystem at Stake

Giant kelp provide the architecture for a diverse ecosystem

- It is food
- It provides protection
- It creates a place to hunt for food



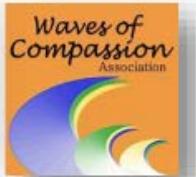
# What Are We Doing to Support Recovery?

Reducing the Purple Urchin Population!



# HIGHLY COLLABORATIVE PARTNERSHIP PROGRAM

- Working with commercial urchin divers to remove purple urchin from North Caspar Bay, Noyo Harbor, and Albion cove.
- Organizing recreational divers to remove purple urchin in collaboration with program
- Engaging citizen scientist in the program
- Conducting ecosystem surveys to document the effectiveness of this effort
- Educating the public and business community about this crisis
- Outreach and fundraising



Fortunate Farm



Mendocino County Chapter



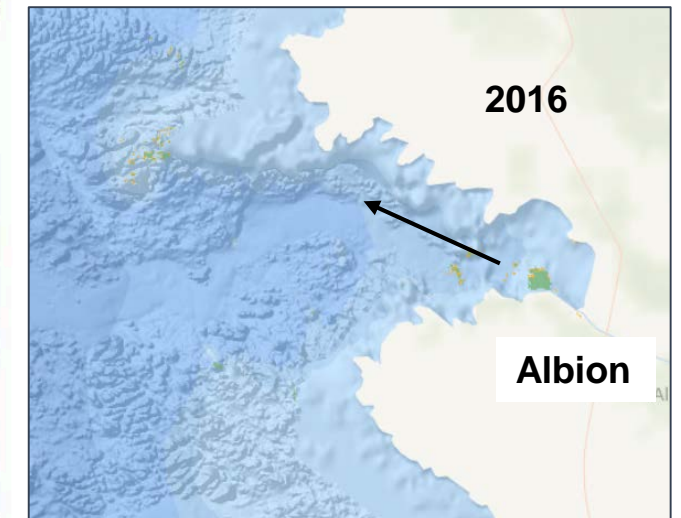
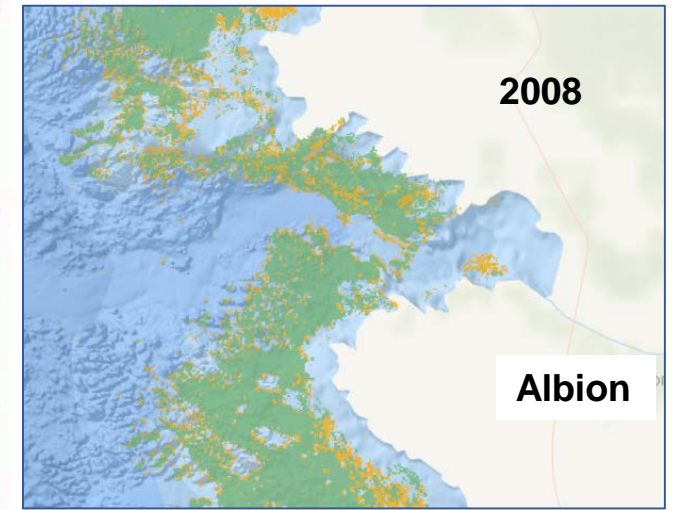
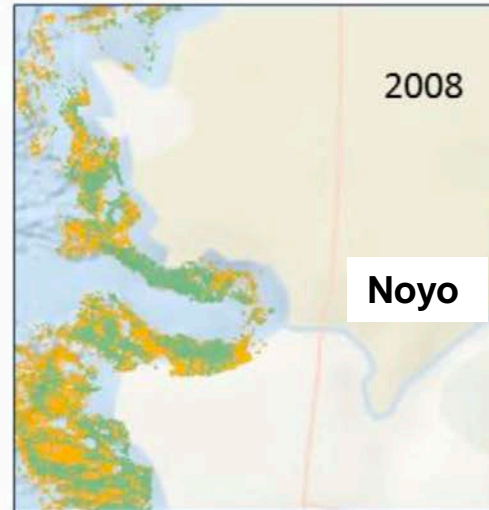
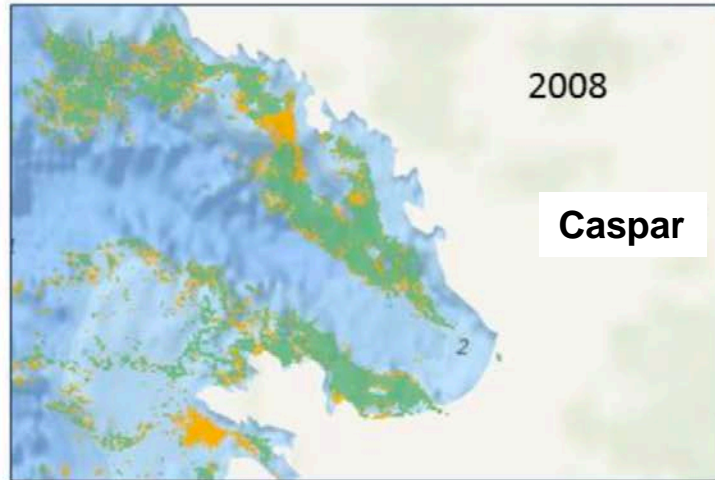


## Protecting the Bull Kelp Spore Bank

When in balance, kelp forest ecosystems are home or shelter for a variety of marine life, from invertebrates, fish, marine mammals and birds. This severe reduction in kelp has impacted the red abalone and urchin fisheries. But that is just the start.

We are creating “kelp oasis” zones in areas that have historically had persistent bull kelp stands. Allowing bull kelp to mature and release spores is the primary project goal.

# Kelp Oasis Sites: Caspar Bay, Noyo Harbor, Albion Cove





## Commercial Urchin Divers

Red urchin are the target of the commercial urchin fishery, but the purple urchin are outcompeting them as well. Commercial divers are eager to see a better balance for their fishery to continue.

The Project team is paying urchin divers to create “kelp oasis” sites in North Caspar Bay, North Noyo Harbor and Albion Bay. Keeping these areas free of purple urchin will allow the kelp to grow to reproductive size and hopefully help support a natural recovery of the species.



## RECREATIONAL TAKE OF PURPLE URCHIN

- Requires a valid fishing license
- Daily bag limit increased from 35 individuals to 20 gallons;
- Collection only through free or SCUBA diving, not by foot;
- There is no possession limit for purple urchin;
- Only removal and not smashing.





# ALL ORGANIZED EVENTS

- Divers will be briefed onsite about the “plan of the day,” describing what methods and procedures will be used that day.
- The event plan will depend on number of divers present, gonad assessment, sea conditions and bottom topography.



As of May 2018, our commercial divers have removed 20,000lbs of purple urchin.



Other  
Species of  
Interest



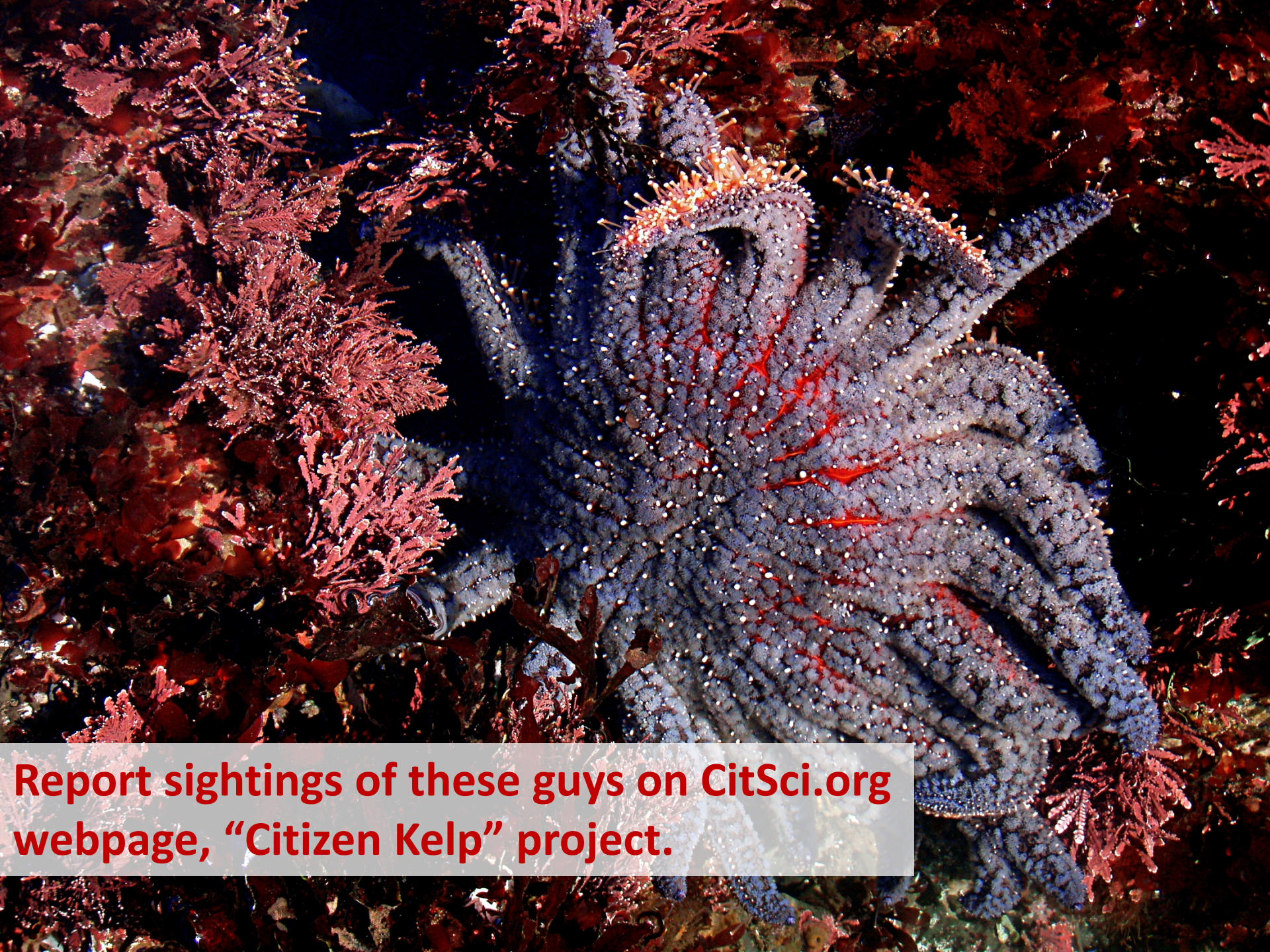
## RED ABALONE

Most are weakened and >25% are shrunk due to starvation



Sunflower star  
*Pycnopodia helianthoides* &  
*Solaster* spp.





## Sunflower sea stars

usually have 16 to 24 limbs and their color varies widely. **They are a voracious predator of urchin**, but their population was decimated by the sea star wasting disease.

**Report sightings of these guys on [CitSci.org](https://www.citsci.org) webpage, "Citizen Kelp" project.**



## Dockside Sampling and Urchin ReUse

- Citizen scientists are working at the docks collecting data on all urchin brought in.
- Project partners are working with local composters and fertilizer facilities to integrate urchin into their products.
- Other ideas for reuse are welcome!

Contact [info@noyocenter.org](mailto:info@noyocenter.org) for more information