

Kelp Forests in the MBNMS

December 10, 2009

Sanctuary Advisory Council

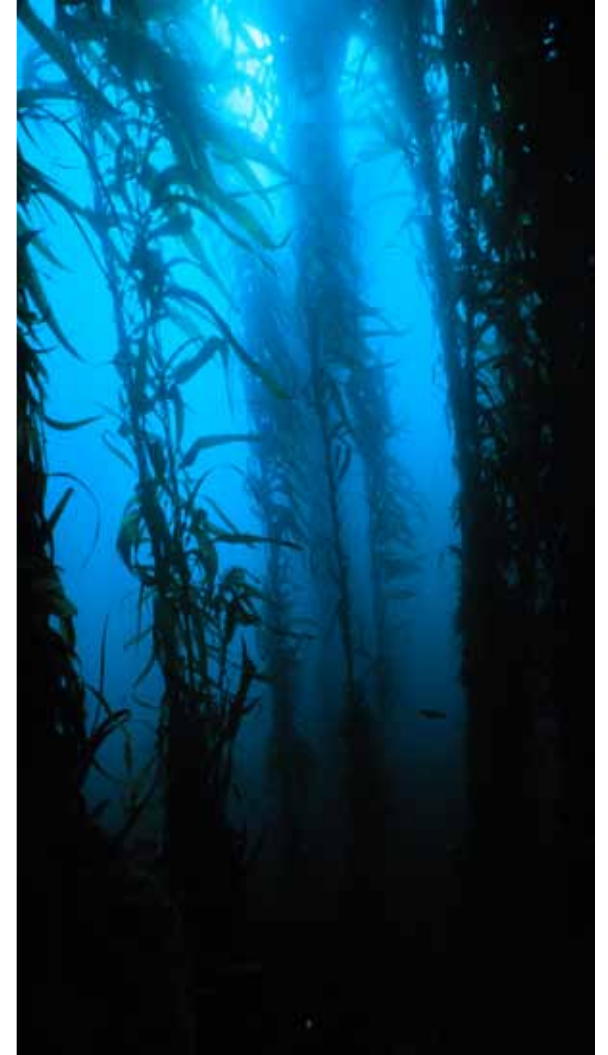


Steve I. Lonhart, Ph.D.



"The numbers of living creatures of all Orders whose existence intimately depends on kelp is wonderful... I can only compare these great aquatic forests with the terrestrial ones in the intertropical regions."

"Yet if in any country a forest was destroyed, I do not believe nearly so many species of animals would perish as would here from the destruction of kelp."



--Charles Darwin (1860) The Voyage of the Beagle

Kelp Forest Productivity

MARINE PRODUCERS

Corals

Kelp and Rockweeds

Salt Marsh Grasses

Sea Grasses

Mangroves

Benthic microalgae

Coastal phytoplankton

Open sea phytoplankton

FRESHWATER PRODUCERS

Macrophytes

Phytoplankton (nutrient-rich)

Phytoplankton (nutrient-poor)

TERRESTRIAL PRODUCERS

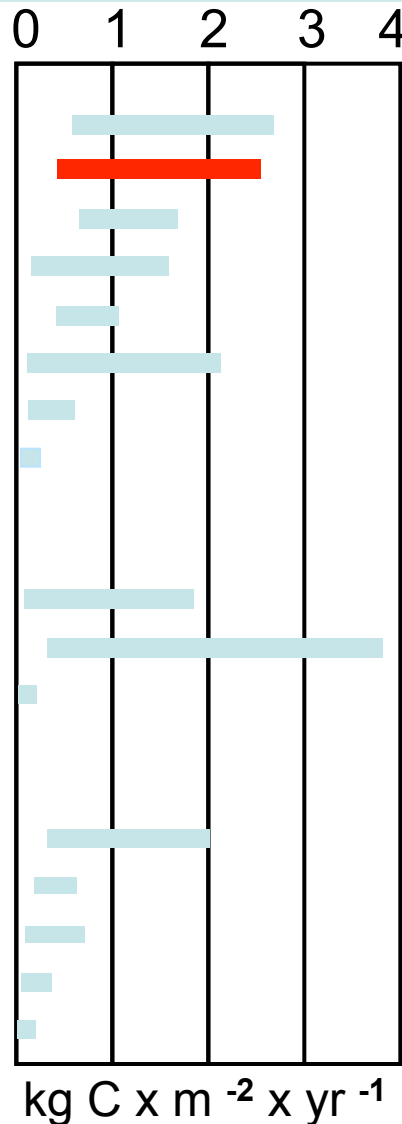
Rain forests

Temperate forests

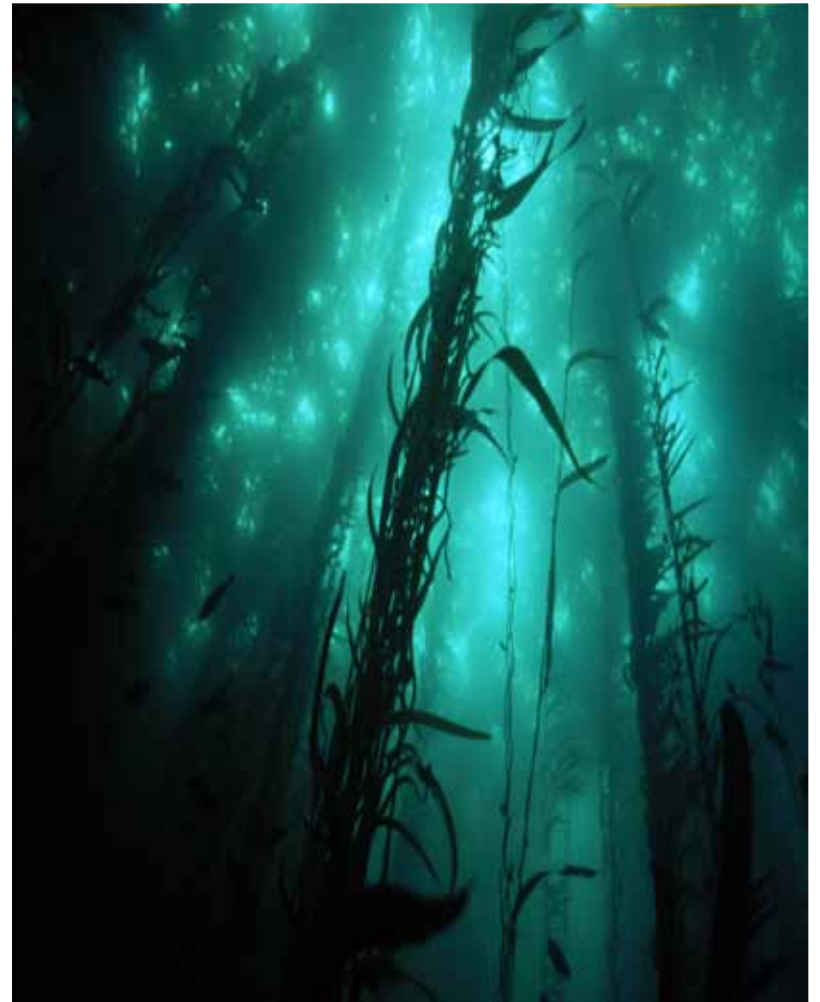
Grasses, forbs

Prairies, steppes

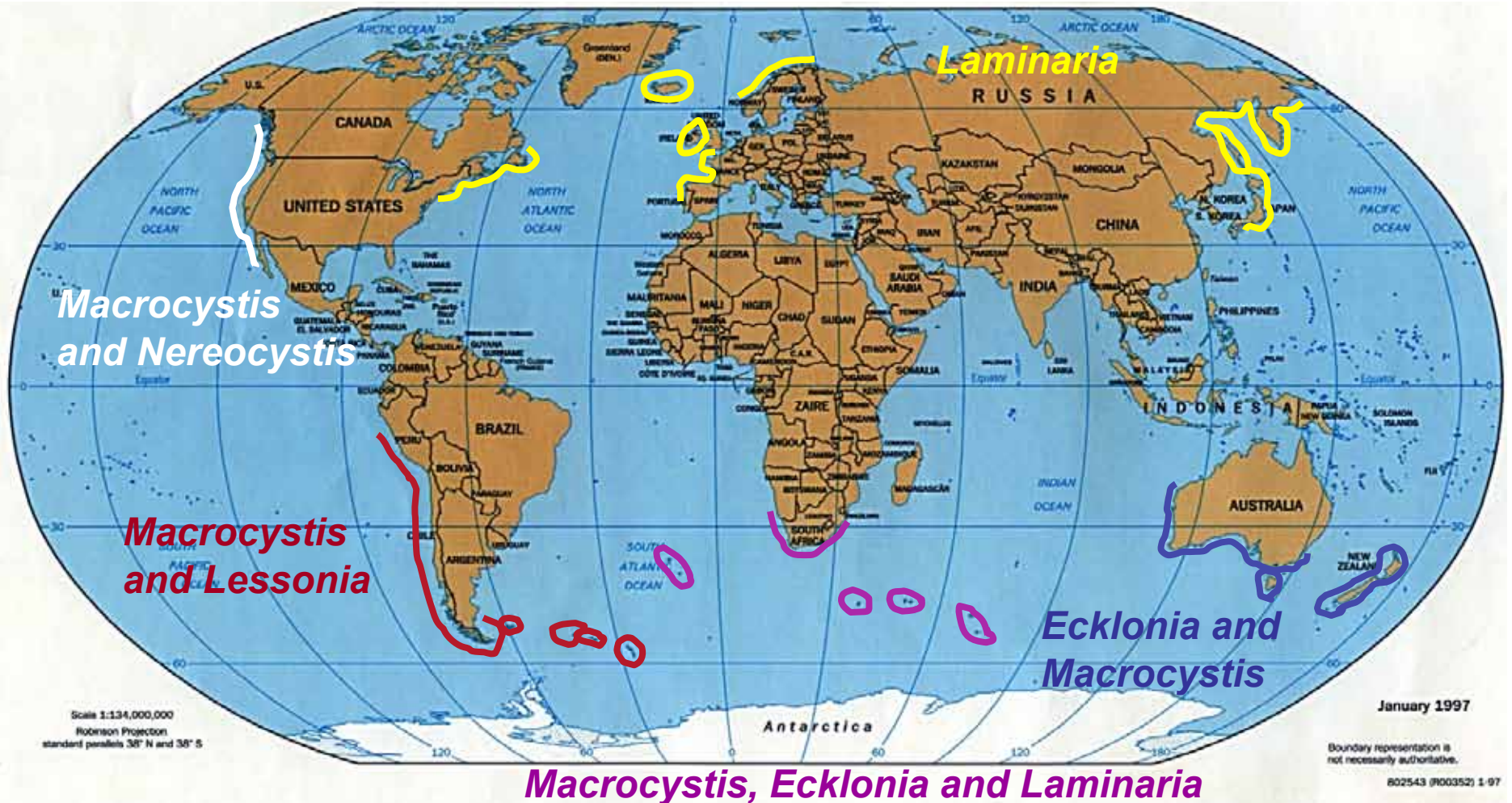
Deserts, tundra

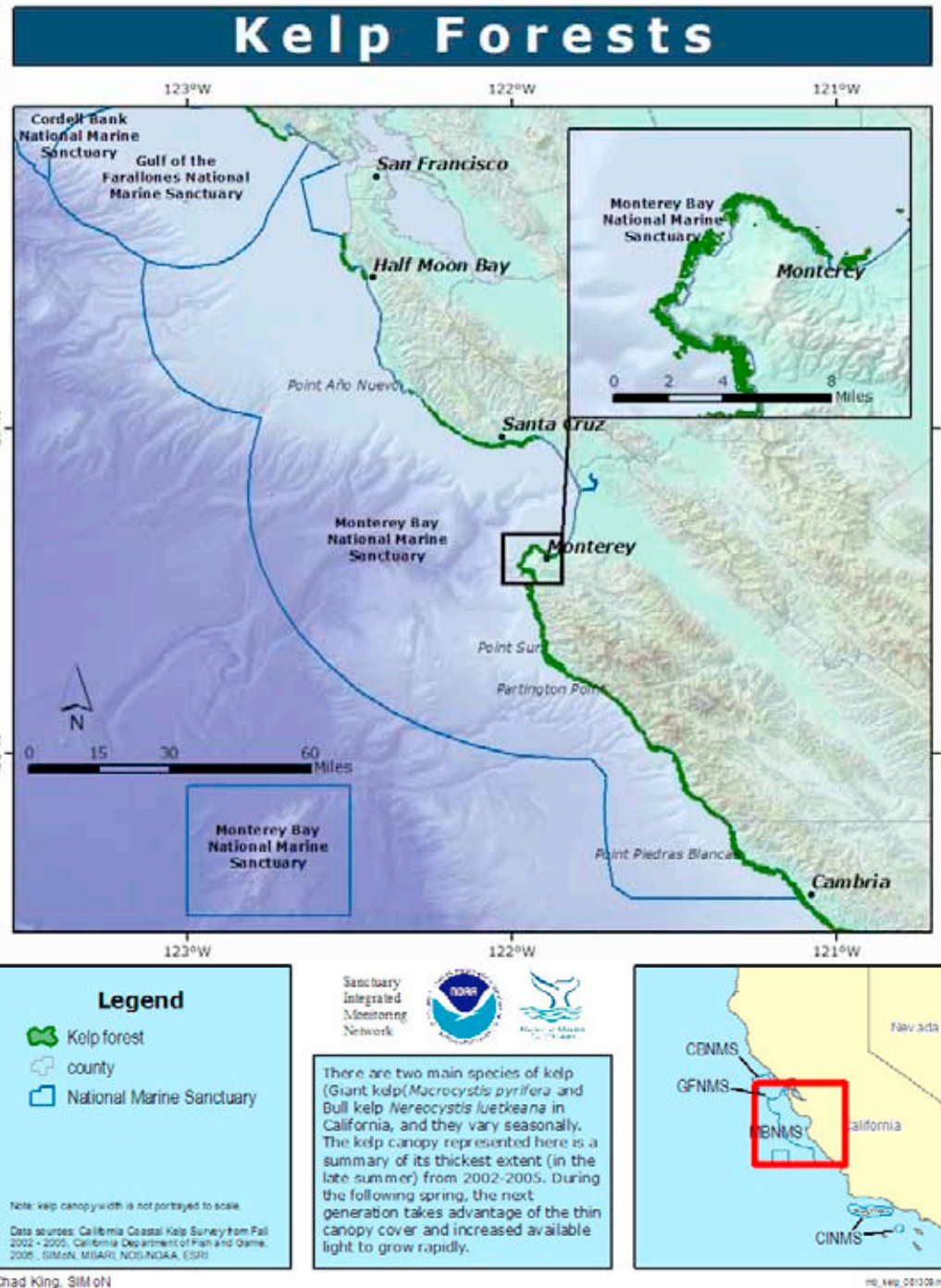


From: Valiela 1995



Global Kelp Distribution





Monterey Bay National Marine Sanctuary

[OVERVIEW](#) [MAPS & GRAPHS](#) [PROJECTS](#)

ROCKY SHORES

KELP FORESTS

BEACHES

SANDY FLOOR

ESTUARIES

SEAMOUNTS

SUBMARINE CANYONS

DEEP SEA

OPEN OCEAN

GEOLOGY

OCEANOGRAPHY

WATER QUALITY

FISHERIES

SEABIRDS & SHOREBIRDS

MARINE MAMMALS

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KELP FORESTS MAPS & GRAPHS



Want to know about the kelp forests within Monterey Bay? Check out the maps below and see kelp canopy coverage over time with a dynamic map or compare data at Point Lobos between 1989 and 2002.

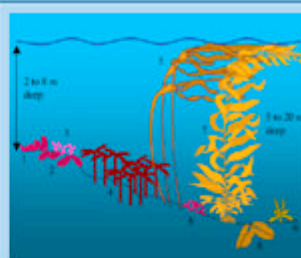


Kelp Coverage From 1985 to 1989
This dynamic map series illustrates the kelp canopy coverage between the Monterey Peninsula and San Francisco from 11/22/85 to 12/22/89. These data are from monthly aerial surveys performed by the Resource Data for the Monterey Bay Aquatic Ecosystem (RDA-MBAE) project, digitized by Mike Donnellan (graduate student, Landing Marine Laboratories).

Note: This map series displays as a Flash movie. It must be loaded before it is able to play. Depending on connection speed, this 1.5 Mb file may take several seconds and two minutes to completely load.

[View dynamic map](#)

[Download Flash movie \(1.5 Mb ZIP\)](#)



Algae Found Within a Kelp Forest
This figure is a schematic representation of the algal elements found within a kelp forest. Monterey Bay National Marine Sanctuary. actual species at a particular site will vary with several variables (e.g., substrate, exposure, energy, depth, water clarity, etc.), this diagram captures some of the species typically found in an open coast.

[View figure](#)

Kelp Canopy Comparison - Point Lobos



Kelp Canopy Comparison at Pt. Lobos
This map shows a two year kelp canopy comparison at Point Lobos between 1989 and 2002. The kelp canopy in 1989 is possibly greater in part due to more favorable oceanographic conditions during that year and more accurate measurement technology than in 2002.

[View map](#)



Map of Kelp Distribution
Kelp distribution from Yankee Pt. to Pt. St. George, California. Cal. Fish & Game 2002 survey.

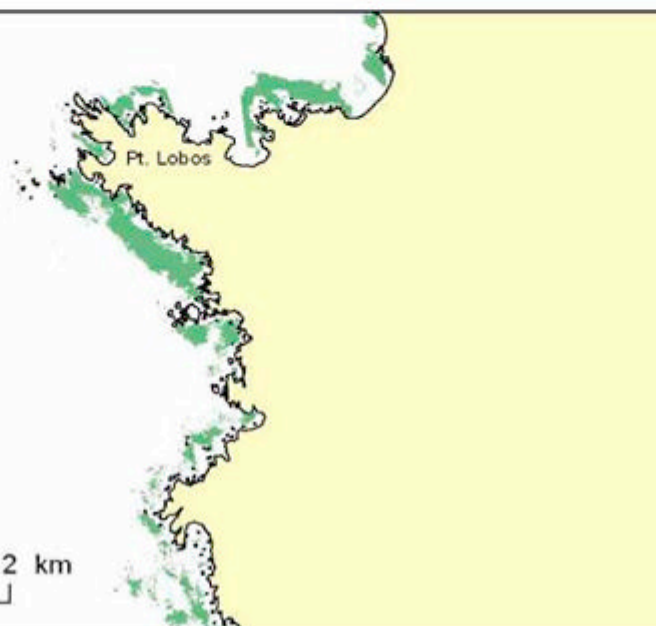
[View map](#)

Kelp Canopy Comparison - Point Lobos

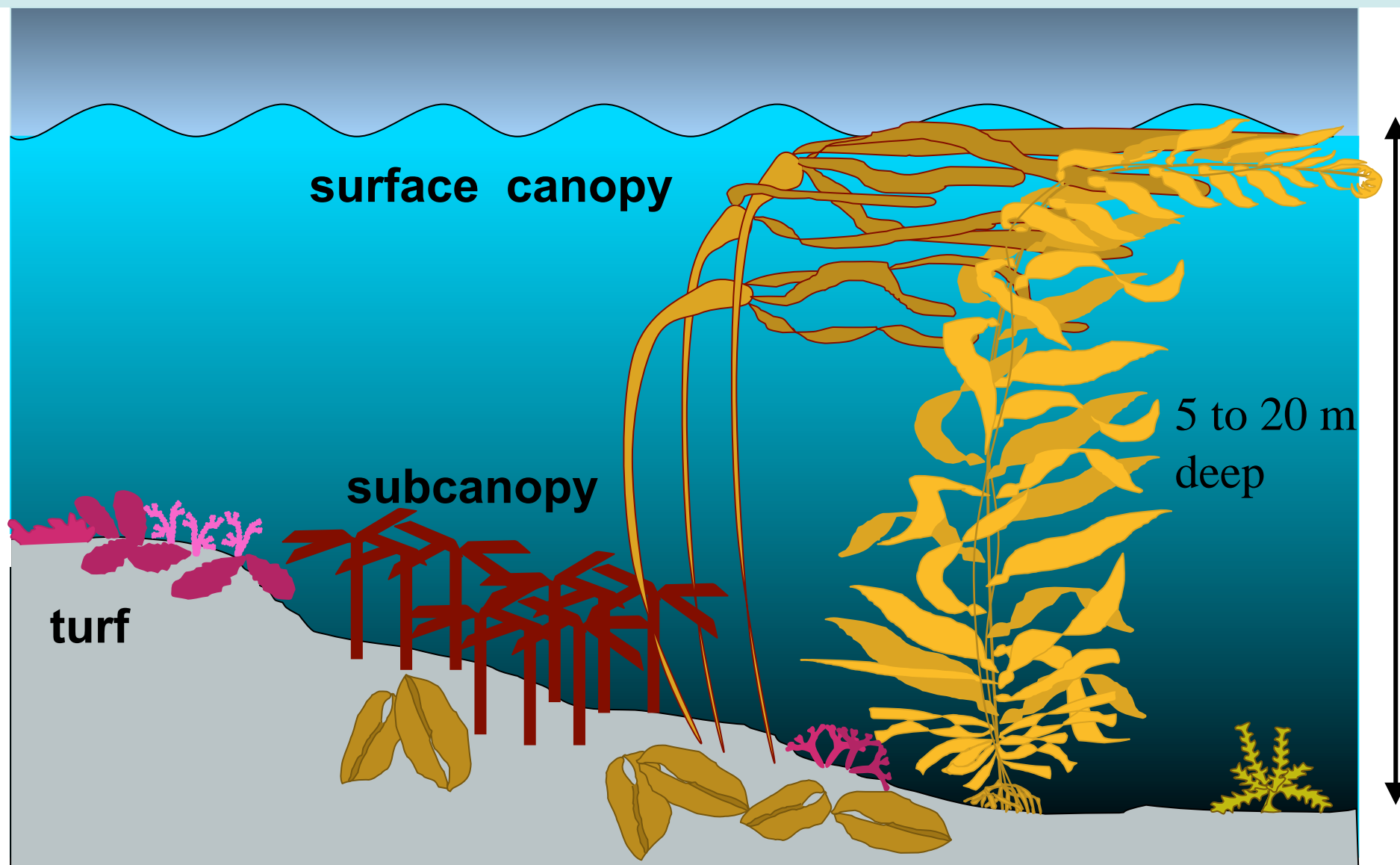
June 1989



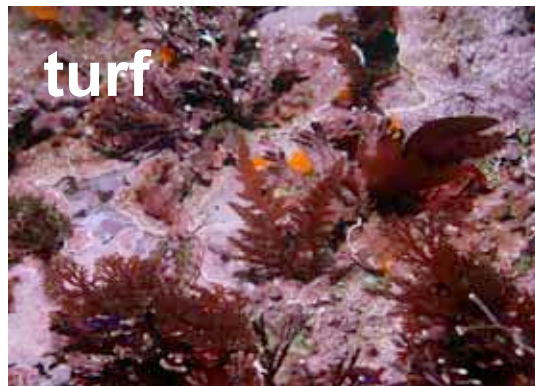
June 2002



Kelp Forest Zonation



Kelp Forest Zonation



Giant kelp *Macrocystis pyrifera*



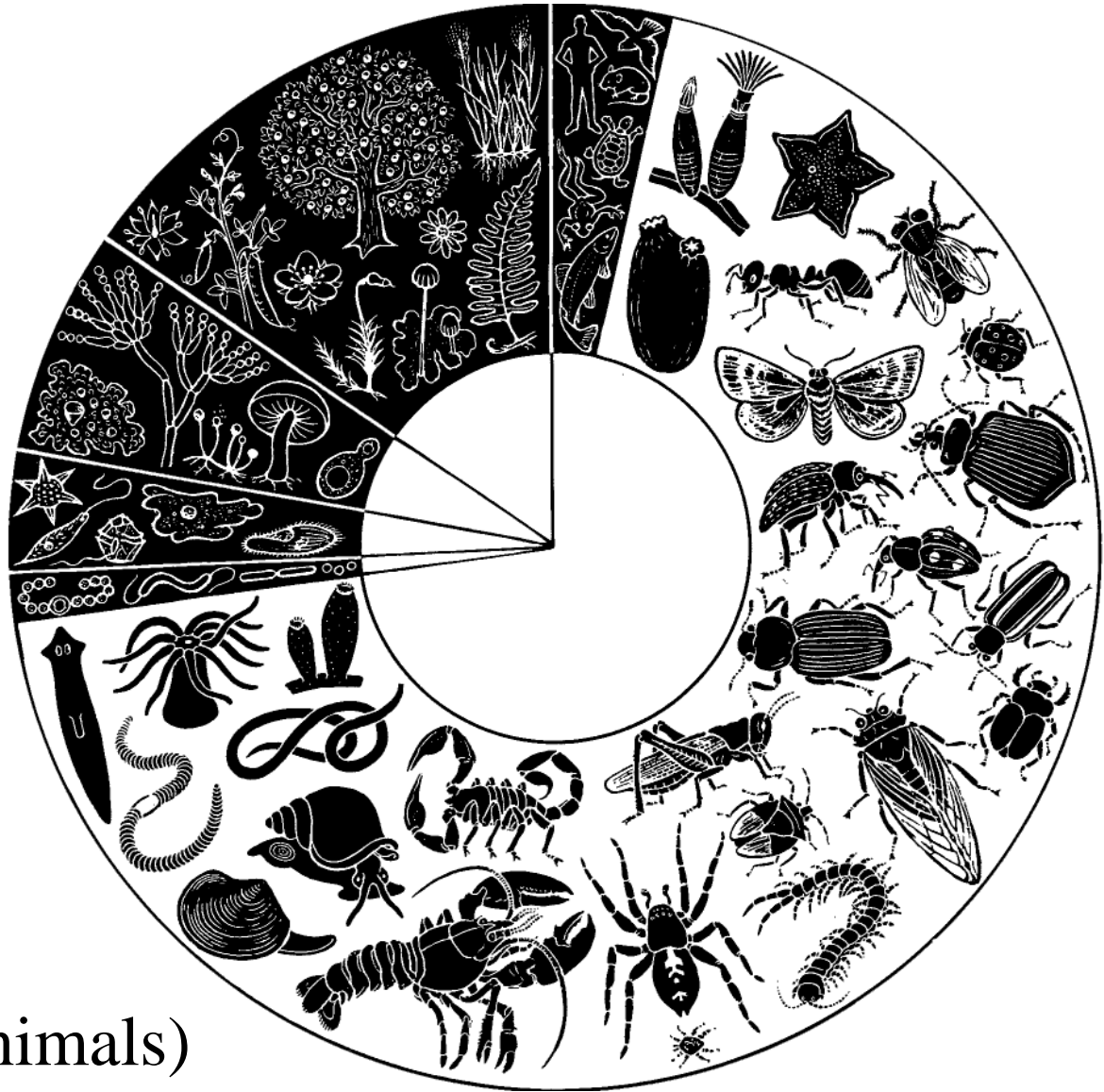
Bull kelp *Nereocystis luetkeana*



1.5 M terrestrial
plants and animals
described to date

~300,000 marine
species. True
global total
likely >1 M

35 marine phyla (animals)
14 exclusively marine



Species Richness

Algae in California

>1,338 species (Abbott and Hollenberg, 1976)

Fishes in California

~554 species, 438 of which are <400 ft (Miller and Lea, 1972)

~345 species in MBNMS (MBNMS)

Seabirds in MBNMS

~94 species

Marine Mammals in MBNMS

~34 species (MBNMS)

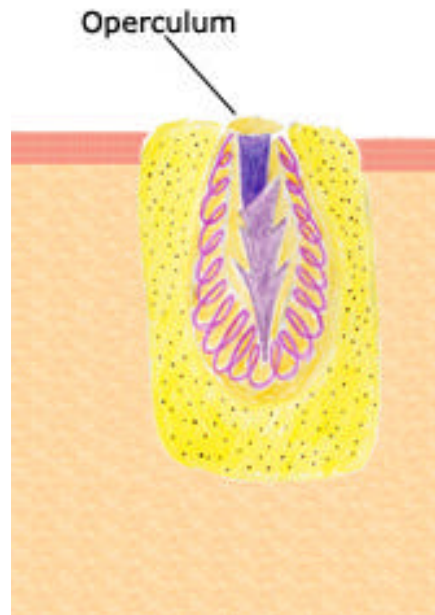
Invertebrates

~250 sponge species in CA (Lee et al., 2006)

~109 crustaceans in MBNMS <100 ft (Jensen, 1995)

Few invertebrate richness estimates are well documented

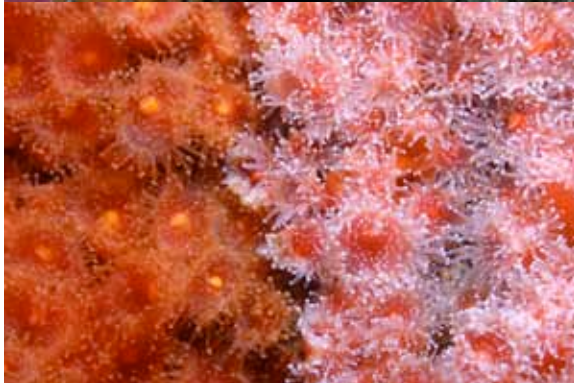
Cnidaria: stinging cells



Cnidaria: corals and hydrocorals



Cnidaria: anemones



Cnidaria: hydroids



Mollusca: Nudibranchs



Hermissenda crassicornis



Hermissenda crassicornis



Hermissenda crassicornis



Hermissenda cerata



Phidiana hiltoni



Phidiana hiltoni



Phidiana hiltoni



Dendronotus albus



Dendronotus frondosus



Dendronotus frondosus



Dendronotus frondosus



Dendronotus iris



Dendronotus iris



***D. iris*: stalking its prey**



***D. iris*: preparing to 'strike'**



***D. iris*: ok, let swell pass...**



D. iris: attack!



***D. iris*: laying egg cases**



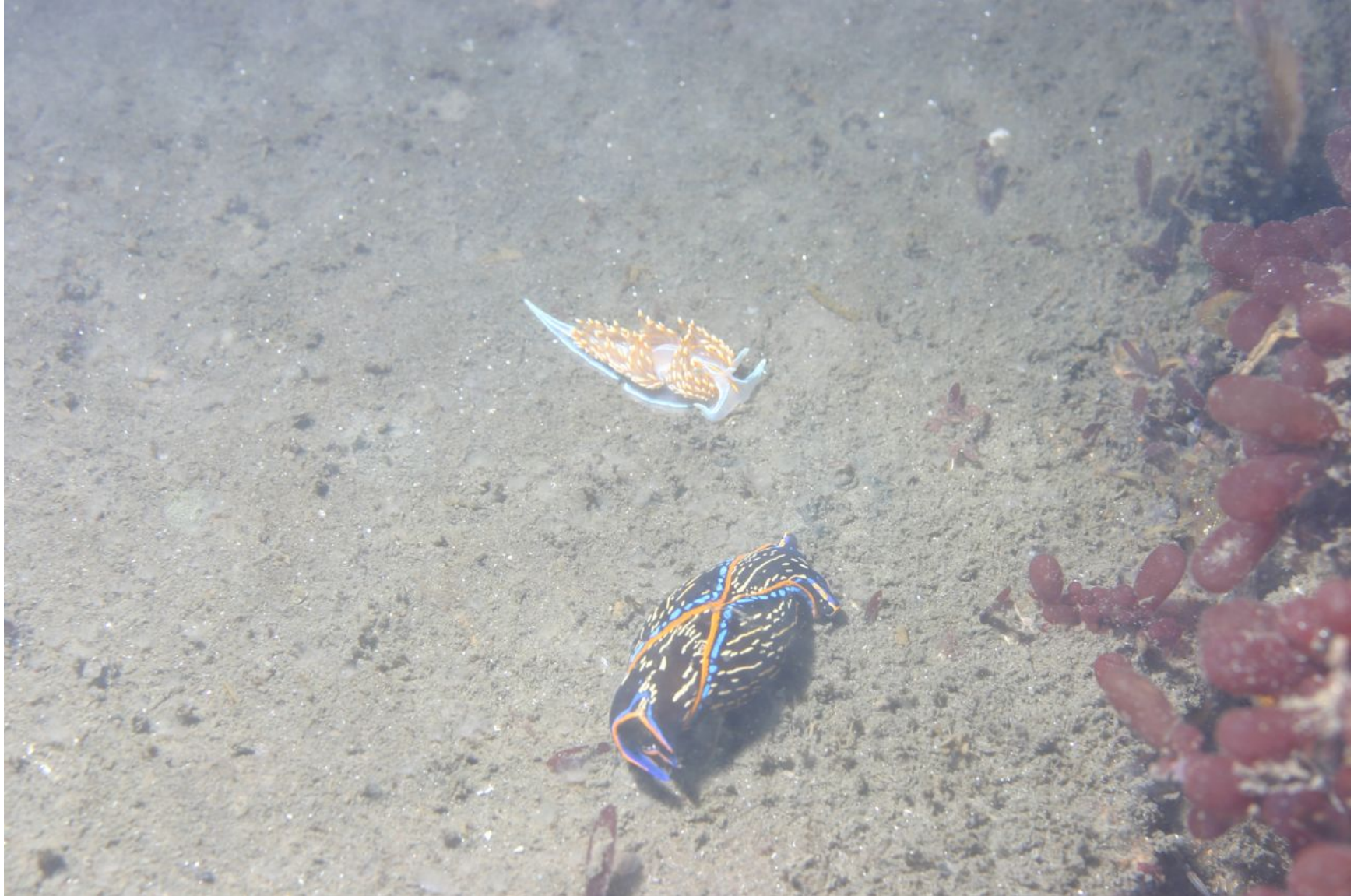
***D. iris*: laying egg cases**



D. iris: laying egg cases



Hermisenda vs. Navanax



Hermissenda vs. Navanax



Hermisenda vs. Navanax



Hermisenda vs. Navanax



Hermissenda vs. Navanax



Hermissenda vs. Navanax





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