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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

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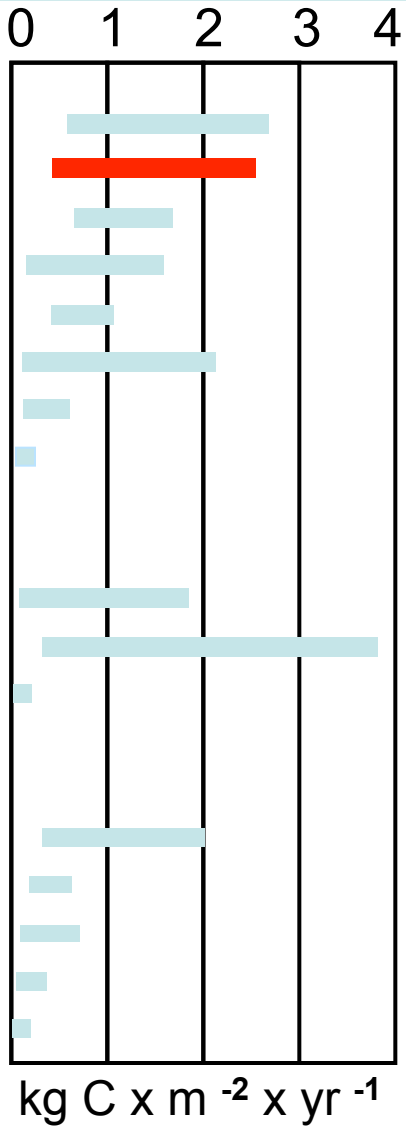
Kelp Forest Productivity

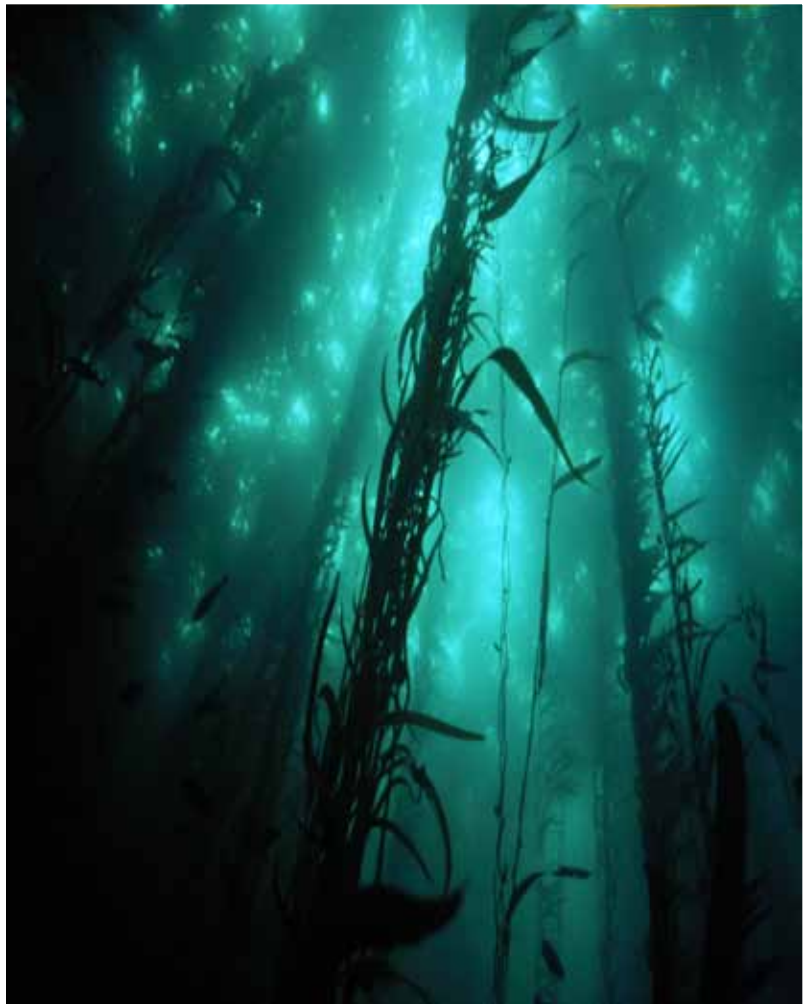
MARINE PRODUCERS
Corals
Kelp and Rockweeds
Salt Marsh Grasses
Sea Grasses
Mangroves
Benthic microalgae
Coastal phytoplankton
Open sea phytoplankton

FRESHWATER PRODUCERS
Macrophytes
Phytoplankton (nutrient-rich)
Phytoplankton (nutrient-poor)

TERRESTRIAL PRODUCERS
Rain forests
Temperate forests
Grasses, forbs
Prairies, steppes
Deserts, tundra

From: Valiela 1995





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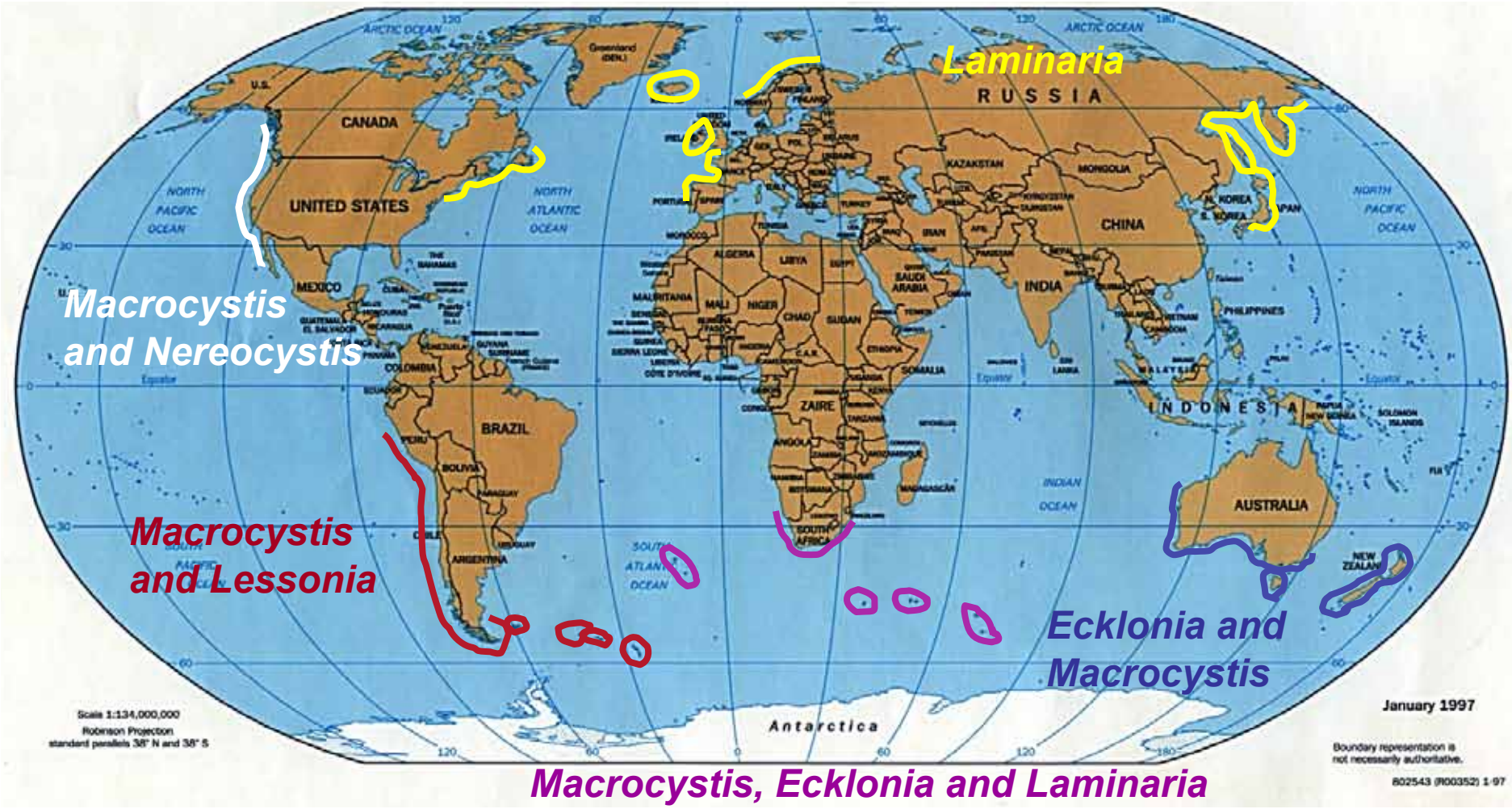
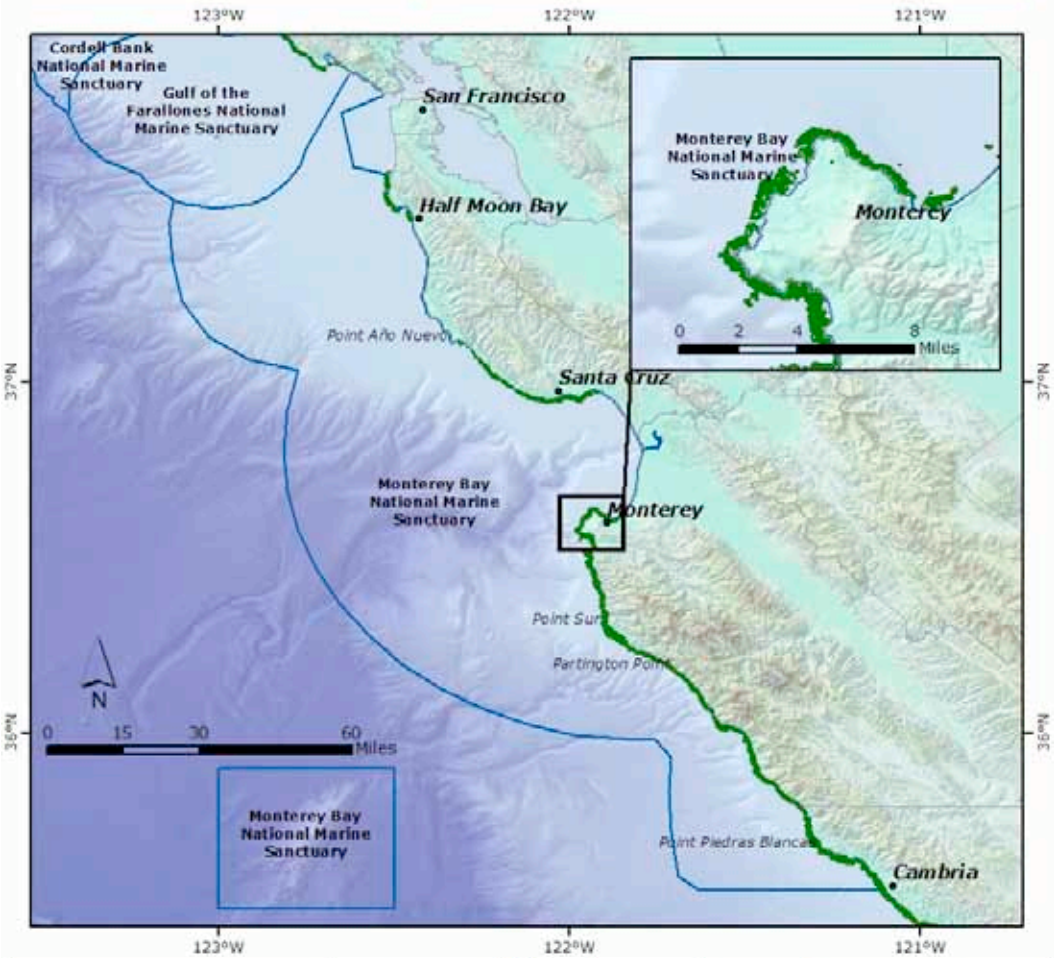
Global Kelp Distribution



Macrocystis, Ecklonia and Laminaria

Kelp Forests



Legend

- Kelp forest
- county
- National Marine Sanctuary

Note: kelp canopy width is not portrayed to scale.

Data sources: California Coastal Kelp Survey from Fall 2002 - 2005, California Department of Fish and Game, 2005 , SIMoN, MBARI, NOS-NOAA, ESRI

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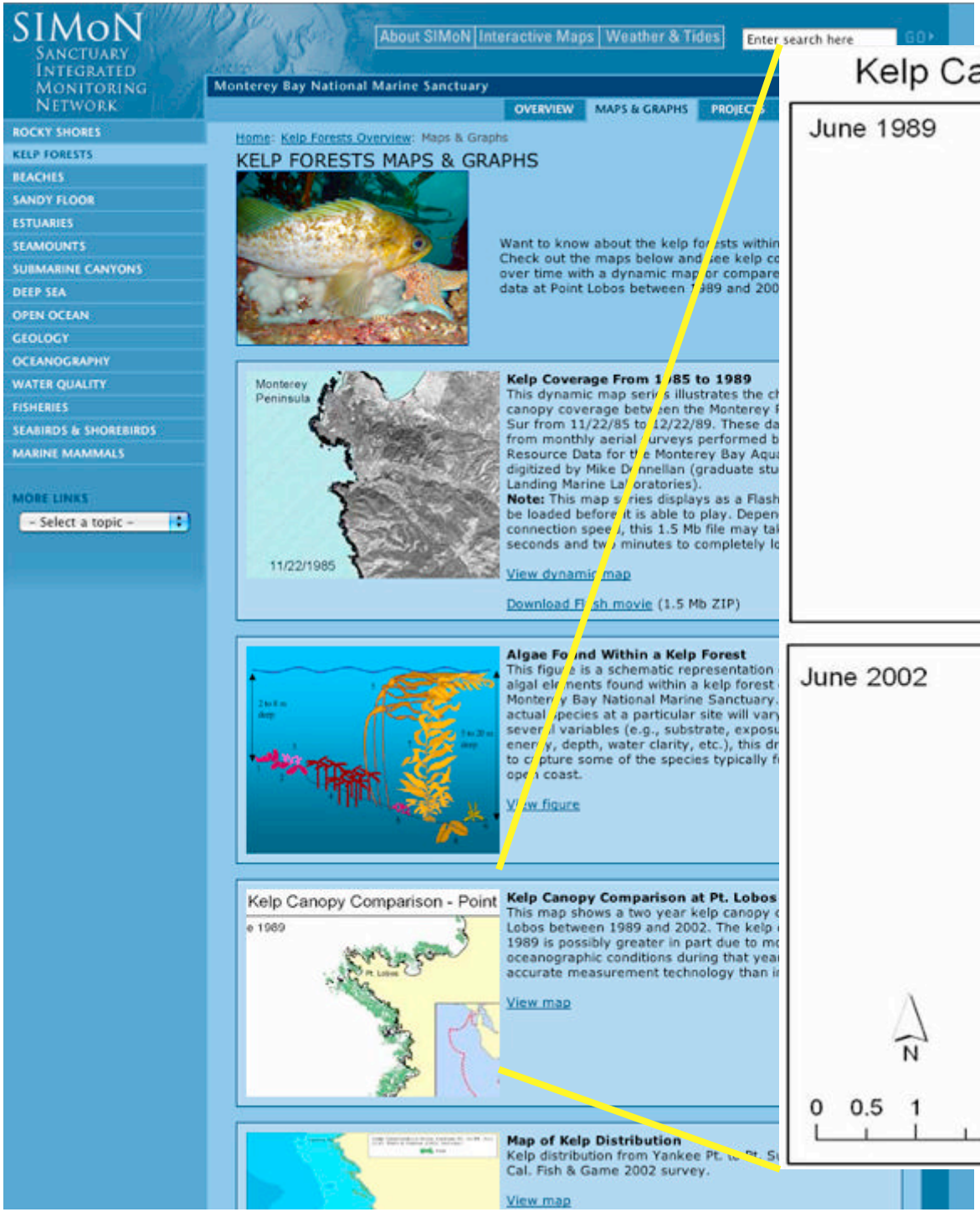
There are two main species of kelp (Giant kelp(*Macrocystis pyrifera* and Bull kelp *Nereocystis luetkeana* in California, and they vary seasonally. The kelp canopy represented here is a summary of its thickest extent (in the late summer) from 2002-2005. During the following spring, the next generation takes advantage of the thin canopy cover and increased available light to grow rapidly.

Chad King, SIMoN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KELP FORESTS MAPS & GRAPHS
Want to know about the kelp forests within
Check out the maps below and see kelp co
over time with a dynamic map or compare
data at Point Lobos between 1989 and 200
Monterey Peninsula
11/22/1985
Kelp Coverage From 1985 to 1989
This dynamic map series illustrates the ch
canopy coverage between the Monterey P
Sur from 11/22/85 to 12/22/89. These da
from monthly aerial surveys performed b
Resource Data for the Monterey Bay Aqua
digitized by Mike Donnellan (graduate stu
Landing Marine Laboratories).
Note: This map series displays as a Flash
be loaded before it is able to play. Depen
connection speed, this 1.5 Mb file may tak
seconds and two minutes to completely lo
View dynamic map
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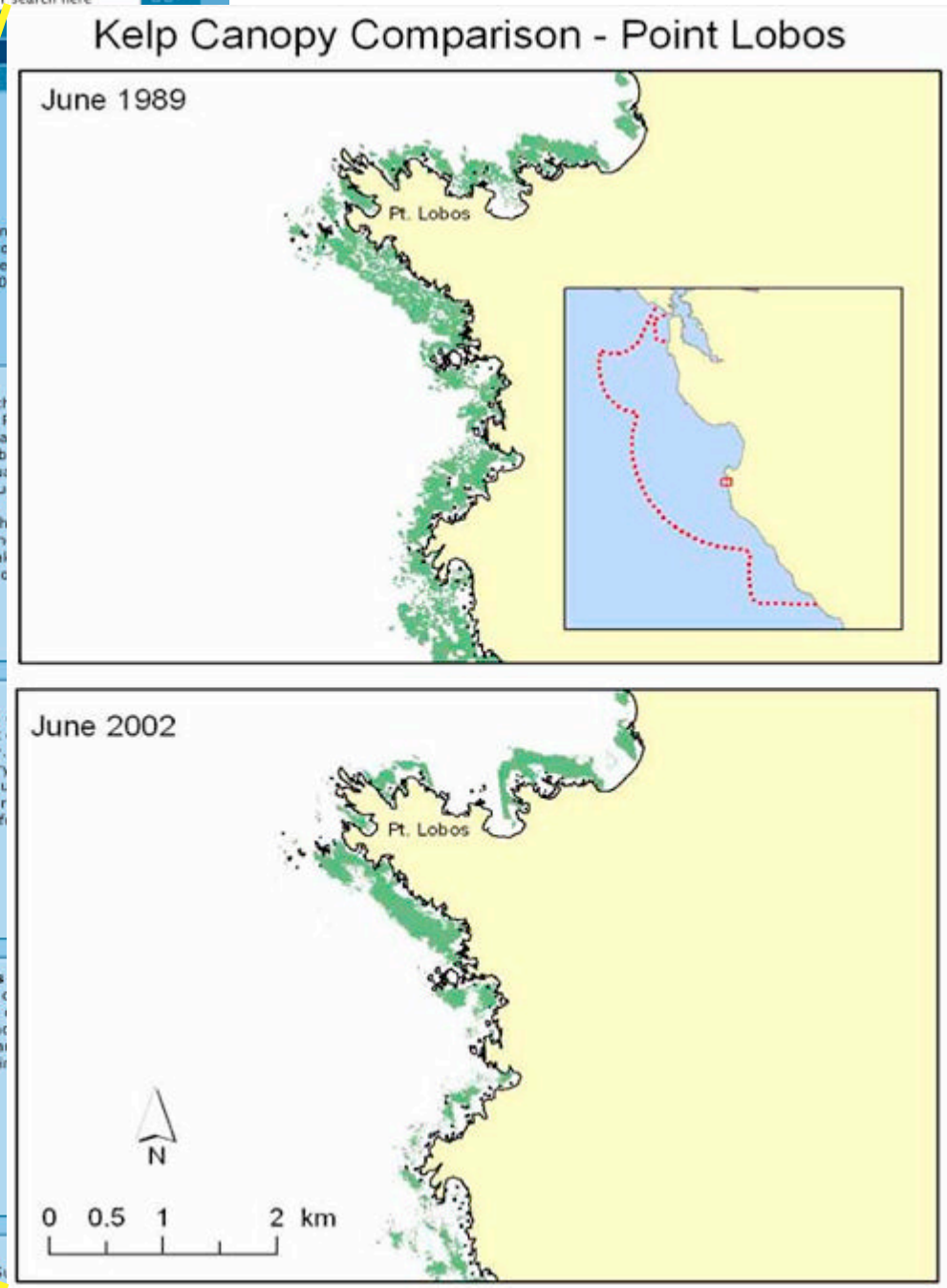
Algae Found Within a Kelp Forest
This figure is a schematic representation
algal elements found within a kelp forest
Monterey Bay National Marine Sanctuary.
actual species at a particular site will vary
several variables (e.g., substrate, exposu
energy, depth, water clarity, etc.), this dr
to capture some of the species typically f
open coast.
View figure
Kelp Canopy Comparison - Point
e 1989
Pt. Lobos
Kelp Canopy Comparison at Pt. Lobos
This map shows a two year kelp canopy c
Lobos between 1989 and 2002. The kelp c
1989 is possibly greater in part due to mo
oceanographic conditions during that yea
accurate measurement technology than i
View map
Map of Kelp Distribution
Kelp distribution from Yankee Pt. to Pt. Su
Cal. Fish & Game 2002 survey.
View map


Kelp Canopy Comparison - Point Lobos
June 1989
Pt. Lobos
June 2002
Pt. Lobos
N
0 0.5 1 2 km

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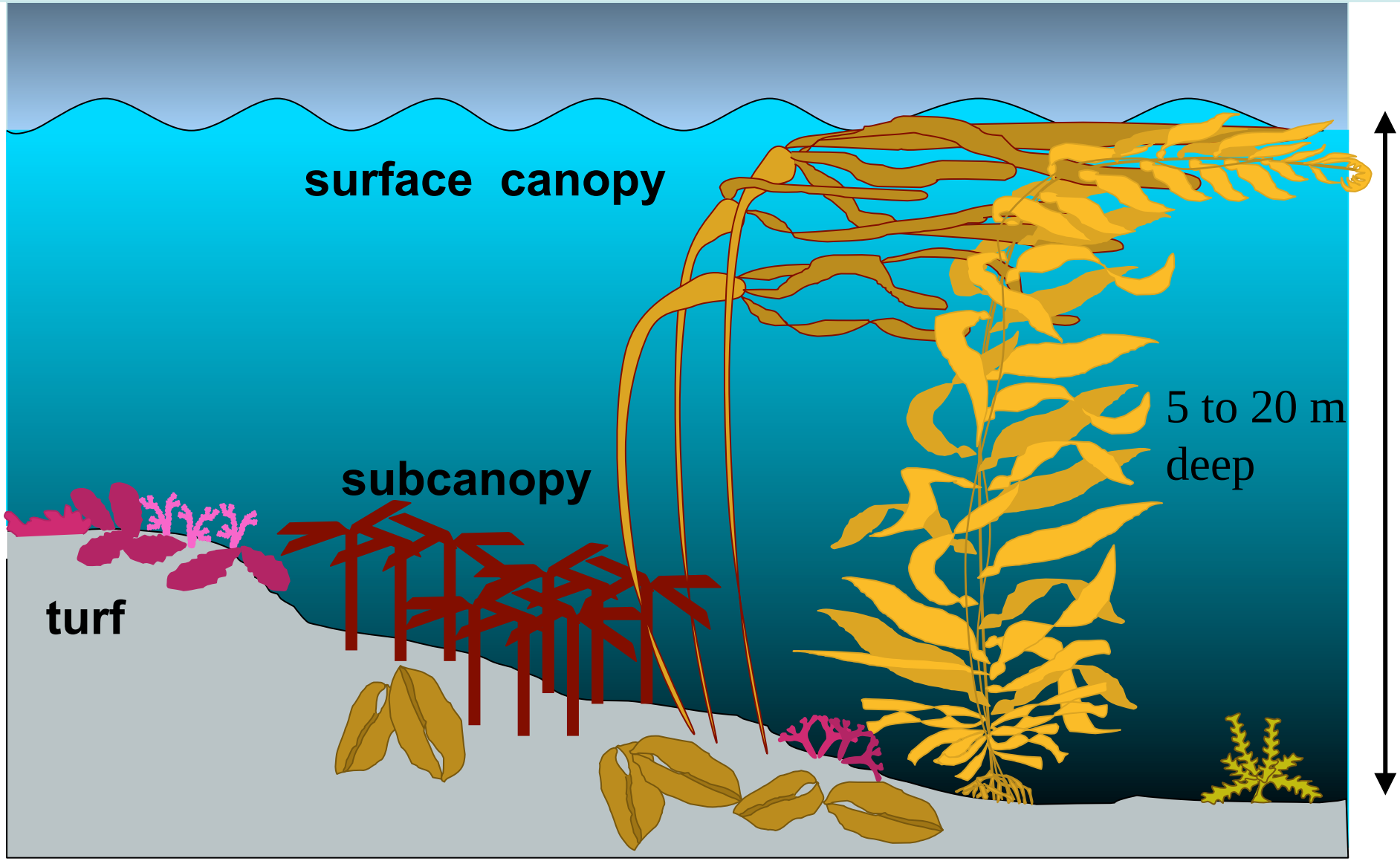
Kelp Forest Zonation



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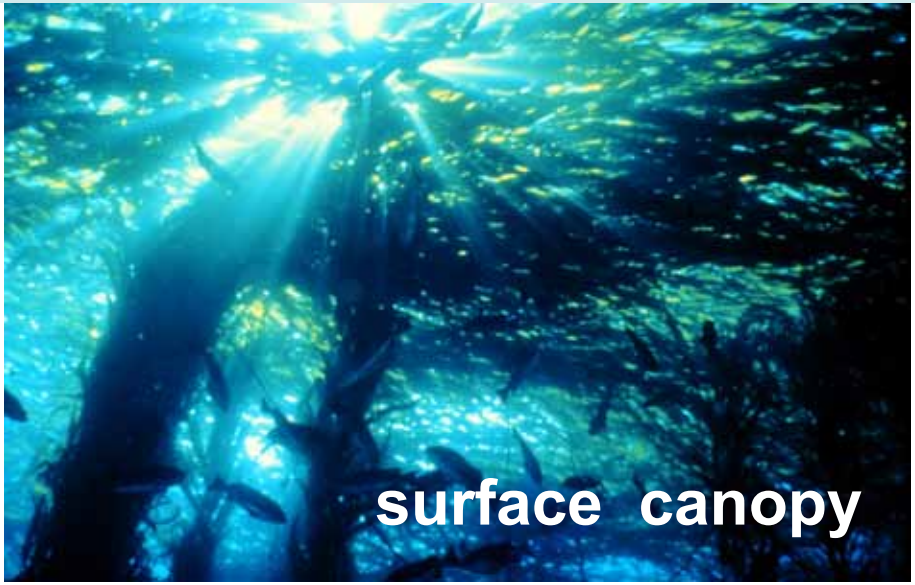
Kelp Forest Zonation



subcanopy

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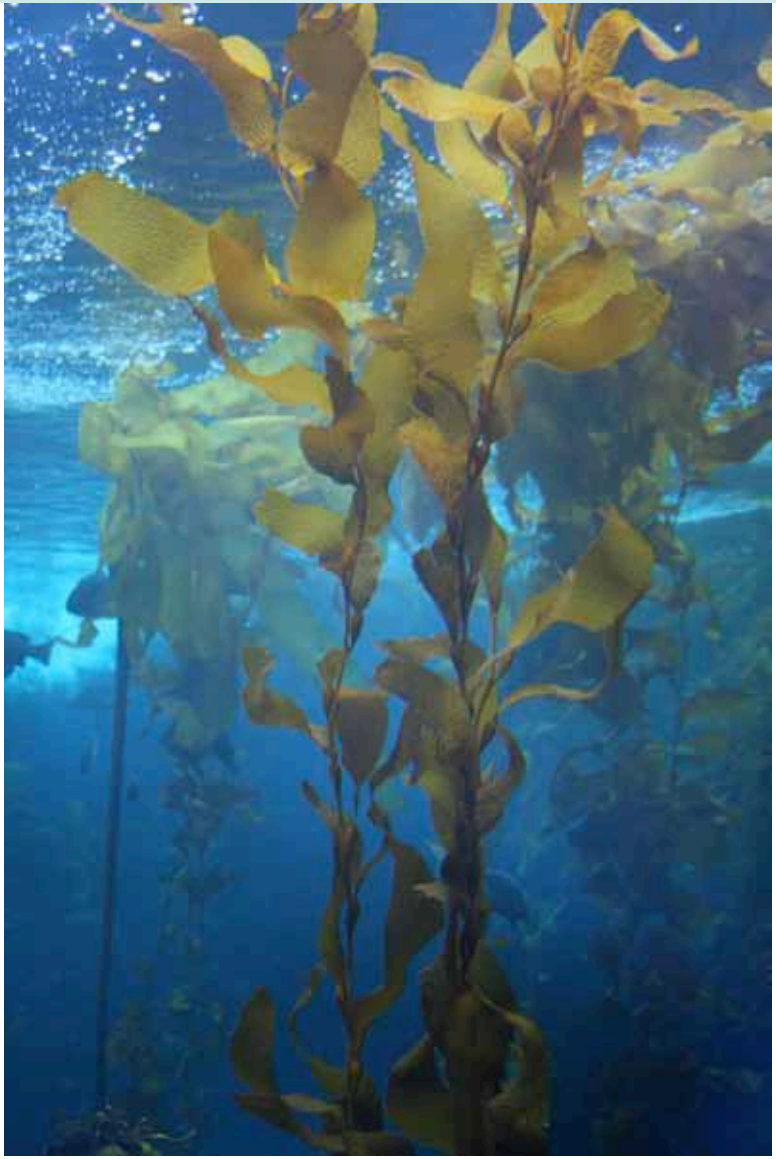
Giant kelp *Macrocystis pyrifera*



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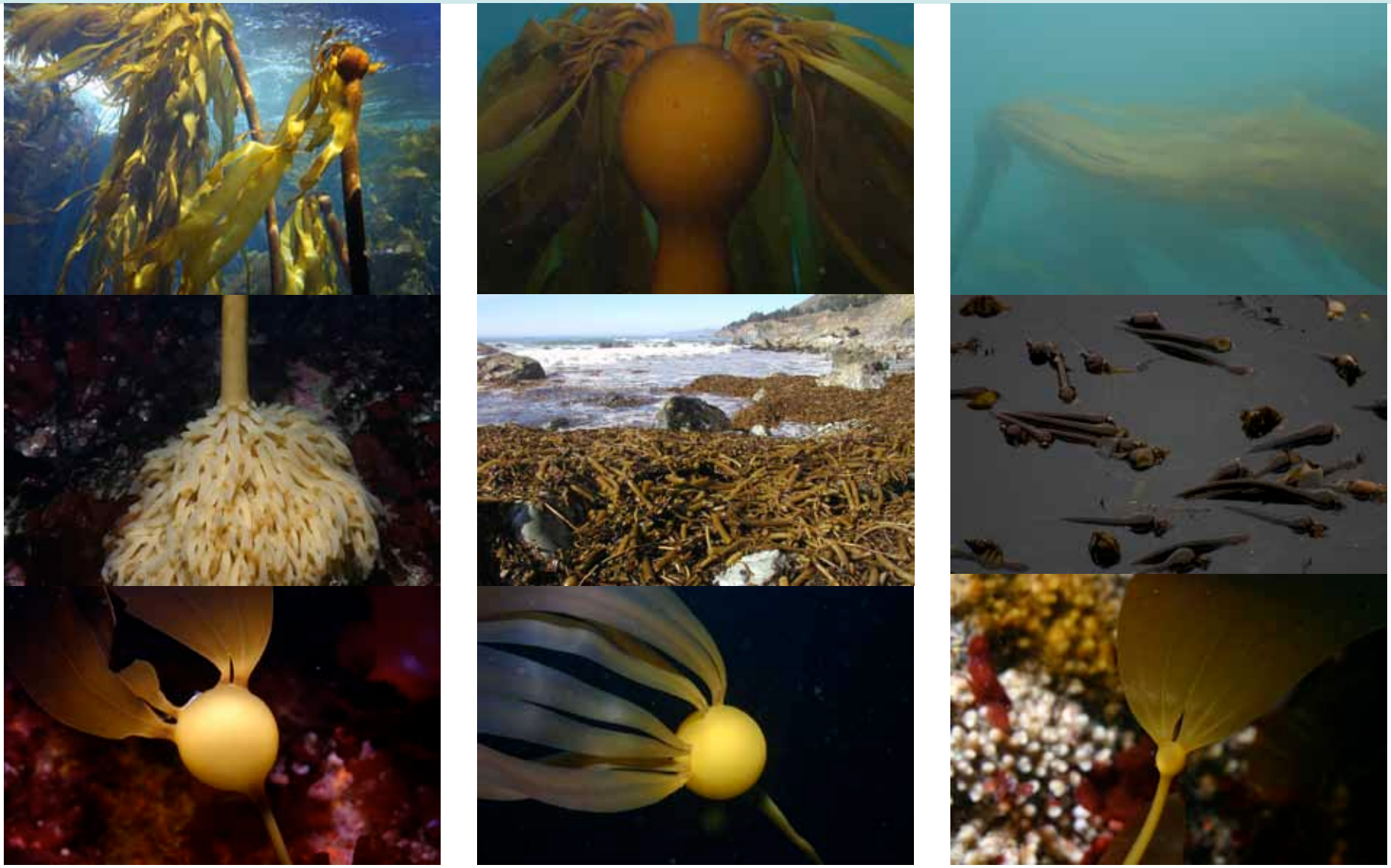
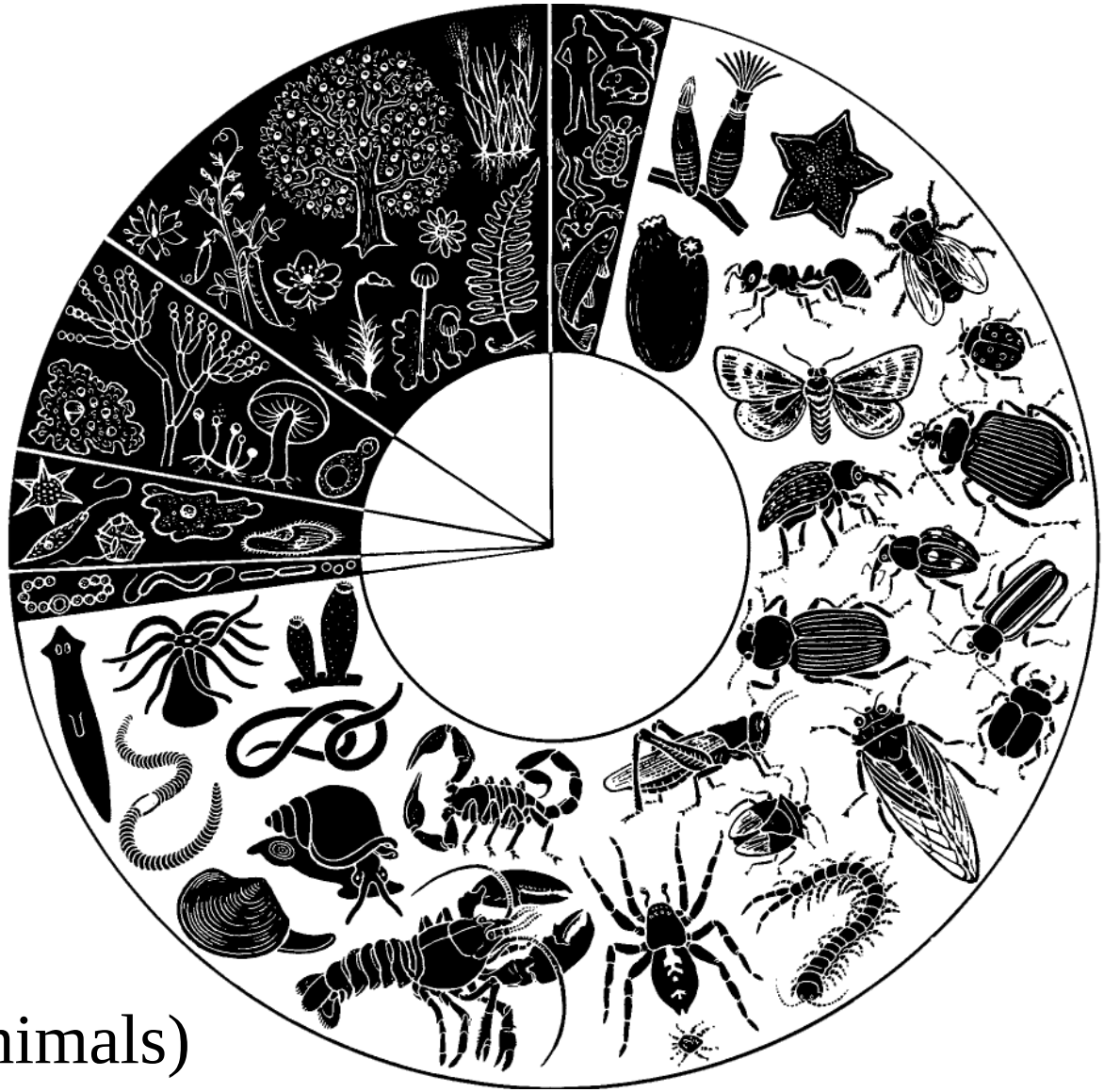
Bull kelp *Nereocystis luetkeana*



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

Pearse & Buchsbaum 1987

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

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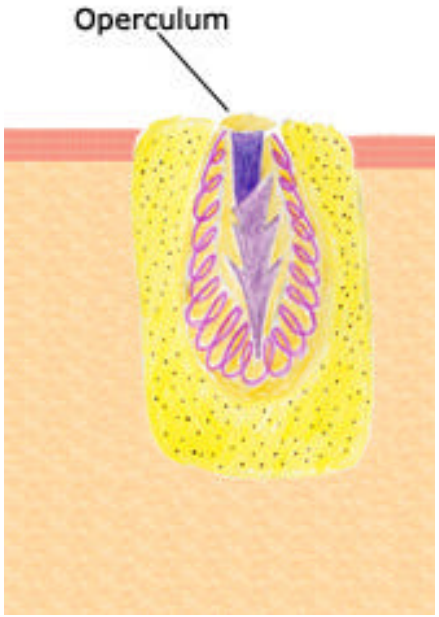
Cnidaria: stinging cells



Artwork Credit: NOAA/Caritta Lee

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Cnidaria: corals and hydrocorals

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Cnidaria: anemones

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Cnidaria: hydroids

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Mollusca: Nudibranchs

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Hermissenda crassicornis

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Hermissenda crassicornis

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Hermissenda crassicornis

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Hermissenda cerata

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Phidiana hiltoni

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Phidiana hiltoni

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Phidiana hiltoni

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Dendronotus albus

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Dendronotus frondosus

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Dendronotus frondosus

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Dendronotus frondosus

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Dendronotus iris

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Dendronotus iris

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D. iris: stalking its prey

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D. iris: preparing to 'strike'

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D. iris: ok, let swell pass…

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D. iris: attack!

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D. iris: laying egg cases

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D. iris: laying egg cases

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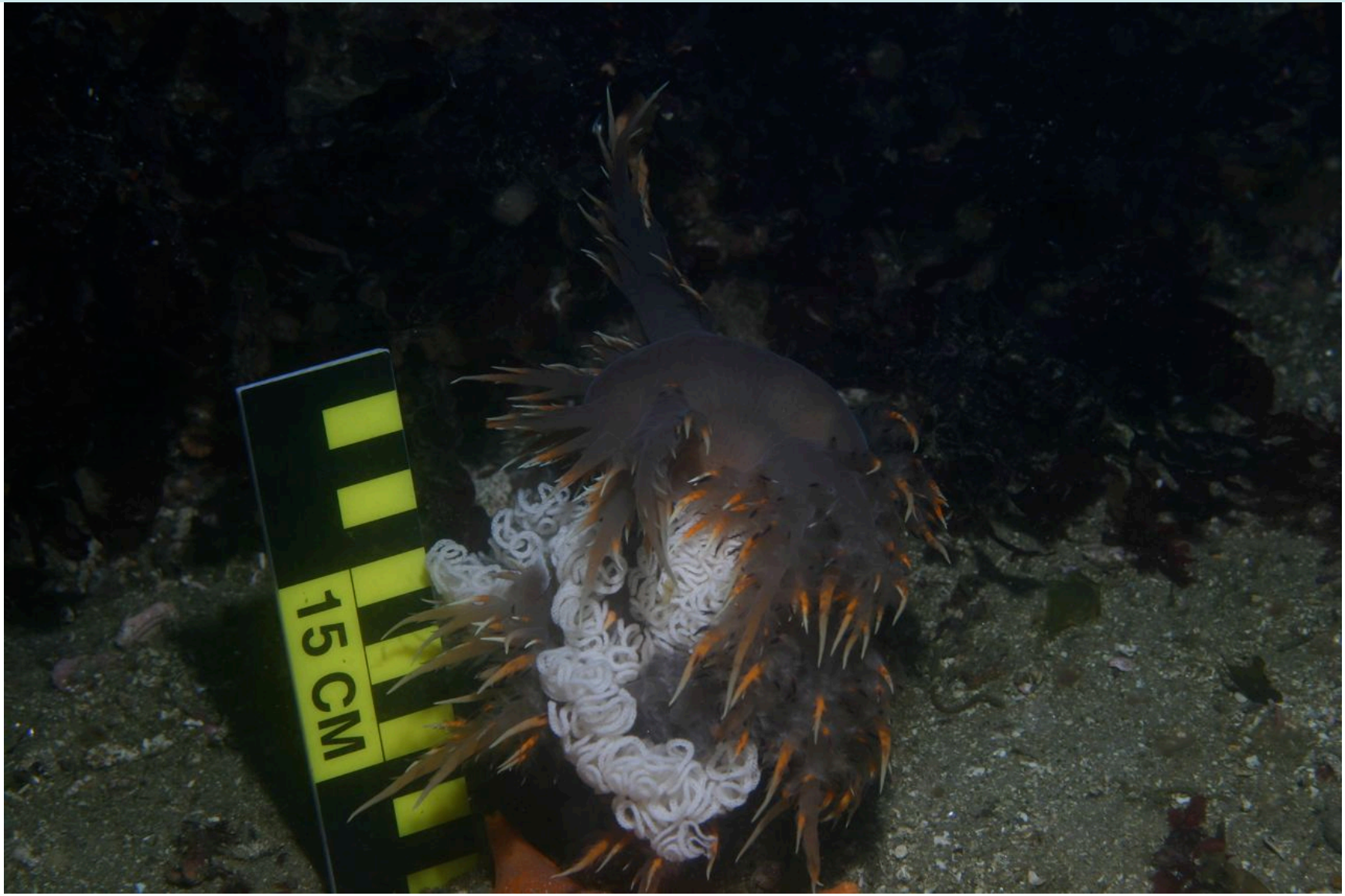
D. iris: laying egg cases



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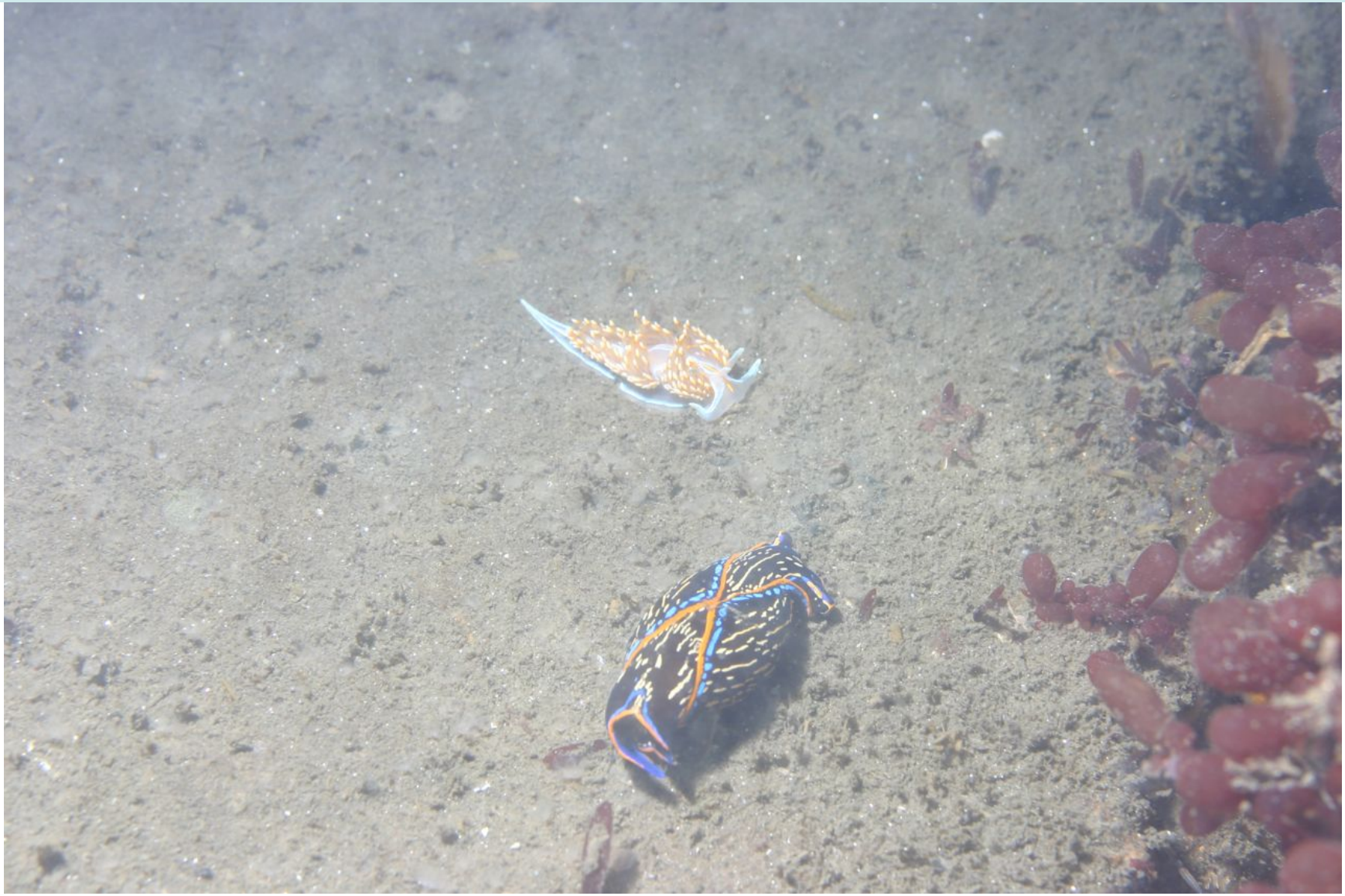
Hermissenda vs. *Navanax*



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Hermissenda vs. *Navanax*

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