

Rocky Reef & Kelp Bed Fishes



Rocky Reefs and Kelp Beds

- I. Reef Structure & Characteristics
- II. Trophic Structure
- III. Major taxa of fishes
- IV. Factors affecting species composition and abundance of fishes
 - A. Latitude
 - B. Macroalgae and Bottom Characteristics
- V. Temporal Changes

I. Reef Structure & Characteristics

What is a rocky reef?

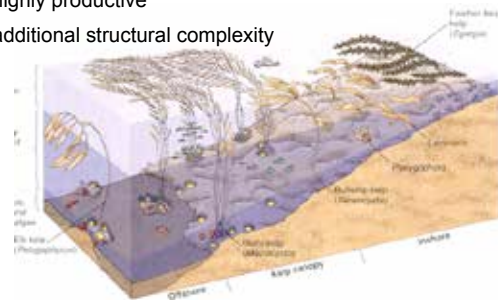
- hard substrate (rocks)
 - various types (e.g. volcanic, sedimentary, etc.)
 - not living (e.g., not corals or bivalve shells)
- usually along continental shelves
- usually in temperate and subtropical areas (but also in tropical areas where corals can't grow – e.g., deep or murky)
- typically structurally complex (e.g., crevices to hide in)
- often with algae attached to rocks...

Rocky Reef in Sea of Cortez



What is a kelp bed?

- rocky reefs with macroalgae
 - “**kelp forest**”: canopy forming kelps reach sea surface (e.g., *Macrocystis*)
 - “**kelp bed**”: shorter kelps don't reach surface
- highly productive
- additional structural complexity



kelp forest



kelp bed (or “understory”)



Kelp Forests are...

- highly productive
- structurally complex
 - both features likely affect fish assemblages



High primary production

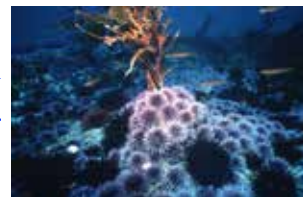
- *Macrocystis* can grow up to 50 cm per day
- reaches 60 m long
- 2.2 kg/m²/yr primary production (average – similar to tropical rain forests)

High structural complexity (3-dimensional structure)

- places to hide from predators (e.g., kelp perch, juvenile kelp bass, juvenile rockfishes)
- unique foraging locations (e.g., halfmoon, opaleye, pickers)

Kelp forests and beds are dynamic:

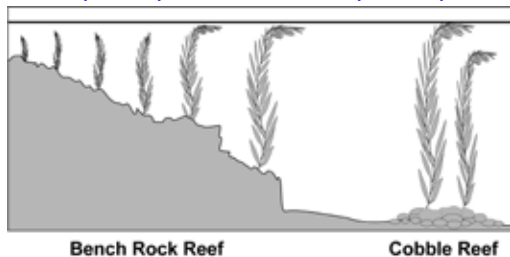
- seasonal changes (more kelp during cool part of year)
- interannual variability
- fluctuations in grazers (e.g., urchins) cause shifts from kelp forest to “urchin barren”



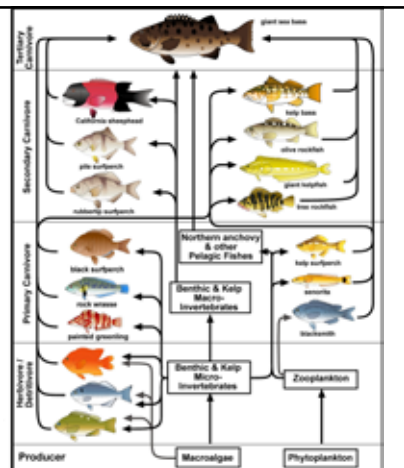
But while kelp forests are highly productive and structurally complex...

- few fish are obligate associates of kelp forests
 - kelp presence has relatively little affect on fish assemblage on high relief reefs
 - much larger effect of kelp abundance on low-relief reefs

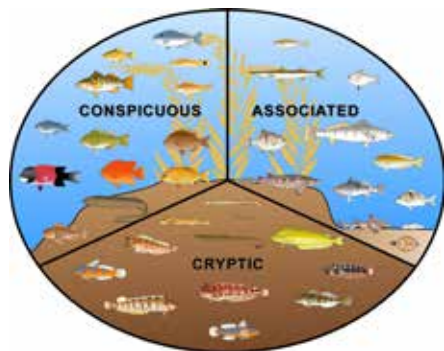
kelp less important kelp more important



II. Trophic Structure



III. Major taxa of reef and kelp fish (southern California)



Differences relative to coral reefs:

1. Diversity: lower than in tropics
2. Reproductive patterns:
 - more livebearers than in tropics
 - fewer sex changers
3. Longevity & maturity: longer & slower than tropics
4. Diet: reduced herbivory



Conspicuous species

Embiotocidae



Embiotoca jacksoni



Rhacochilus toxotes



Hyperprosopon argenteum



Brachystius frenata

Conspicuous species

Scorpaenidae



Sebastes carnatus



Sebastes chrysomelas



Sebastes atrovirens



Sebastes serriceps

Conspicuous (?) species

Scorpaenidae



Sebastes auriculatus



Scorpaena guttata



Sebastes mystinus



Sebastes melanops

Conspicuous species

Pomacentridae



Hypsypops rubicundus



Chromis punctipinnis



Conspicuous species

Labridae



Semicossyphus pulcher



Halichoeres semicinctus



Oxyjulis californica

Conspicuous species

Serranidae



Paralabrax clathratus



Paralabrax nebulifer

Conspicuous species

Polyprionidae



Stereolepis gigas

Conspicuous species

Kyphosidae



Medialuna californiensis



Girella nigricans



Hermosilla azurea

Conspicuous (?) species

Muraenidae



Gymnothorax mordax

Conspicuous species

Heterodontidae



Heterodontus francisci

Scyliorhinidae



Cephaloscyllium ventriosum

Cryptic species

Gobiidae



Rhinogobiops nicholsii



Lythrypnus dalli



Lythrypnus zebra

Cryptic species

Clinidae



Heterostichus rostratus



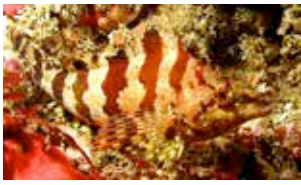
Alloclinus holderi



Gibbonsia elegans

Cryptic species

Hexagrammidae



Oxylebius pictus



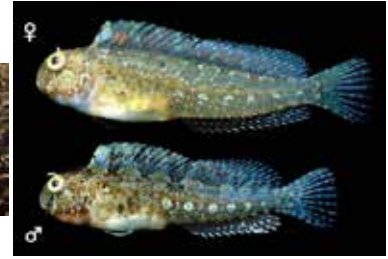
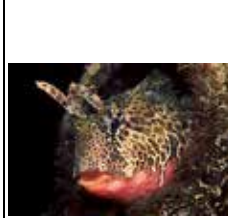
Ophiodon elongatus



Hexagrammos decagrammus

Cryptic species

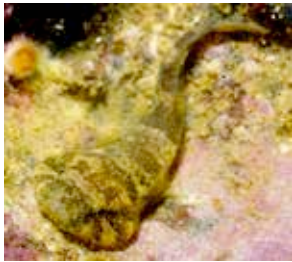
Bleniidae



Hypsoblennius gentilis

Cryptic species

Gobiesociidae



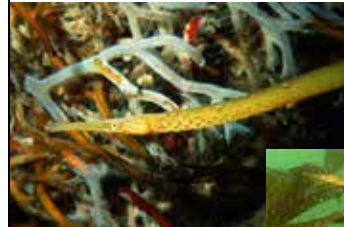
Gobiesox rhessodon



Rimicola muscarum

Cryptic species

Syngnathidae



Syngnathus californiensis



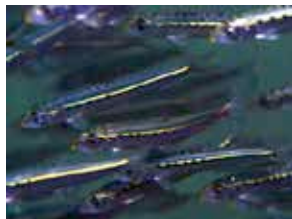
Associated species

Atherinopsidae



Atherinops affinis

Clupeidae



Sardinops sagax

Associated species

Haemulidae



Anisotremus davidsoni



Xenistius californiensis

Associated species

Sciaenidae



Cheilotrema saturnum



Atractoscion nobilis

Associated species

Carangidae



Seriola lalandi



Trachurus symmetricus

Sphyraenidae



Sphyraena argentea

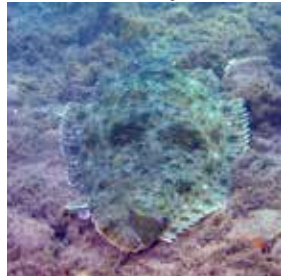
Associated species

Malacanthidae



Caulolatilus princeps

Paralichthyidae



Paralichthys californicus

Pleuronectidae



Pleuronichthys coenosus

Associated species

Elasmobranchs

Myliobatidae



Myliobatis californicus

Triakidae



Triakis semifasciata

Torpedinidae



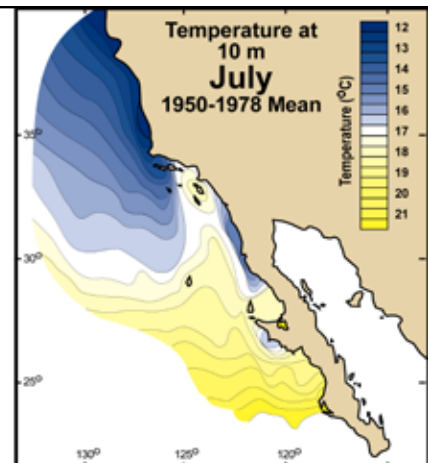
Torpedo californica

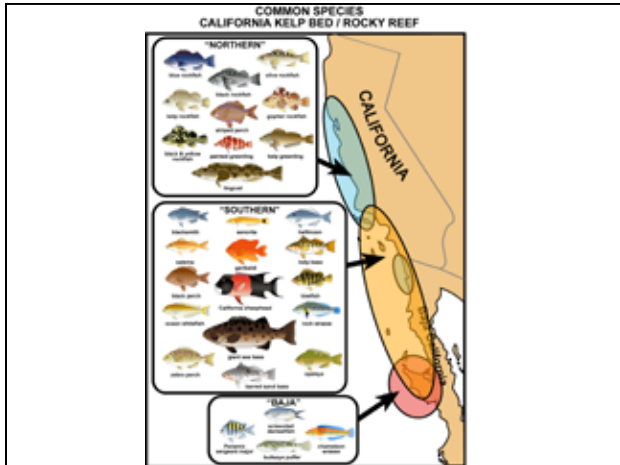
IV. Factors affecting species composition and abundance of fishes

A. Latitude

B. Macroalgae and Bottom Characteristics

Latitude affects temperature






V. Temporal Changes

- Seasonal
- Inter-annual

Seasonality


- pronounced seasonality in abiotic factors
 - temperature
 - day length
 - surge/swell/turbulence
- main changes:
 - spring/summer peaks in reproduction/recruitment
 - influx of warm water “associate” species during summer/fall
 - seasonal changes of kelp / rocky reef fish assemblage are less extreme than in bays & estuaries, but more extreme than in deeper waters



Inter-annual variability


- large variation among years (e.g., El Niño, La Niña, and PDO)
- linked to ocean climate (warm or cold regime)
- kelp coverage varies dramatically among years
- shift in productivity (high when cold)
- shift in assemblage

warm



black rockfish

cool



blue rockfish

Summary:

Kelp Forest & Rock Reef fish assemblages...

- are highly productive
- vary with latitude & temperature regime
- are dynamic within and between years