

Baseline Characterization of Sandy Beach Ecosystems along the North Coast of California

Karina J. Nielsen, Jenifer E. Dugan, Tim Mulligan, David M. Hubbard, Sean F. Craig, Rosa Laucci, Megan E. Wood, Drew R. Barrett, Helen L. Mulligan, Nick Schooler & Michelle L. Succow

Karina Nielsen
Our Fearless
Peerless
Leader



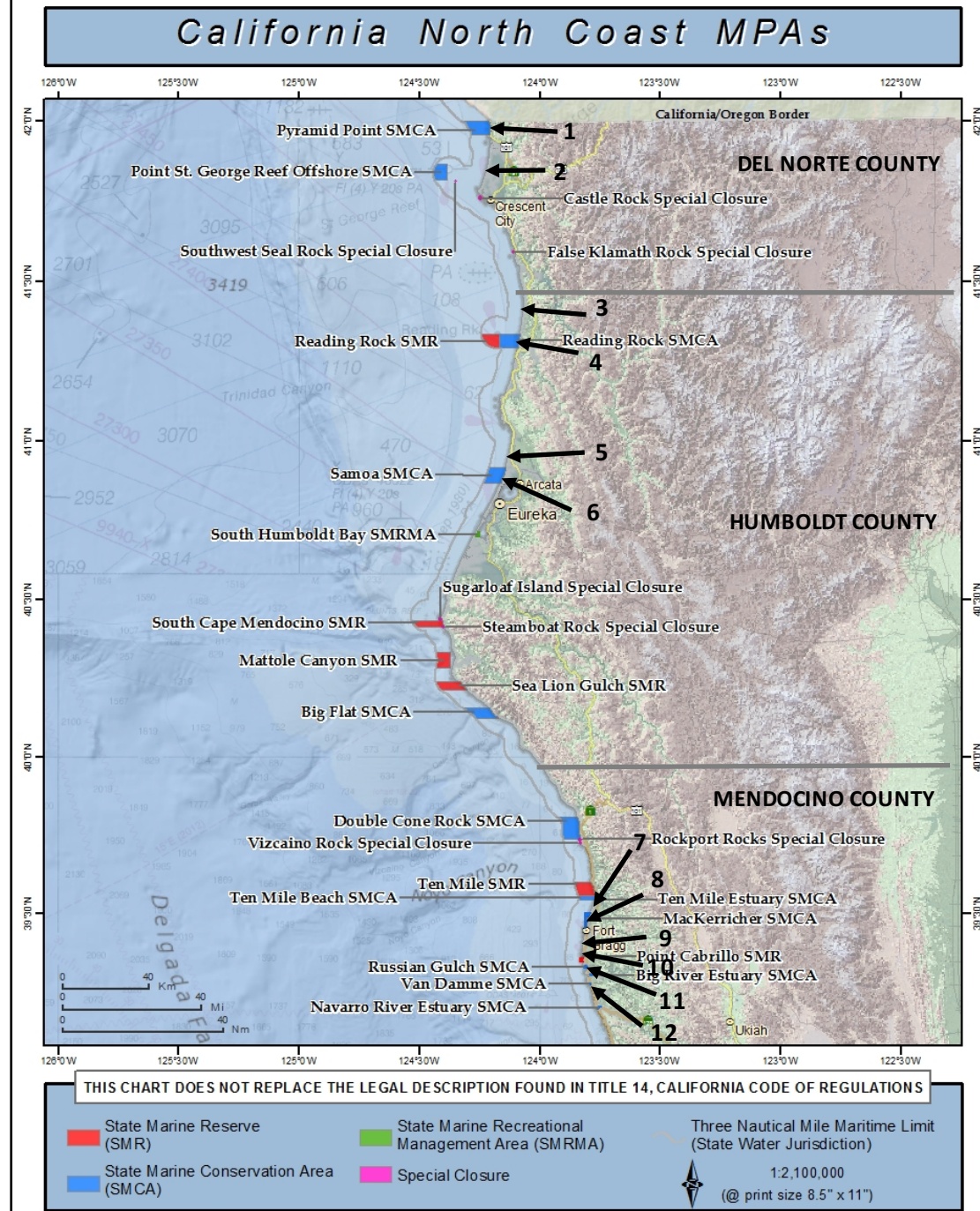
NCMPA Baseline Study Beaches 6 MPA** 6 Reference

Long beaches (>1 km)

1. Pyramid Point SMCA**
2. Kellogg Beach
3. Gold Bluffs
4. Reading Rock SMCA**
5. Mad River
6. Samoa SMCA**
7. Ten Mile
8. Virgin Creek SMCA**

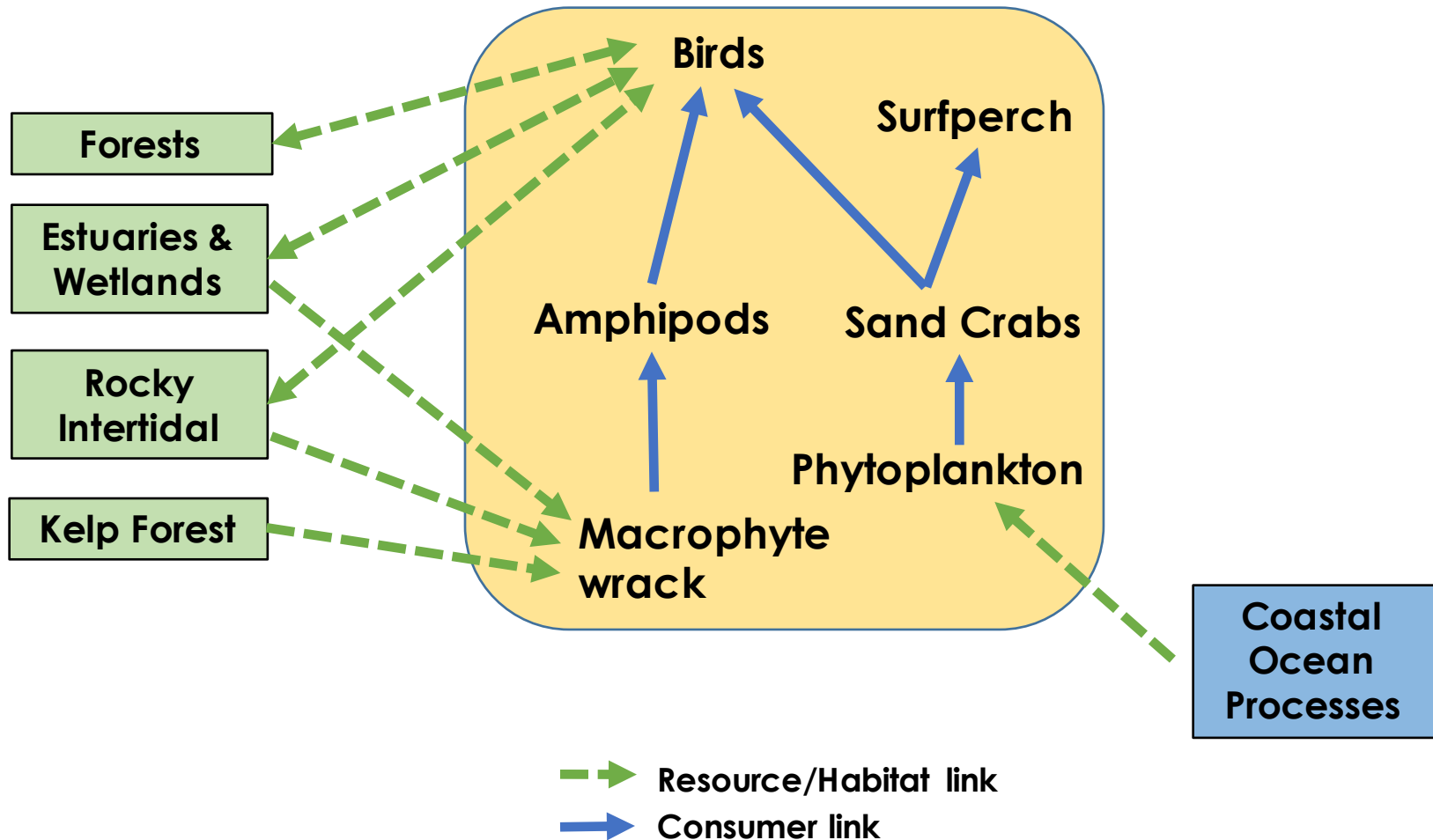
Pocket beaches (≤1 km:120-690 m)

9. Jug Handle
10. Caspar
11. Russian Gulch SMCA**
12. Van Damme SMCA**




Sandy Beach & Surf Zone

Key Relationships



NCMPA Beach Baseline Study

- 
1. Monthly surveys of birds, people, dogs, fresh kelp plants, wrack & beach characteristics
 - Surveys of standard transects on 12 beaches
 - Sept 2014 – May 2015, n = 108
 2. Intertidal biodiversity surveys
 - Summer 2014, 12 study beaches, 540 samples (5400 cores, 42 m², ~12 metric tonnes of sand sieved)
 3. Surfperch abundance & diet, 9 beaches, 2 years
 4. Night Smelt populations, 9 beaches, 2 years

NCMPA Beach Baseline Study

1. Monthly surveys of birds, people, dogs, fresh kelp plants, wrack & beach characteristics

- Surveys of standard transects on 12 beaches
- Sept 2014 – May 2015, n = 108

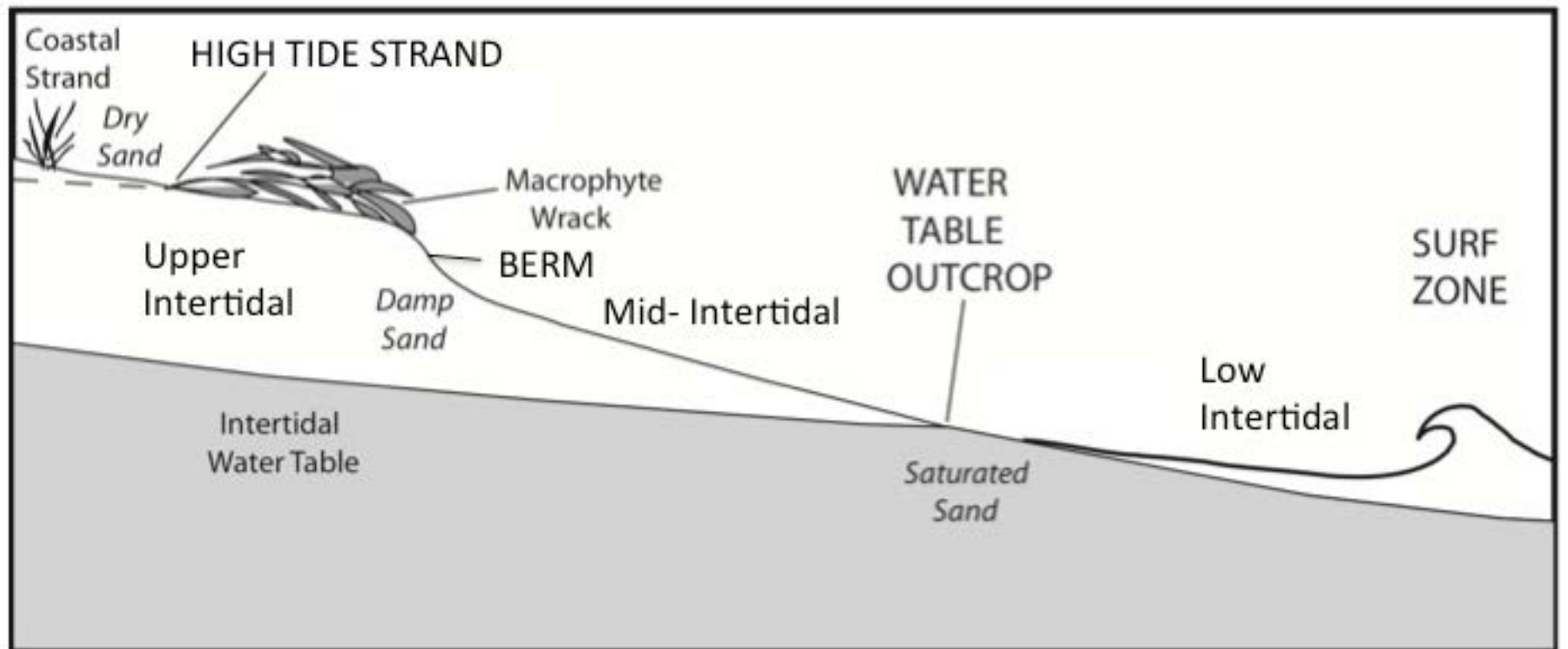
2. Intertidal biodiversity surveys

- Summer 2014, 12 study beaches, 540 samples (5400 cores, 42 m², ~12 metric tonnes of sand sieved)

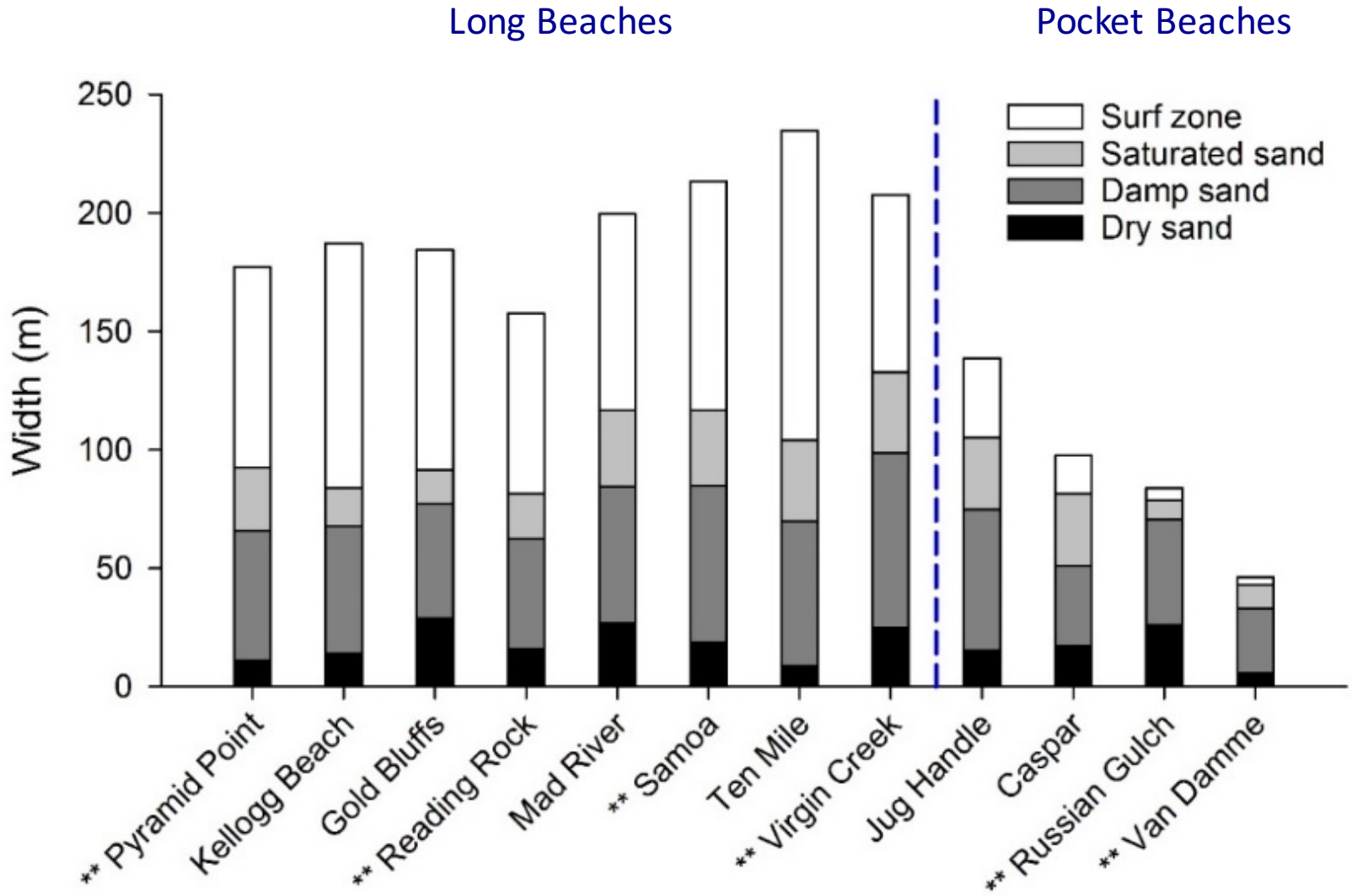
3. Surfperch abundance & diet, 9 beaches, 2 years

4. Night Smelt populations, 9 beaches, 2 years

Beach Zones



Beach Characteristics: Zone Widths



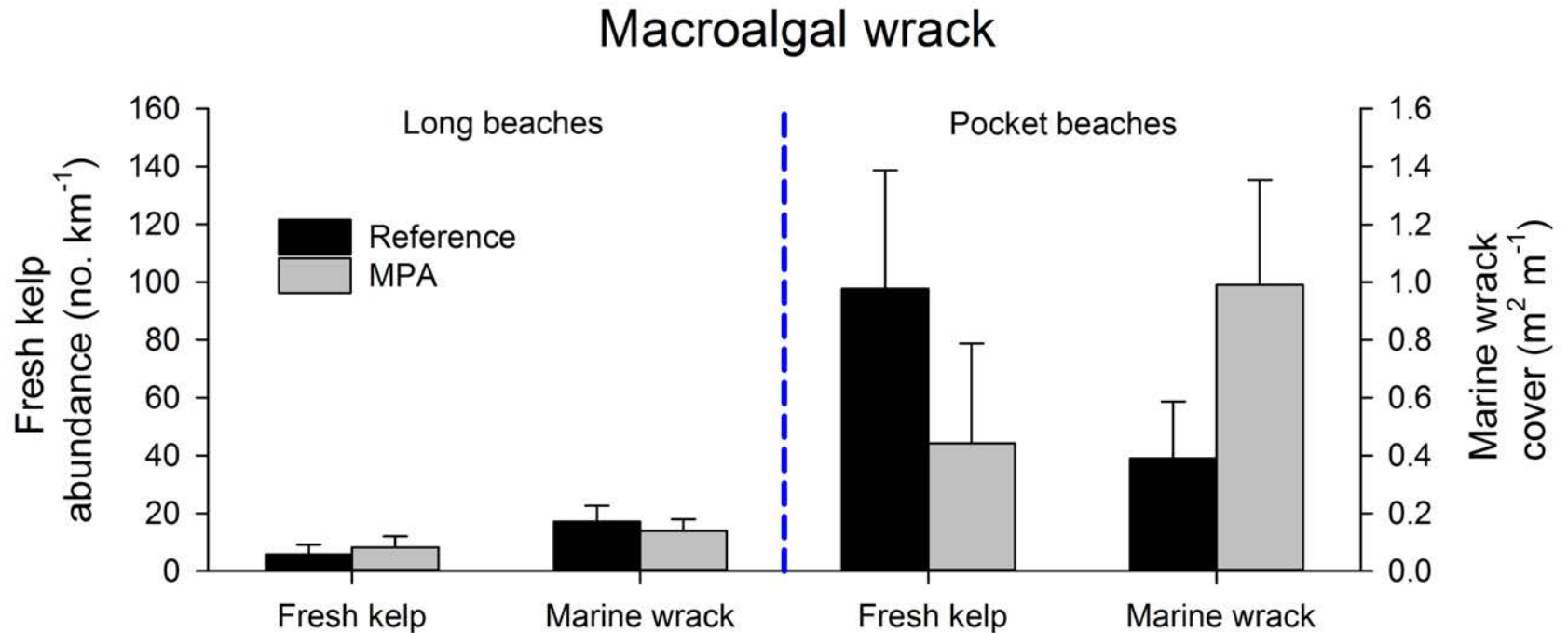
Marine Wrack



- **Macrophyte wrack (kelps, eelgrass, surfgrass)**
 - 20 cm^2 to 1.3 m^2 per m
- **Animal wrack (crab molts, by-the-wind sailors)**
 - 180 cm^2 to 0.45 m^2 per m



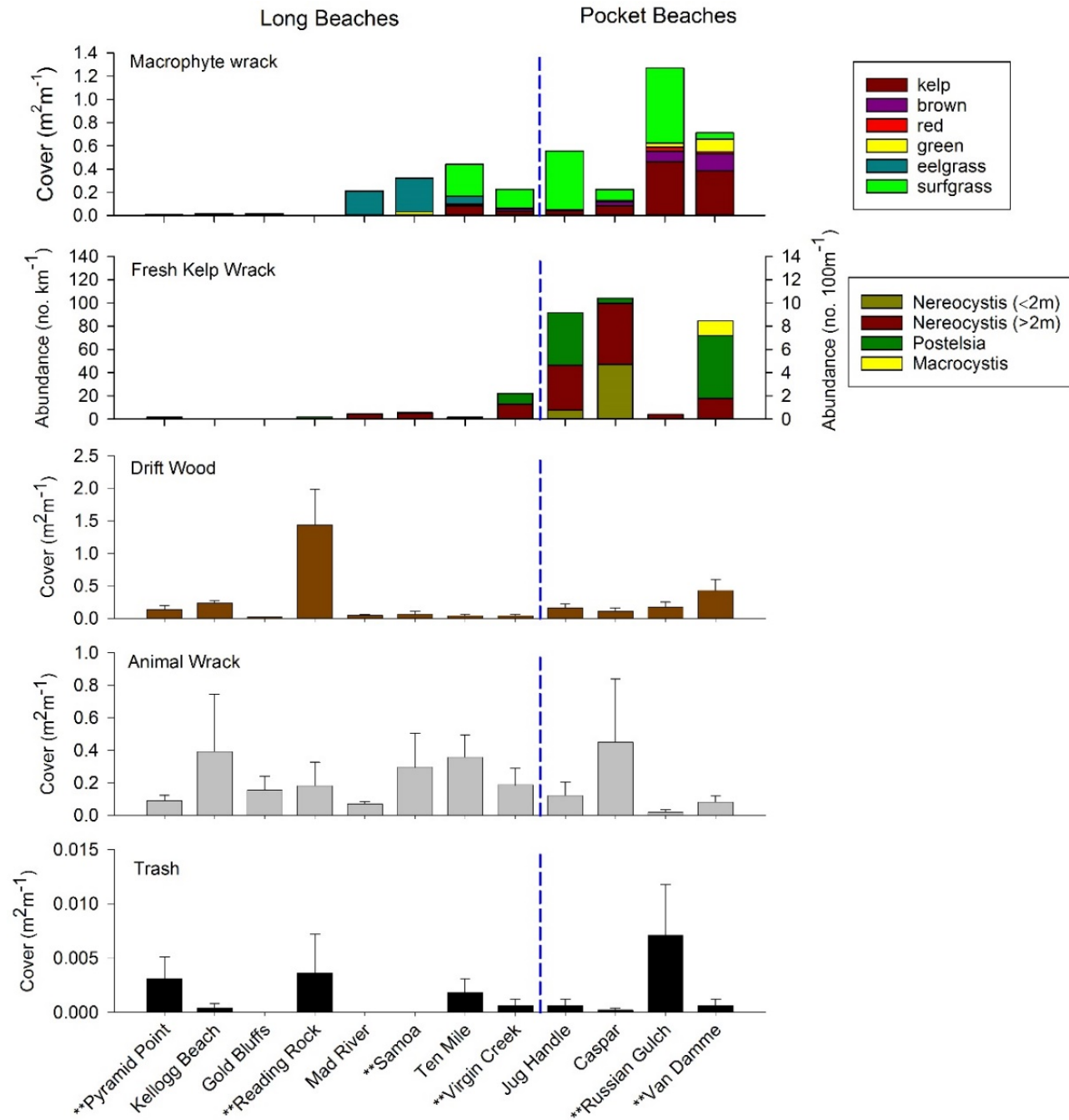
Marine Wrack Subsidies



Macroalgal wrack, far more abundant on pocket beaches

Wrack Subsidies

- Kelps dominate on pocket beaches
- Seagrasses dominate on long beaches



Intertidal Invertebrates

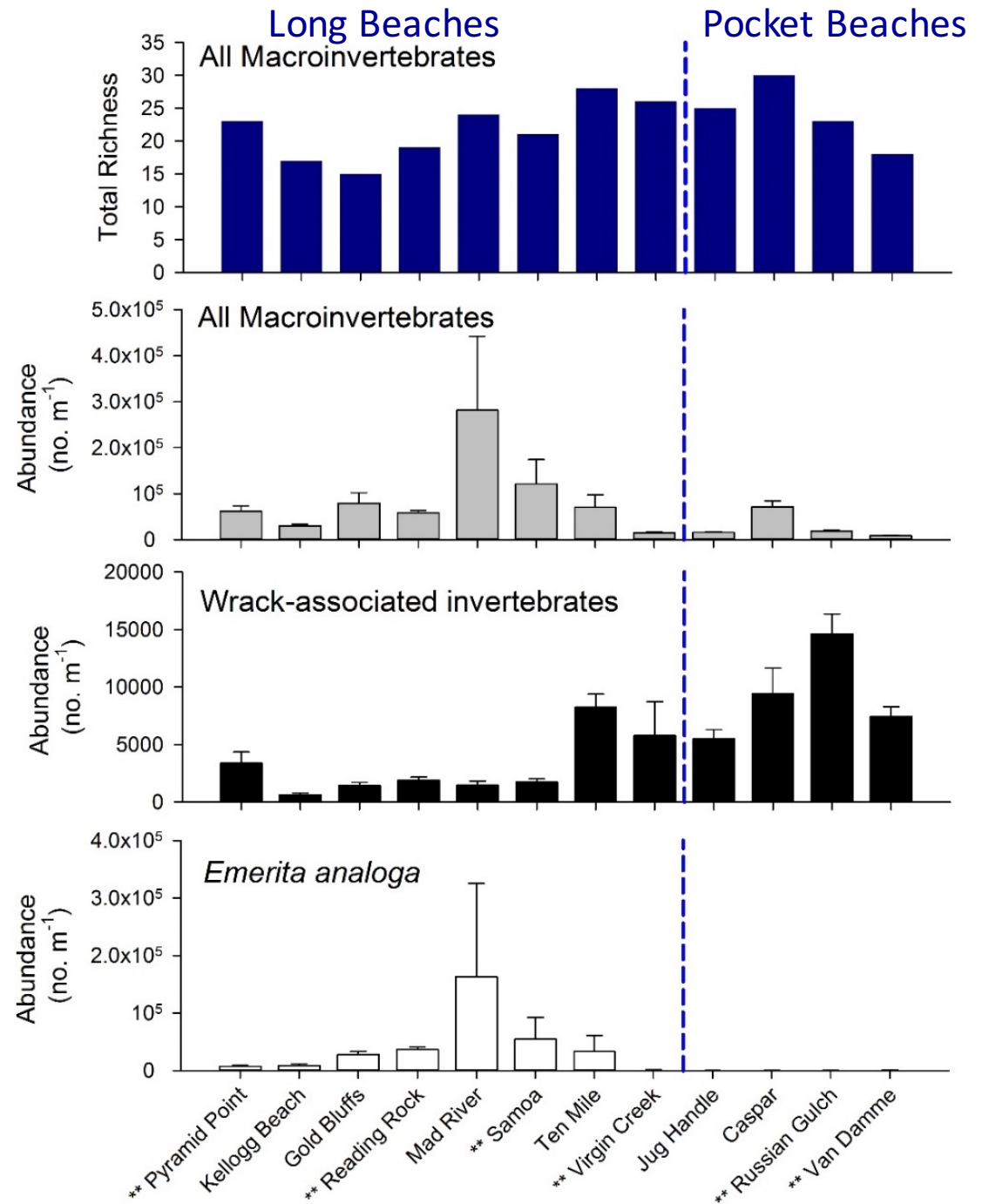


- High Biodiversity > 70 species found
- High Abundance > up to 281,641 ind m⁻¹
- High Biomass > up to 15,334 g m⁻¹



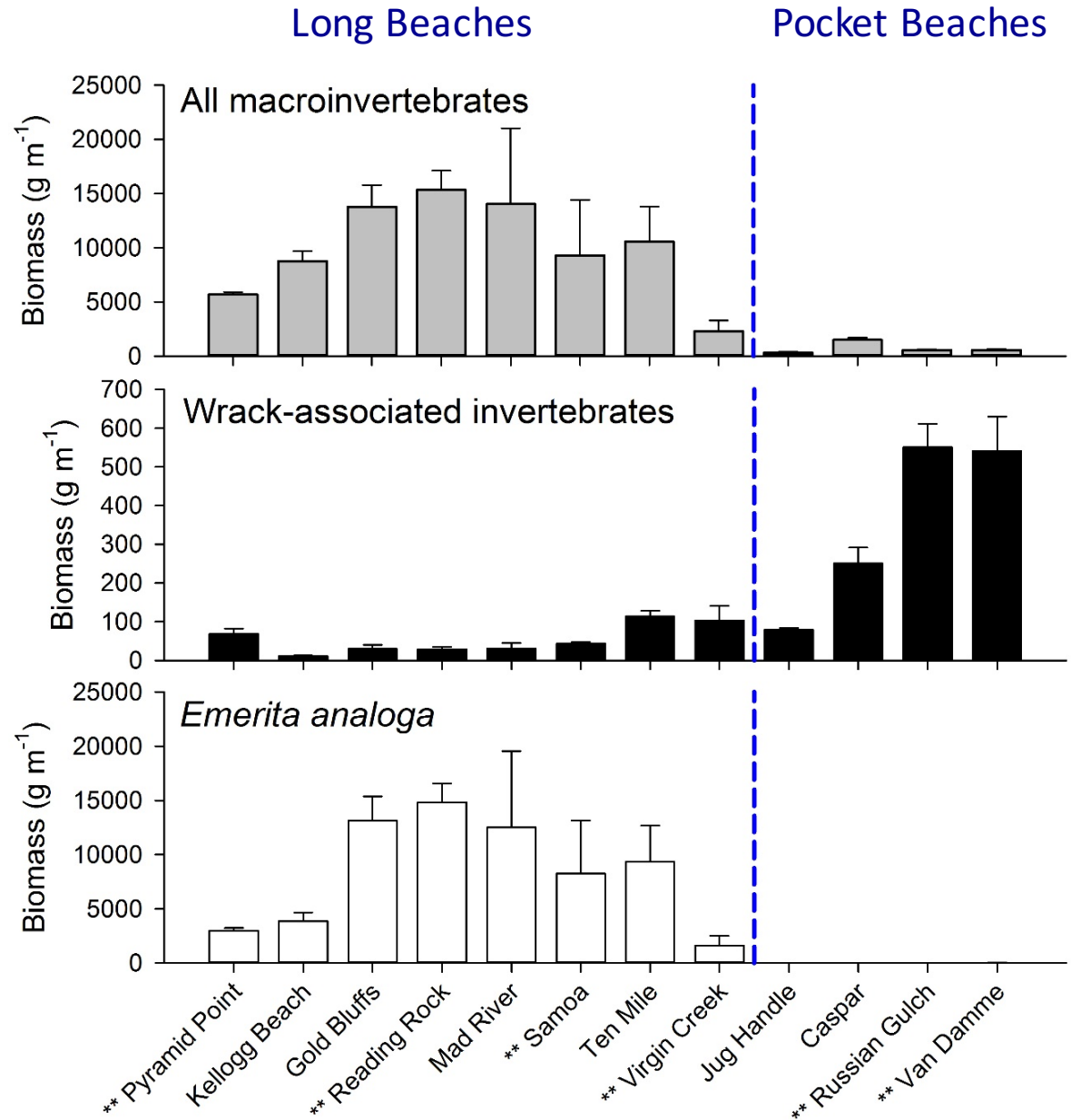
Intertidal Invertebrate Richness & Abundance

- Species richness: no pattern with beach type
- Sand crabs & talitrid amphipods found on all beaches
- Composition differed with beach type
- Long beaches >>> Pocket beaches = sand crabs
- Wrack invertebrates: higher abundance on pocket beaches



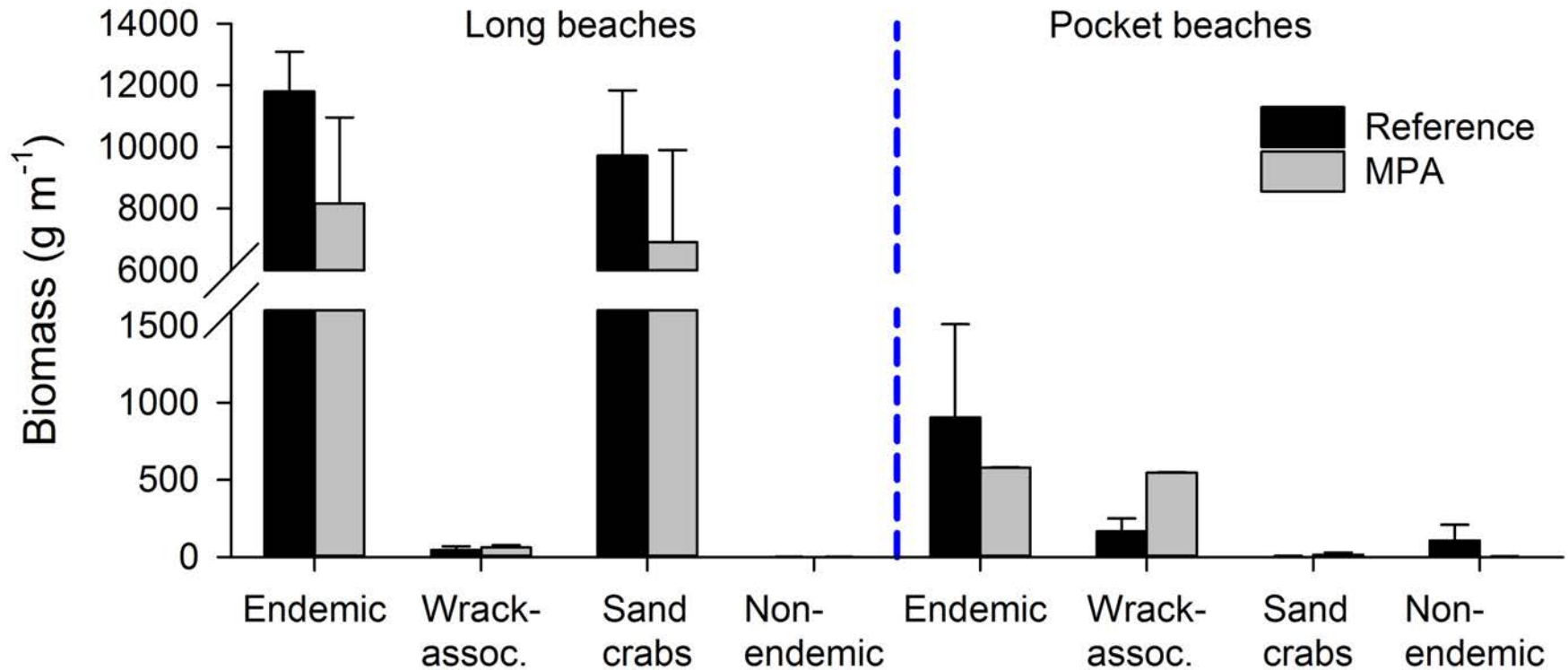
Intertidal Invertebrate Biomass

- Long beaches >>> Pocket beaches
- Sand Crabs
 - 78% Long Beaches
 - 2% Pocket Beaches
- Wrack Invertebrates
 - 0.5% Long Beaches
 - 58% Pocket Beaches



Intertidal Invertebrate Biomass

Macroinvertebrates



Birds



**Monthly surveys for 9 months
(September – May)**

17,891 birds of 68 species

8,714 shorebirds of 20 species

4,984 gulls of 7 species

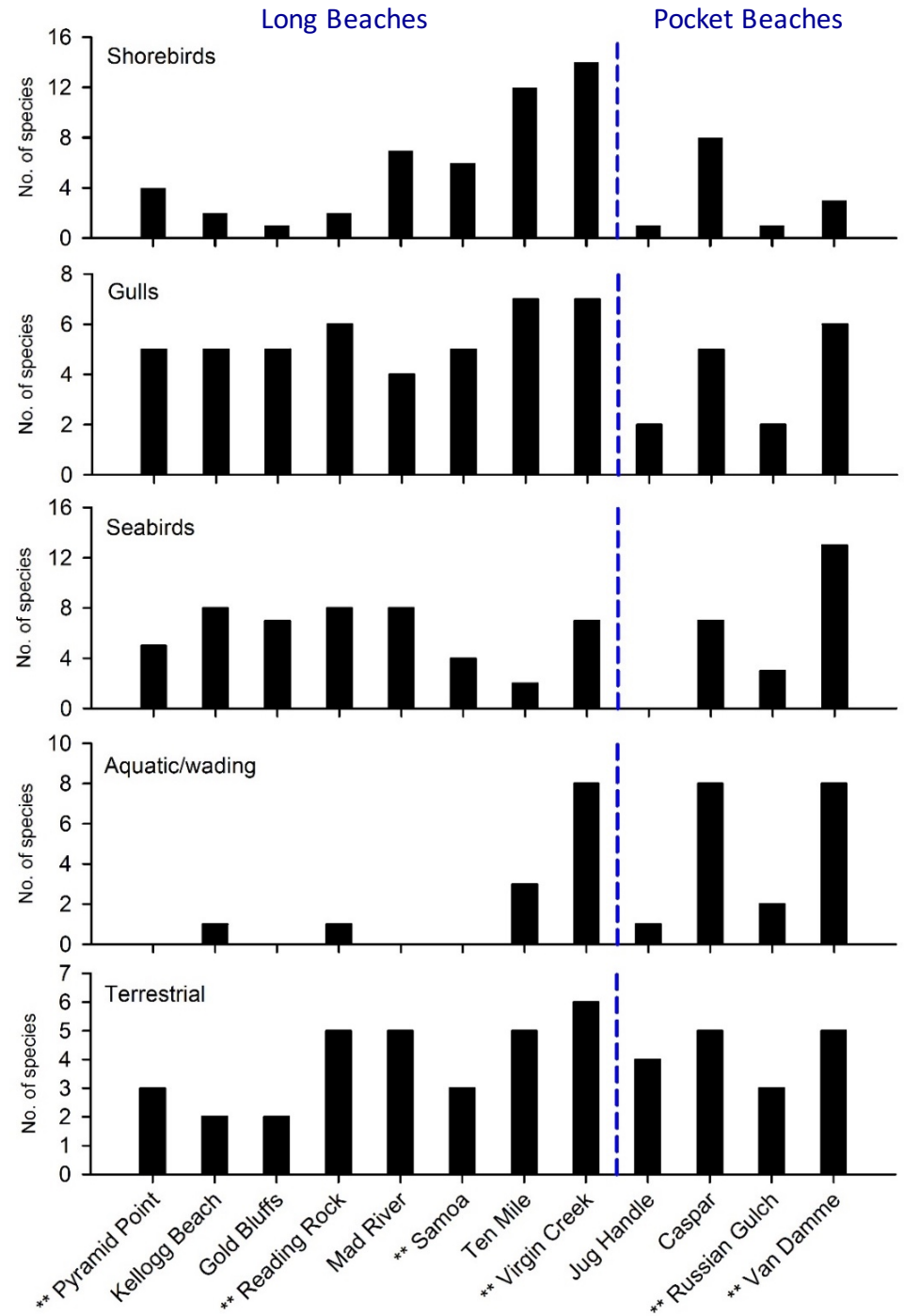
3,559 seabirds of 19 species



Birds

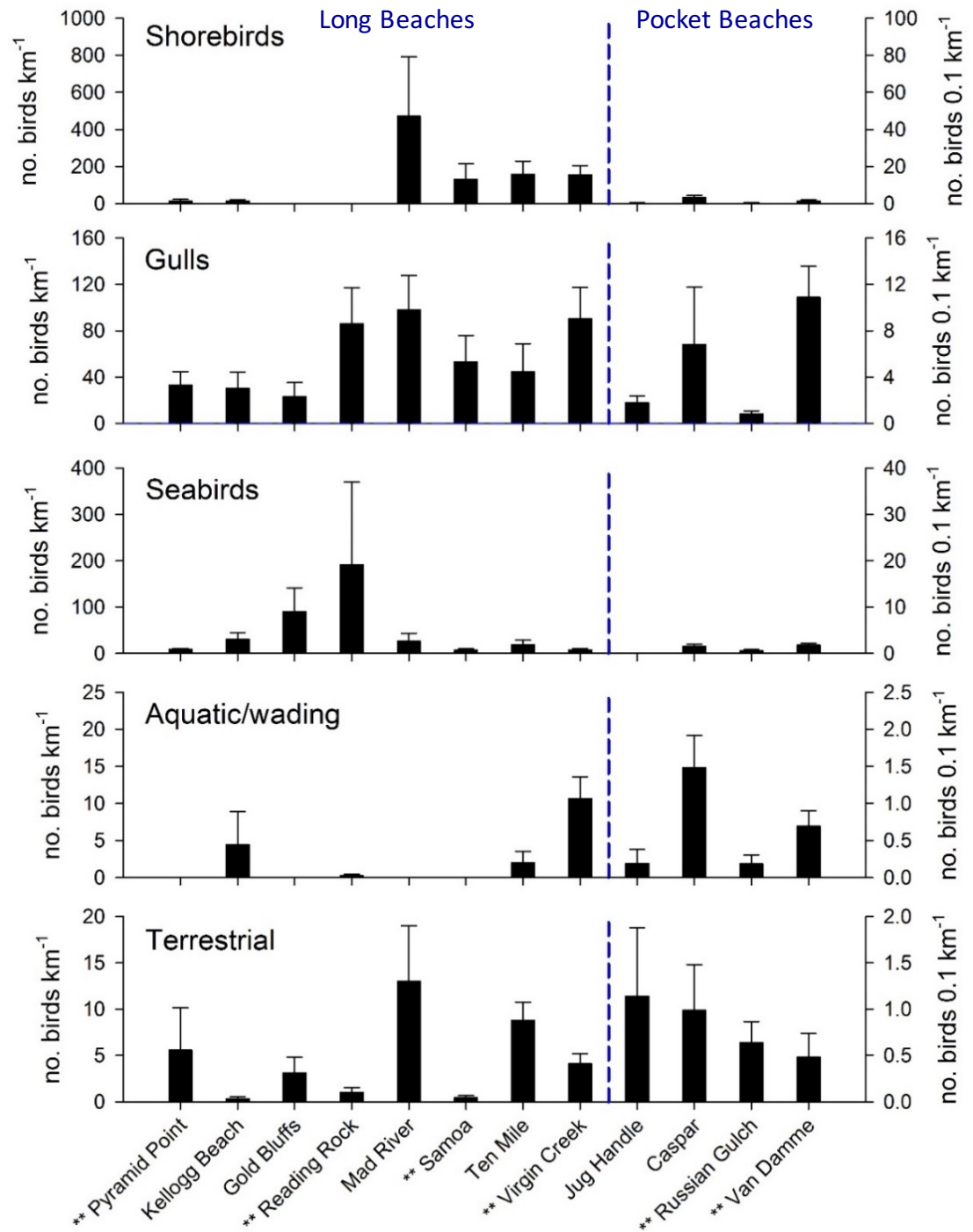
Species Richness

- More shorebird species on long beaches
- More aquatic/wading birds on pocket beaches



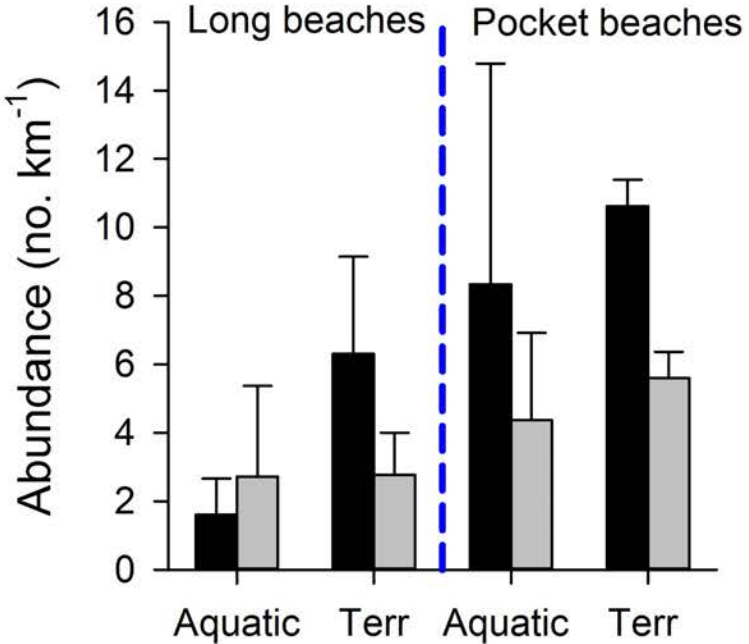
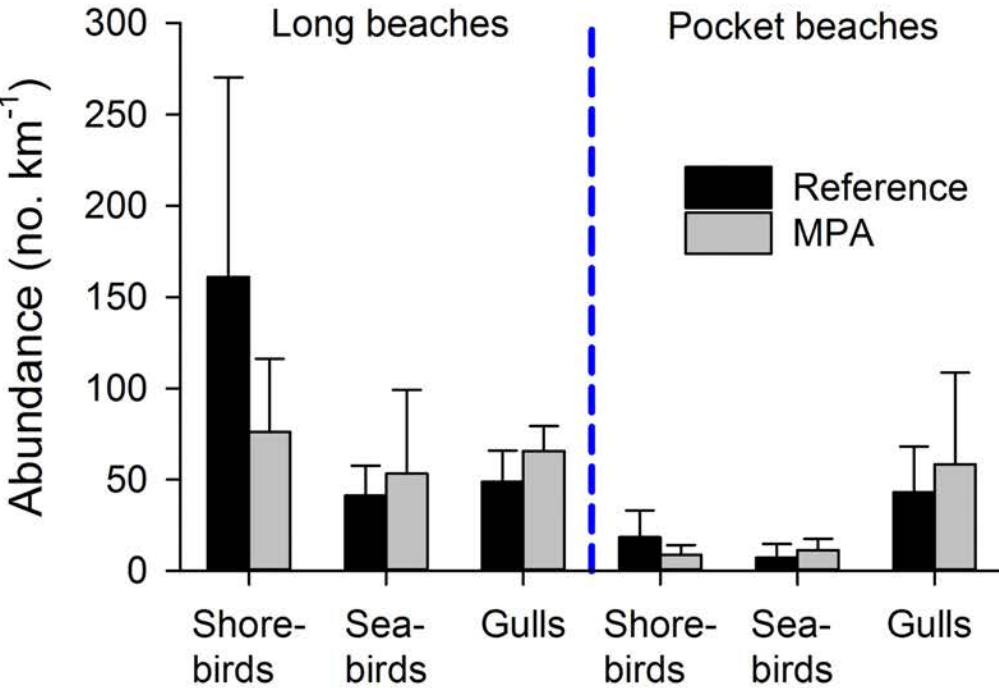
Bird Abundance

- Shorebirds & seabirds prefer long beaches
- Terrestrial & aquatic/wading birds important on pocket beaches

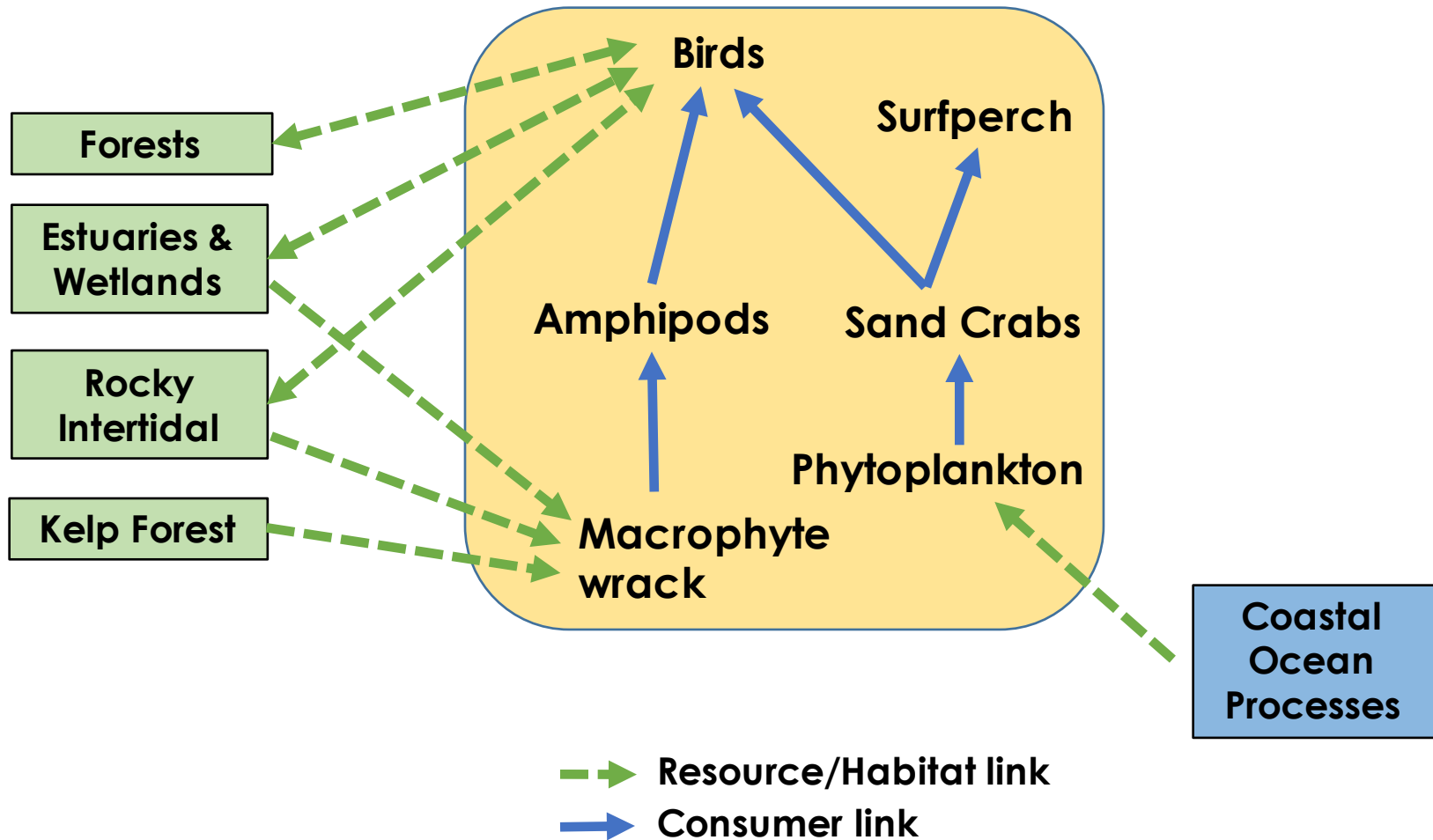


Bird Abundance

Birds



Sandy Beach & Surf Zone Key Relationships



Beach Type

Wrack

Intertidal Invertebrates

Birds

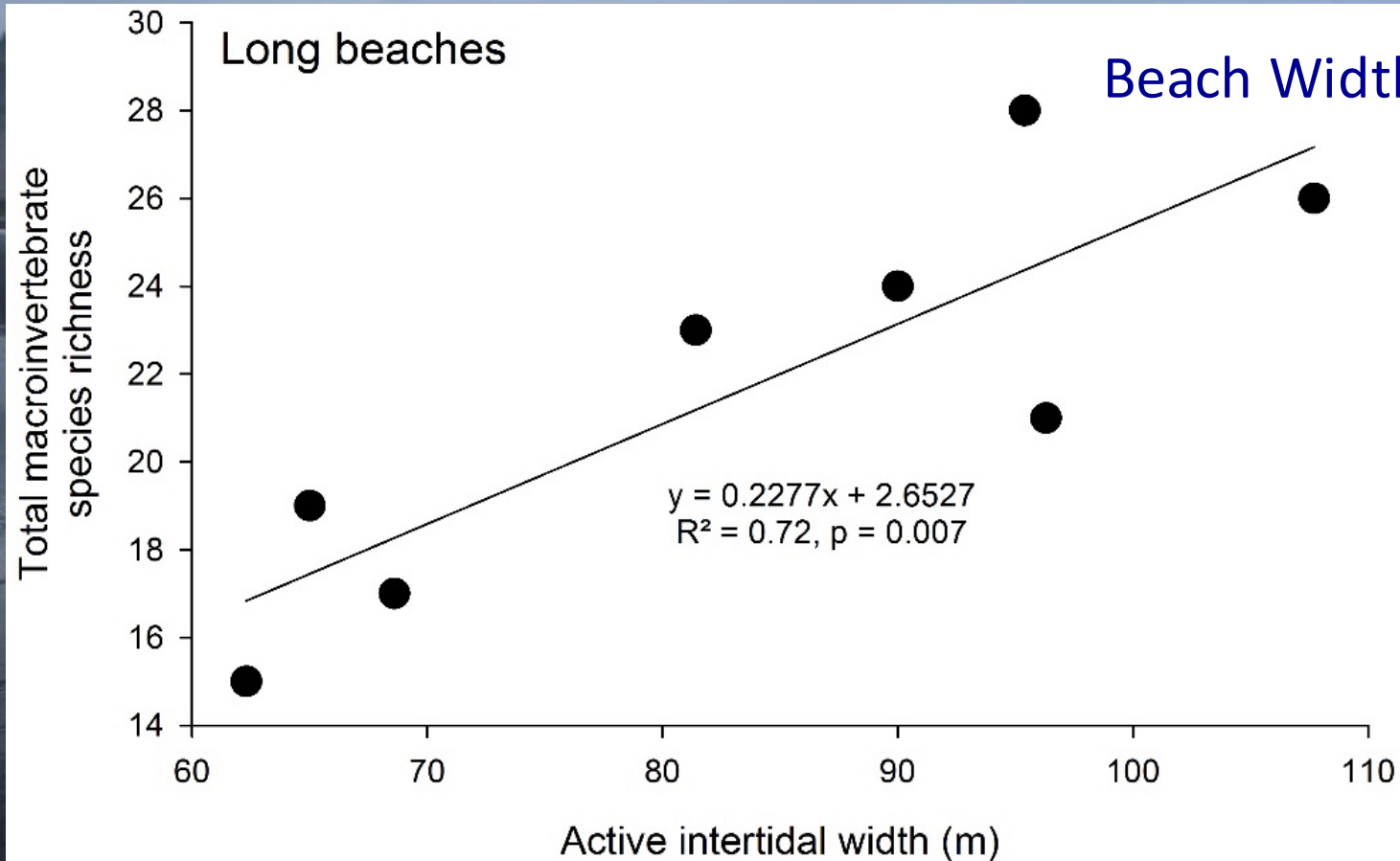
-Composition

-Abundance

-Biomass

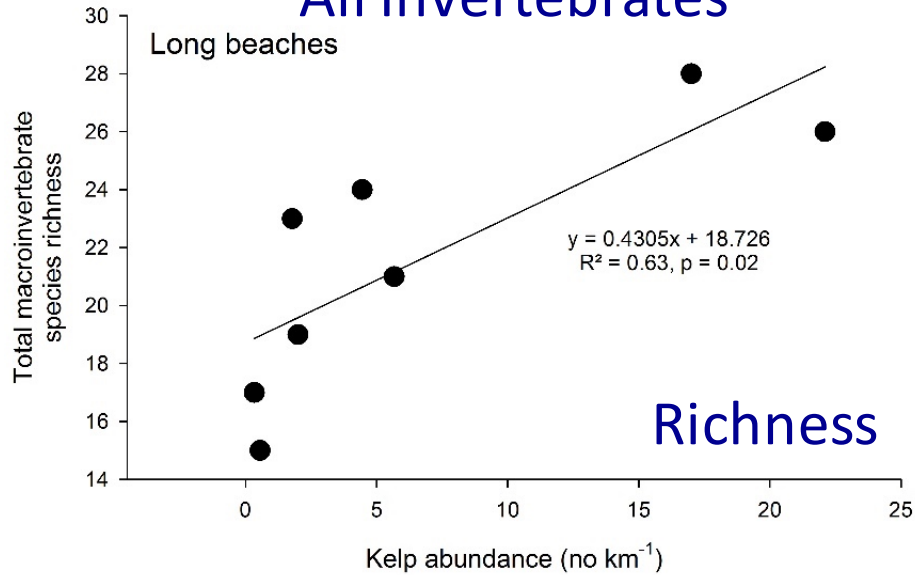


Beach Characteristics Influence Intertidal Biodiversity

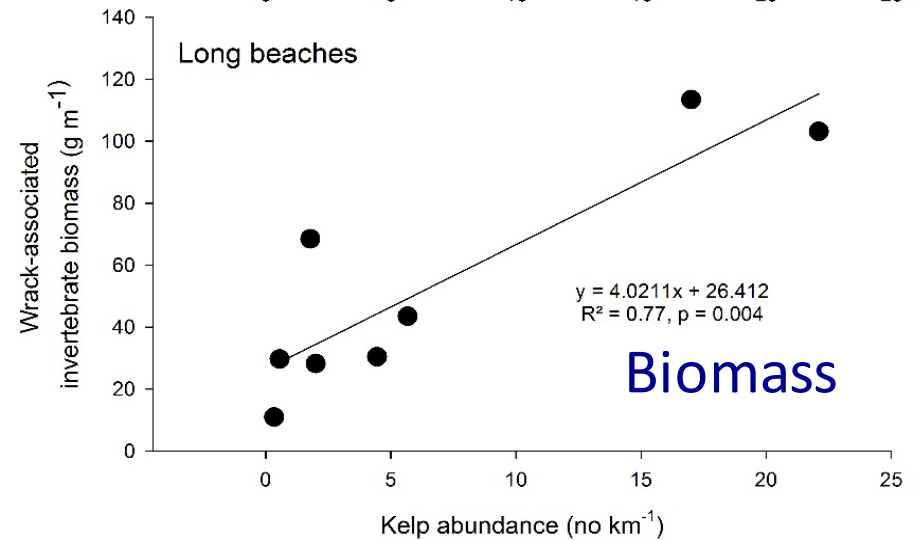
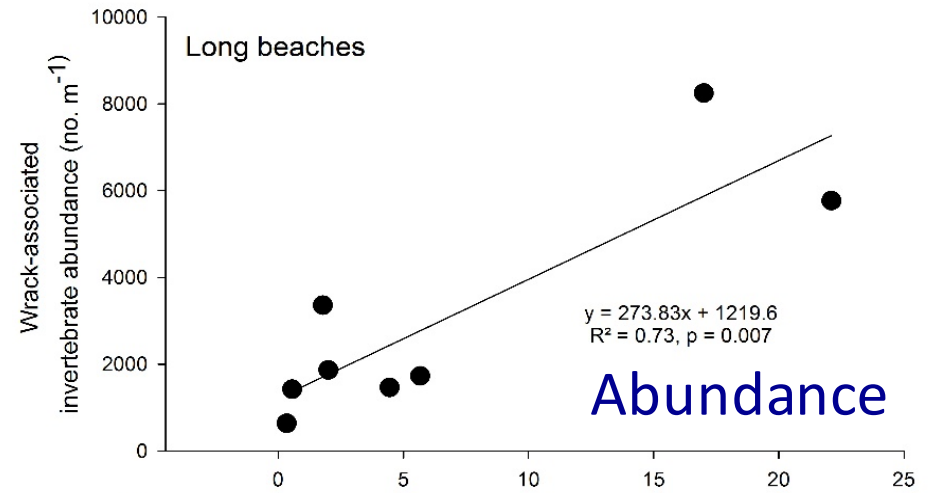


Wrack Subsidies & Invertebrates

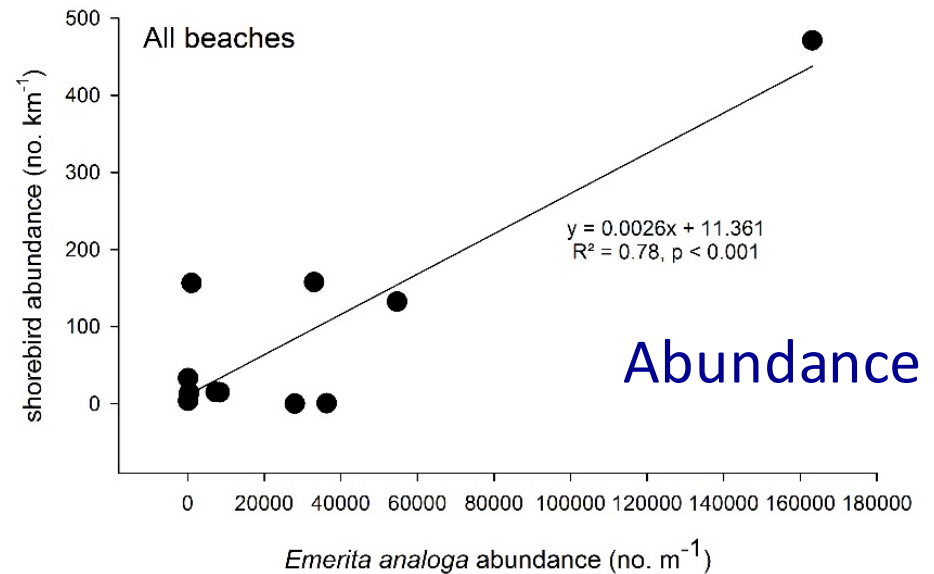
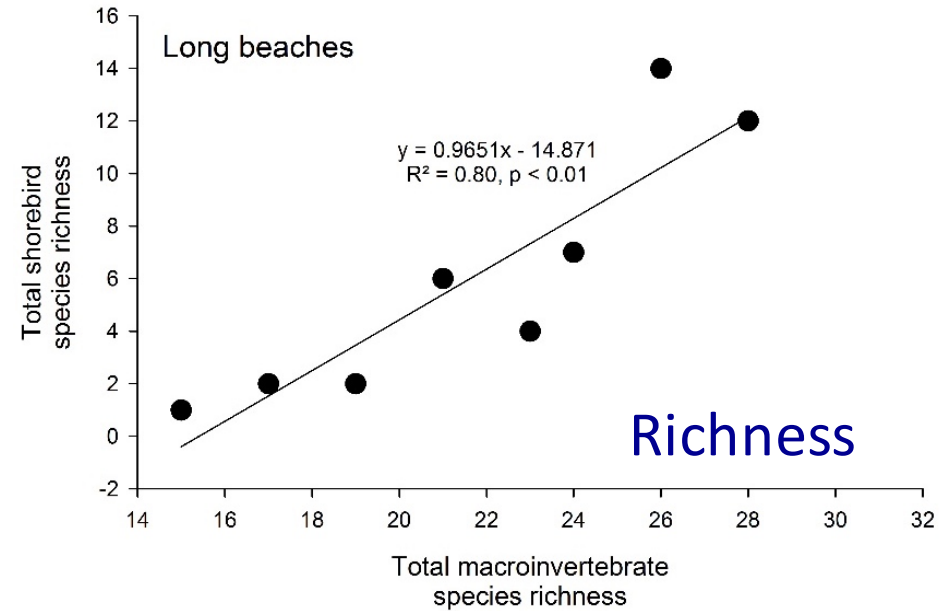
All Invertebrates



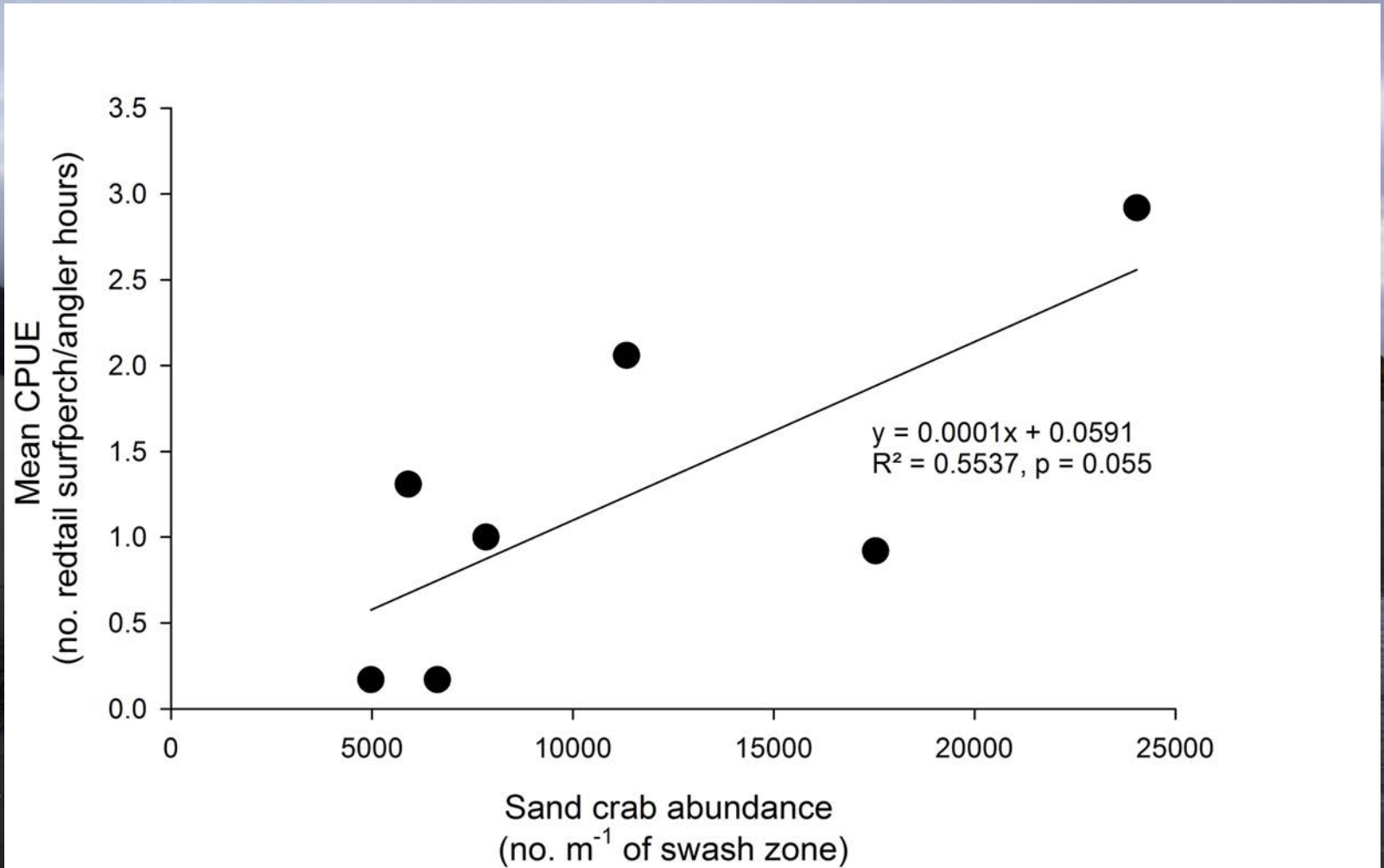
Wrack Invertebrates



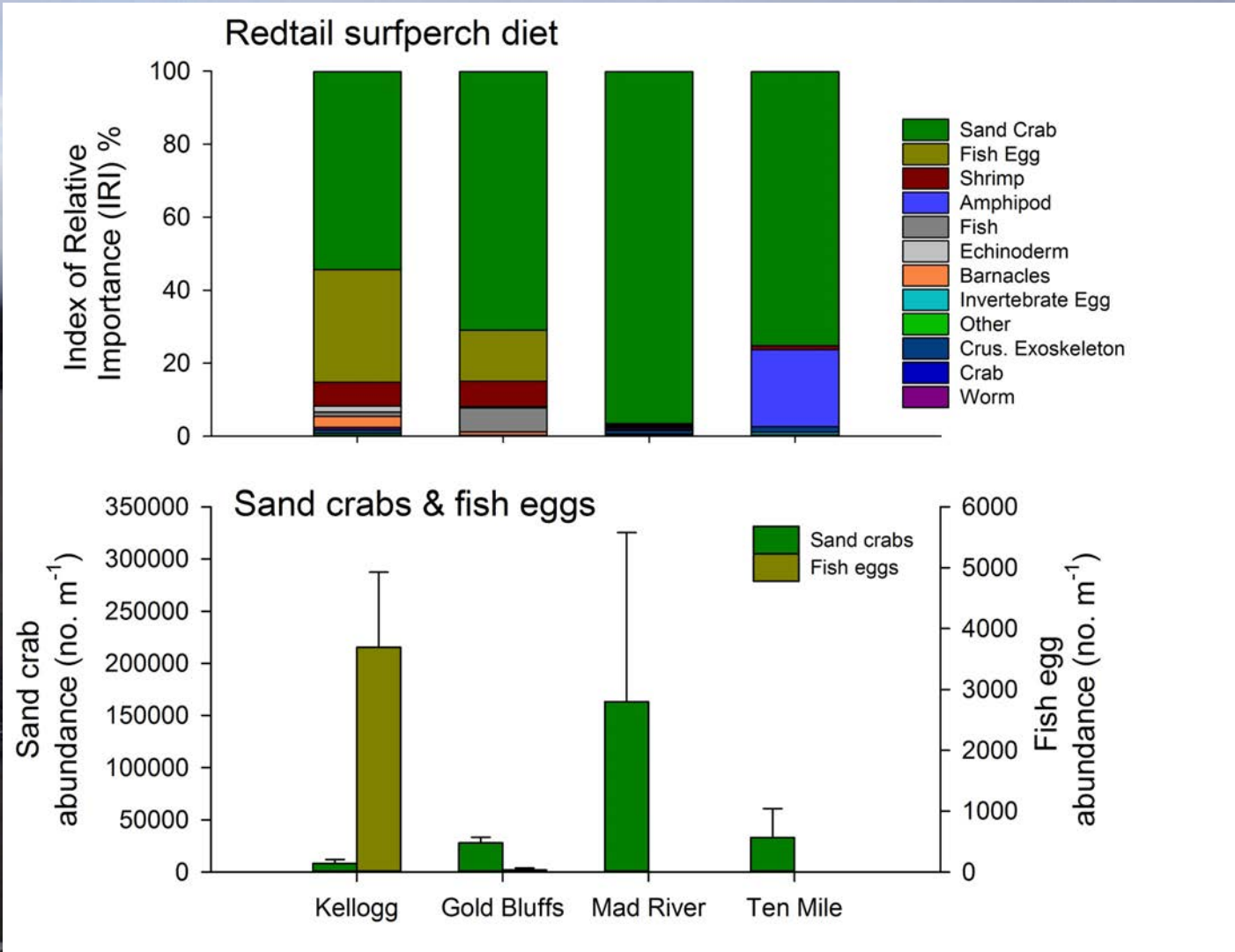
Shorebirds Respond to Invertebrate Prey



Surfperch CPUE & Prey Abundance



Surfperch diet reflects intertidal prey availability



NCMPA Sandy Beach Highlights

A wide, sandy beach stretches across the foreground, leading to a line of dunes in the distance. The sky is filled with soft, grey clouds, and the overall scene is a natural, coastal landscape.

- Diverse & Productive Ecosystems
- Striking Differences between Pocket & Long Beaches
- Strong support for Conceptual Framework
 - High Invertebrate Abundance & Biomass
 - High Bird Use
 - New Links with Surf Zone Fishes
- Robust Trophic Links:
 - Kelp Forests, Rocky shores, Estuaries & Surf Zones
 - Implications for direct and indirect effects of MPAs

Deepest Thanks to our many amazing, swash-ready
Participants & Volunteers & for Support from Sea Grant,
California Ocean Protection Council, Tolowa Dee-ni' Nation,
HSU, SFU, SSU & UCSB



Questions?



Thank you!

