

SMALL SCALE RESTORATION WITH LARGE SCALE IMPACT: SEAGRASS RESTORATION SUCCESS FOSTERS RECOVERY OF KEY ECOSYSTEM SERVICES

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Study Description

Restoration of marine foundation species has had variable success, especially for seagrasses, where a majority of restoration efforts have failed. We tracked the structural and functional recovery of 117 0.25-m² transplanted seagrass plots in a central California estuary from 2015 to 2018. During this short period of time, restored plots expanded ~8,500%, and the overall functioning of the restored habitats was higher than adjacent unvegetated habitats and approaching but lower than reference seagrass habitats. Our study demonstrates how a fast-growing foundation species can lead to rapid recovery of biological (e.g., biodiversity) and biogeochemical (e.g., water quality) functions.

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Photo 1. Rapid expansion of restoration plots. UC Santa Cruz undergraduate intern, Natalie Rossi, collects video footage inside one of large 2015 plots at low tide. The 2015 plots were marked by PVC posts shown immediately right and left of Natalie. Other restoration plots are visible in the background both at (2015) and adjacent to (2016) the PVC posts. This photo shows the tremendous expansion of the restoration plots tracked within just a few years. Photo credit: Kathryn Beheshti.

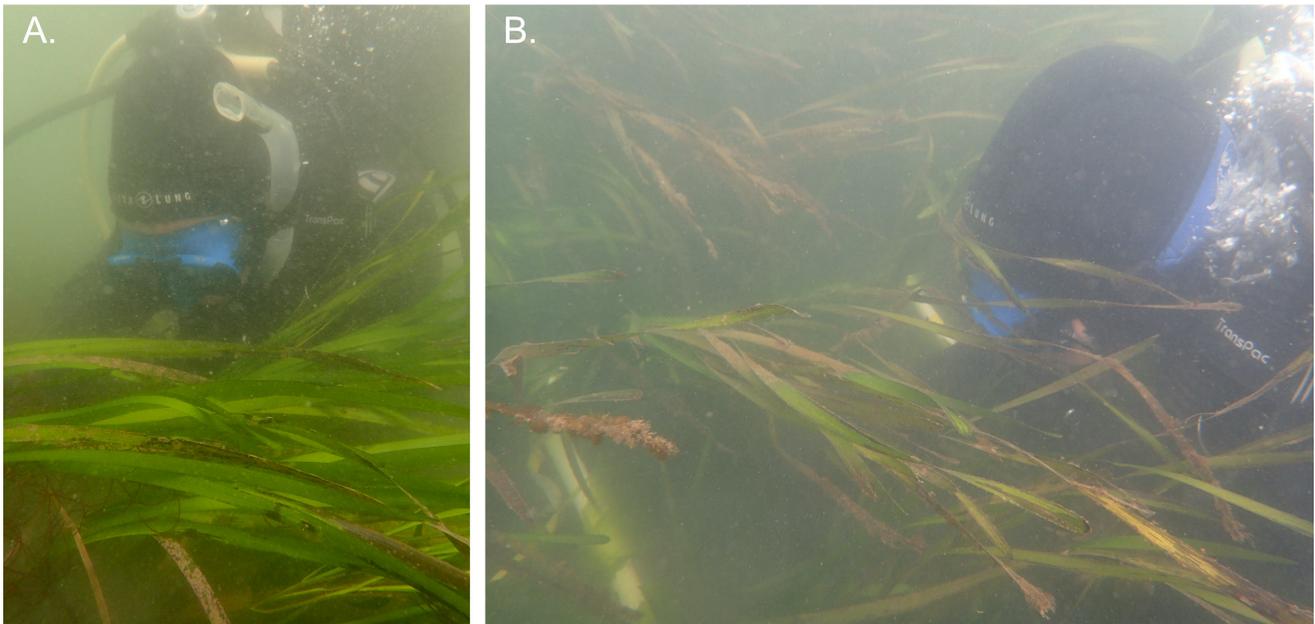


Photo 2. Monitoring eelgrass in Elkhorn Slough. Study co-author, Annakate Clemons monitoring our (A) restored and (B) reference eelgrass plots on SCUBA. Quadrats (50 × 50 cm) were placed over the eelgrass and all vegetative and flowering shoots were counted and compared. Photo credits: Kathryn Beheshti.

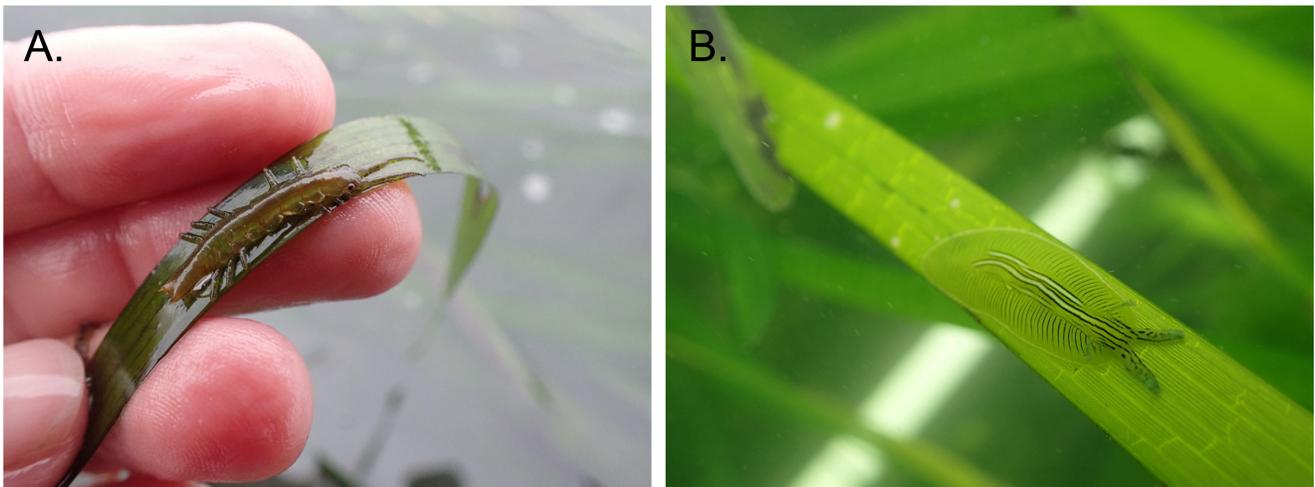


Photo 3. Critical mesograzers utilize restored eelgrass habitat. Mesograzers (A) *Pentidotea resecata* and (B) *Phyllaplysia taylori* play a critical role in maintaining healthy eelgrass meadows by consuming the epiphytic algae that grows on and shades eelgrass. Our study showed that the number of grazers in restored plots were either similar to (*P. taylori*) or higher than (*P. resecata*) reference plots. Photo credits: Kathryn Beheshti.

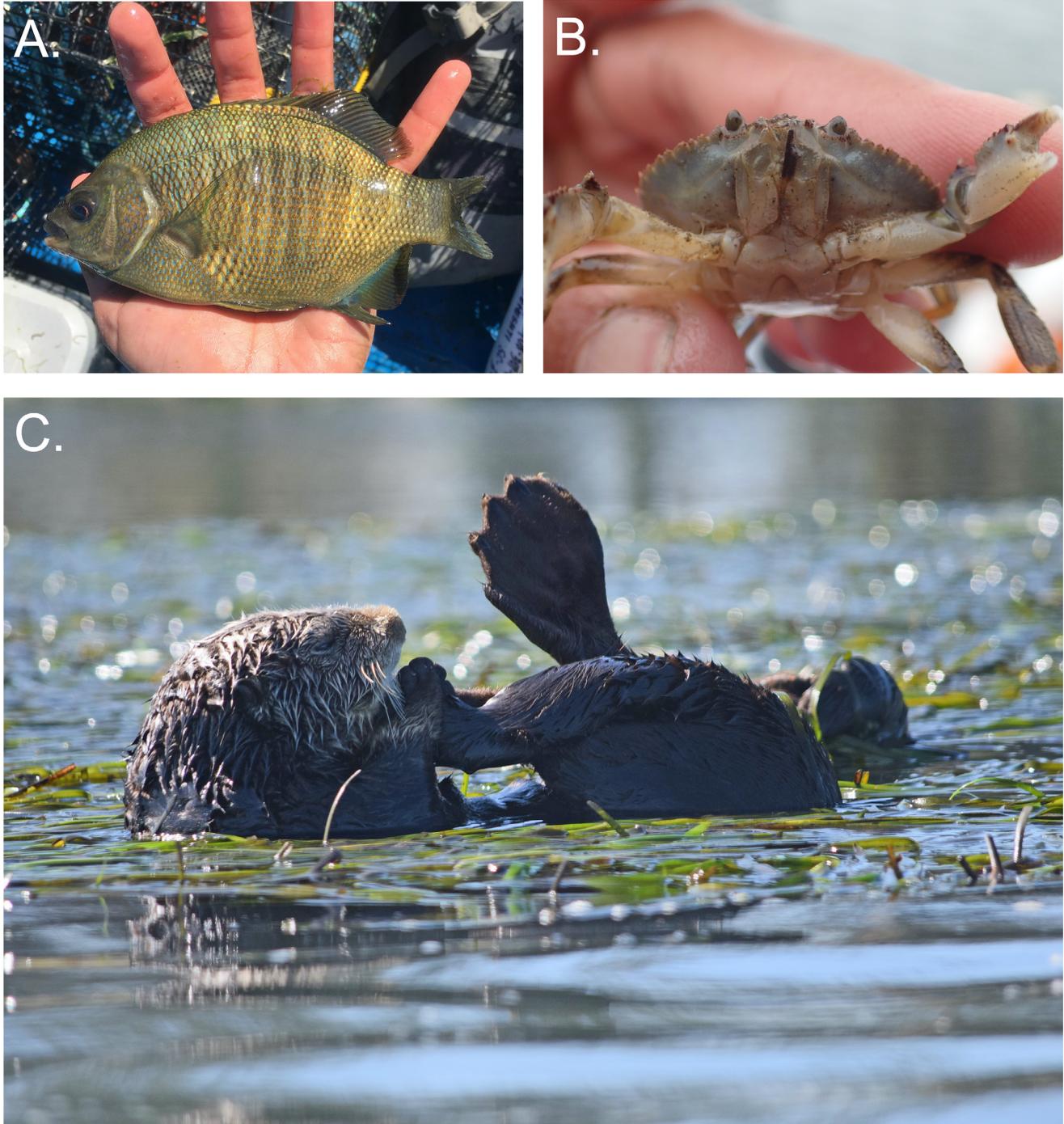


Photo 4. A diversity of species utilize restored eelgrass habitat. We trapped a diversity of fish and invertebrate species in restored and reference habitats. Overall, our study showed that fish and invertebrate species density in restored plots were at or approaching reference levels. Many of the trapped species support commercial and recreational fisheries, including (A) black surfperch (*Embiotoca jacksoni*) and (B) Dungeness crab (*Metacarcinus magister*). The restoration plots are also being used by marine mammals, including keystone species like the southern sea otters (*Enhydra lutris*). (C) A sea otter resting in one of the restored plots in June 2021. Photo credits: (A, B) Kathryn Beheshti, (C) Emma Levy.

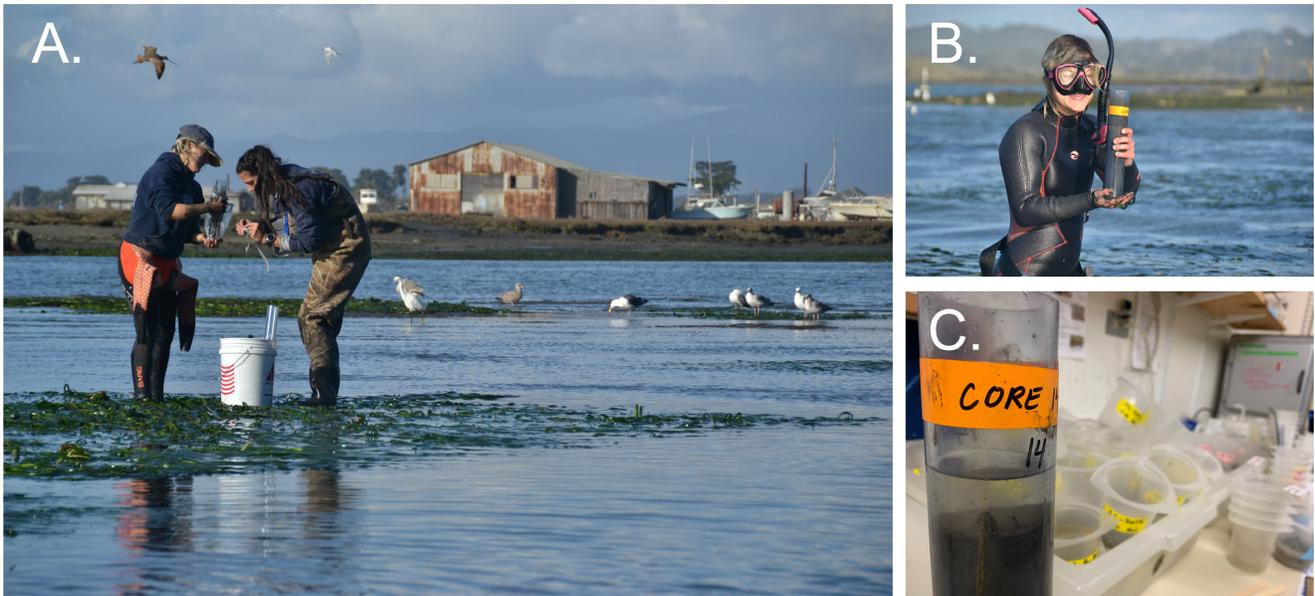


Photo 5. Assessing carbon stocks in restored, natural, and unvegetated habitats. (A) Undergraduate intern, Natalie Rossi and study lead, Dr. Kathryn Beheshti preparing a core inside a restored plot at low tide. As the tide rises, the research team switches from waders to wetsuits and snorkel gear, (B) Natalie carries a harvested core back to the boat. (C) Cores were then brought to UC Santa Cruz's Coastal Science Campus for processing. Photo credits: (A, B) Jacqueline Schwartz, (C) Kathryn Beheshti.

These photographs illustrate the article “Rapid enhancement of multiple ecosystem services following the restoration of a coastal foundation species” by Kathryn M Beheshti, Susan L Williams, Katharyn E Boyer, Charlie Endris, Annakate Clemons, Tracy Grimes, Kerstin Wasson, and Brent B Hughes published in *Ecological Applications*, <https://doi/10.1002/eap.2466>.