**Briefly state the novelty, significance, and breadth of interest of the science presented** (1000 characters including spaces). Now 990 with spaces

We investigated the drivers of variability in marine animal-mediated nutrients at three spatial scales. At scales of 10s of km, ammonium varied up to 16-fold across 27 rocky reefs, a larger difference than previously reported. The effect of reef-associated animal abundance on ammonium was positive but mediated by tidal exchange. At a smaller scale, ammonium concentrations were higher inside than outside 16 kelp forests, and ammonium retention increased with kelp biomass, tidal exchange, and animal biomass. Finally, by caging animals in situ, fine-scale enrichment on a scale of m was possible but only when flow was limited. Overall, animal-mediated nutrient cycling contributes to meso-, small-, and fine-scale variation in nutrients even in an upwelling region. This suggests animals may contribute more to bottom-up effects through excretion than previously considered. This work is the most extensive exploration of drivers of ammonium variability in temperate ecosystems to date.

**Describe why L&O is the best outlet for the publication of your paper** (500 characters including spaces). Currently at 427 characters

The readers of *L&O* will find value in our paper as it combines marine ecology with oceanography and includes both physical and biological considerations. Our research broadens our understanding of aquatic systems by documenting an overlooked driver of bottom-up effects in temperate upwelling-influenced ecosystems. This focus will appeal to all those interested in or tasked with ecosystem-based management of ocean resources.

**Reviewers:**

* Deron E. Burkepile
  + Department of Ecology, Evolution, & Marine Biology, University of California, Santa Barbara
  + [deron.burkepile@lifesci.ucsb.edu](mailto:deron.burkepile@lifesci.ucsb.edu)
  + Reason: Leading researcher on animal-mediated nutrient cycling
* Joseph Peters
  + Department of Ecology, Evolution, & Marine Biology, University of California, Santa Barbara, California
  + [jpeters@ucsb.edu](mailto:jpeters@ucsb.edu)
  + Reason: Emerging scholar on animal-mediated nutrient cycling in temperate regions under the mentorship of Dr. Burkepile
* Dr. Matthew Bracken
  + Ecology and Evolutionary Biology, University of California, Irvine
  + [m.bracken@uci.edu](mailto:m.bracken@uci.edu)
  + Reason: Studies nutrient cycling and considers processes across spatial scales
* Brian Gaylord
  + Bodega Marine Laboratory and Section of Evolution and Ecology, University of California at Davis, Bodega Bay, California 94923
  + [bpgaylord@ucdavis.edu](mailto:bpgaylord@ucdavis.edu)
  + Reason: Considers ecology of water flow through kelp forests
* Dr. Catherine Pfister
  + Department of Ecology and Evolution, University of Chicago
  + [cpfister@uchicago.edu](mailto:cpfister@uchicago.edu)
  + Reason: Expert in spatial dynamics of animal-mediated nutrient cycling

**Editors (need 3):**

**\*\*James J. Leichter**

Scripps Institution of Oceanography, USA

Ecology and oceanography of coastal systems; Longterm environmental and climate variability; Internal waves, nutrient dynamics, and larval transport; Marine conservation ecology

* Reason: Studies ecology and oceanography of coastal systems and nutrient dynamics

**\*\*Julia C. Mullarney**

University of Waikato, New Zealand

julia.mullarney@waikato.ac.nz

Physical oceanography; Coastal ocean dynamics; Flow-vegetation interactions; Buoyancy-driven flows; Sediment transport; Mixing; Turbulence; Biophysical interactions

* Reason: Considers coastal ocean dynamics and edited a similar paper

**Anna R. Armitage**

Texas A&M University, USA

Communities and trophic ecology; Coastal wetlands, including salt marshes, mangroves, tidal mudflats, seagrass beds, and tidal freshwater wetlands; Estuaries; Eutrophication; Anthropogenic disturbance and restoration

* Reason: Community ecologist, considers nearshore ecosystems
* Wetland focus, more intertidal than nearshore

Christopher Cornwall

Victoria University of Wellington Te Herenga Waka, New Zealand

Global change; Kelp forests; Coral reefs; Coralline algae; Experimental design; Seawater carbonate chemistry; Calcium carbonate geochemistry; Hydrodynamics

* More of a climate change/ocean acidification focus but has been publishing kelp stuff recently

Josef Ackerman

University of Guelph, Canada

Physical ecology; Ecohydrology; Environmental fluid dynamics; Benthos; Nearshore; Shallow waters; Great Lakes; Unionid mussels; Bivalve suspension feeding; Substrate-water interactions

* Maybe more physics of flow/freshwater focussed

Birte Matthiessen

GEOMAR, Helmholtz Center for Ocean Research Kiel, Germany

Community Ecology; Marine Ecology; Regulation and consequences of biodiversity; Phytoplankton ecology and evolution; Microalgae; Marine food-webs

* Phytoplankton focus

**N-cycling editors:**

Perran Cook

Monash University, Australia

Coastal, estuarine and sediment biogeochemistry; Nutrients: nitrogen, phosphorus and carbon cycling, denitrification and nitrogen fixation

Ilana Berman-Frank

University of Haifa, Israel

N2-fixation; Diazotrophy; Microbial and phytoplankton ecology; Aquatic photosynthesis; N-cycling; C-cycling; Cyanobacteria

Takuhei Shiozaki

Atmosphere and Ocean Research Institute, The University of Tokyo, Japan

Microbial oceanography; Nitrogen fixation; Nitrification; Nutrient biogeochemistry; Phytoplankton ecology

Robinson (Wally) Fulweiler

Boston University, USA

Marine coastal biogeochemistry and ecosystems ecology; Anthropogenic impacts on nutrient and carbon cycling across land-ocean continuum; Coastal silica cycling, sediment denitrification and nitrogen fixation; Climate change and biogeochemical cycles