

LMG 19-01: 30 Dec. 2019 – 12 February 2019, PAL LTER Cruise 27
 Weekly Science Report I

**LTERR: Land-Shelf-Ocean Connectivity, Ecosystem Resilience and Transformation in a
 Sea-Ice Influenced Pelagic Ecosystem on the Western Antarctic Peninsula
 &
 Physiological Ecology of “Herbivorous” Antarctic Copepods
 &
 Biological and physical drivers of O₂ saturation and net community production variability
 at the Western Antarctic Peninsula**

Cruise Overview (Deborah Steinberg, Chief Scientist):

The overall long-term objective of Palmer LTER is to understand the mechanistic linkages by which climate, physical oceanographic forcing and sea ice extent and duration control ocean productivity, food web processes, krill and penguin recruitment and carbon biogeochemistry in the marginal sea ice zone of the western Antarctic Peninsula (WAP) region. The WAP is one of the most rapidly-warming regions on the planet, and we have documented responses throughout the food web from phytoplankton to penguins. The annual oceanographic cruise (now in our 27th year) provides a large-scale regional view of physical-trophic-biogeochemical processes in the region, and contributes to a time series of ecosystem transformation in response to regional warming and sea ice loss. This year on board we also have Dr. Ann Tarrant (B-258) investigating the molecular

physiology of Antarctic copepods in evolutionary and ecological contexts, and a student of Dr. Nicolas Cassar’s laboratory (B-461) investigating net community production and microbial community composition along the WAP.

This cruise is about equally divided between 1) occupying standard LTER stations along the regional grid extending from Palmer Station to Charcot Island and from the inshore coastal region to deep (>3000 m) water off the continental shelf break in the Antarctic Circumpolar Current (**Fig. 1**), and 2) conducting three, ~3-day, plus three, 1-2 day, mechanistic process studies along the Peninsula. This year’s process studies are focused on the relationships among bathymetry (submarine canyons), physical oceanographic forcing, nutrient distributions, phytoplankton and zooplankton community structure, and penguin and whale foraging. This year we

will have three shorter process studies in deep slope waters (see light purple dots at left) for comparison to the coastal process work.

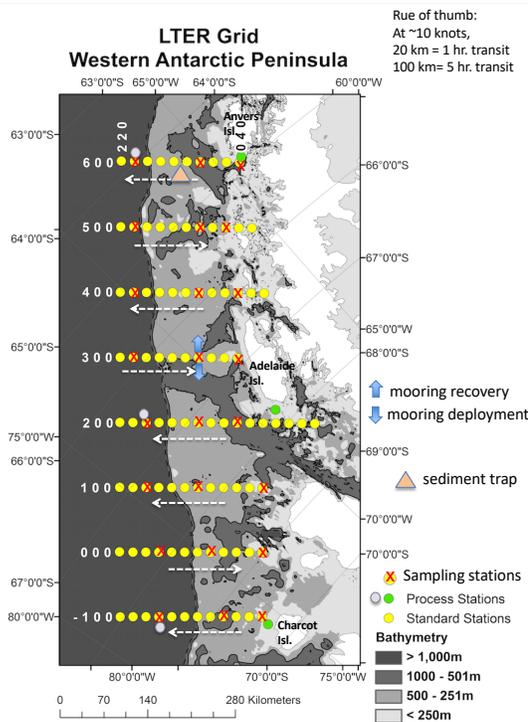


Figure 1. Map of LTER Study region along the Western Antarctic Peninsula, showing standard annual cruise grid stations. Sampling stations to be occupied on this cruise are shown with red X’s; other activities are as indicated in legend. White arrows indicate direction of ship track, beginning at Palmer station on the north.

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As always, we received outstanding help from the ASC, Edison Chouest and Damco staff in Punta Arenas, at Palmer Station, and aboard the ship getting set up for the cruise. The annual LTER cruise is a large and complex operation and we benefit greatly from the accumulated expertise and corporate memory of many dedicated colleagues and friends.

This first reporting period covers only the first day of the LTER cruise proper (most of our first week was transiting to, and setting up at, Palmer Station), thus this report covers our activities at Hugo Island our first day out. (Additional component reports will start next week.)

Operations at Hugo Island

During our first day on the LTER cruise, we successfully transited to and landed at Hugo Island, a penguin colony, and fur seal colony, site of interest. This site has become a clear example of how the northern WAP is transforming from a polar ecosystem to a more subpolar ecosystem, with subpolar species of penguins (Gentoo) and seals (fur seals) establishing themselves. Concerning the latter, last year was the first time fur seals were found breeding at this site. The closest known breeding colony of fur seals is nearly 400 miles to the north, making Hugo Island an important discovery and a unique opportunity to document a ‘ground zero’ change in the ecosystem here. During their time on shore, the LTER seabird component field team members (Megan Roberts and Anne Schaefer) conducted an extensive seabird and marine mammal census of one of the smaller islands here. This visit was about a month earlier than our previous visit during last year’s LTER 18-01, on January 31. They once again found a fur seal pup, clear evidence that breeding is taking place. In addition, LTER marine mammal component field team members (Greg Larsen and Logan Pallin) conducted an unoccupied aerial vehicle (UAV, a.k.a. drone) survey of the island, documenting at high resolution seabird and mammal distribution relative to island topography and other features.



Gentoo Penguins near Hugo Island, photo by Anne Schaefer



Aerial view taken by UAV of rock outcrops with fur seals, photo by Greg Larsen