July 8, 2016

Ms. Allison Reed
U.S. Department of State
OES/OA, Room 5805
2201 C Street, NW
Washington, DC 20520

Dear Ms. Reed,

Enclosed please find the preliminary cruise report for my recent cruise aboard the SSV *Robert C. Seamans* (State Department File Number F2015-094, Sea Education Association Cruise S-267). This cruise operated in waters under national jurisdiction of French Polynesia and Kiribati. Sea Education Association is the custodian of all scientific samples and data collected during this cruise.

This report fulfills the first part of post-cruise obligations. The full report will be completed and filed by or before June 19, 2017.

Sincerely,

Dr. Jeffery Schell

SEA Oceanography Faculty and Chief Scientist

**PRELIMINARY CRUISE REPORT**

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| U.S. Dept. of State CRUISE No.: | F2015-094 |
| SHIP NAME: | *SSV Robert C. Seamans* |
| OPERATING INSTITUTE OR AGENCY: | Sea Education Association |
| PROJECT TITLE: | Sea Semester S-267 |
| CRUISE DATES (INCLUSIVE): | 23 May to 19 June, 2016 |

| CHIEF SCIENTIST: | |
|---|---|
| Name | Jeffrey M. Schell |
| Affiliation | Sea Education Association |
| Address | P.O. Box 6, Woods Hole, MA 02543 |
| Phone | 1-508-444-1905 |
| Fax | 800-977-8516 |
| E-mail | Jschell@sea.edu |

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| CLEARANCE COUNTRIES: | French Polynesia, Kiribati |
| FOREIGN PARTICIPANTS: | NA |

DESCRIPTION OF SCIENTIFIC PROGRAM (include page-sized chart showing cruise track):

**Data Description S267**

The cruise track for S267 (Figure 1) departed from Papeete, Tahiti, French Polynesia and concluded in Honolulu, Oahu, USA, 28 days later. During the four-week voyage we had three island stops; the first in Rangiroa, French Polynesia; the next in Karoraina, Kiribati; and the third in Kiritimati, Kiribati.

Our cruise track traversed several major oceanographic provinces (Figure 1): a) the warm, salty, unproductive waters of the west south Pacific central water (WSPCW) b), the cooler, less saline, productive waters of the south and north Pacific equatorial waters (SPEW and NPEW) and c) then a return to warm, salty and less productive waters of the east north Pacific central waters (ENPCW). Coinciding with water mass transitions were various equatorial and counter currents.

We collected data with 108 individual deployments from 40 discrete geographic stations along our cruise track. Comparison of the physical, chemical, and biologic features of these regions represented the major oceanographic themes of this Sea Semester.

1. Physical oceanographic studies focused on the distribution of surface and sub-surface (to 2000 m) water masses and currents to delineate hydrographic boundaries across the central equatorial Pacific during the unprecedented El Niño event.
2. Chemical oceanographic studies focused on the geographic and vertical distribution of dissolved oxygen, nutrients (phosphate), extracted chlorophyll-*a,* and pH. These chemical parameters were related to patterns in physical hydrography at various scales: nearshore to offshore

transitions, ocean fronts and eddies associated with ocean currents and water column stratification.

3. Biological studies focused on the geographic patterns of charismatic megafauna (seabirds, sea turtles, flying fish, and marine mammals), several micronekton organisms (lantern fish – Family *Myctophidae*, and gelatinous organisms >2cm – i.e salps), meroplanktonic larvae including spiny lobster (phyllosoma) and eels (leptocephali), the floating insect – *Halobates* spp., and the density (mL/m2) and diversity (i.e. Shannon-Weiner index) of the aggregate phytoplankton and zooplankton communities.
4. During three stops (Rangiroa, Karoraina, and Kiritimati) we conducted visual and photographic surveys of coral reef environments including: substrate cover and coral health (live, bleached, diseased, dead) as well as fish and invertebrate abundance and diversity.

Sea surface temperature, salinity, and chlorophyll-*a* fluorescence levels; along with barometric pressure, winds, bathymetry, and geographic position were recorded continuously along the cruise track. Surface samples (72) of nutrients (phosphate), chlorophyll-*a*, pH and microplastics were collected every six hours and in conjunction with all neuston net tows during the cruise track.

Additional Hourly Observations included the enumeration of seabirds, sea turtles, flying fish, marine mammals, and floating plastic debris (n=201). Observations occurred only during daylight hours 0700-1900 for a period of 6 minutes each hour. Periodically, opportunistic sightings were also recorded when notable megafauna or marine debris were present.

The density structure of the water column (maximum depth 2000 m) was determined using a Seabird CTD with attached *in situ* chlorophyll-*a* fluorescence and dissolved oxygen sensors (19 stations). Additionally, we used a 12-bottle carousel to collect water samples for of chlorophyll-*a*, nutrients (phosphate) and pH (7 of the 19 CTD stations).

Surface zooplankton assemblages along with marine debris and tar balls were sampled regularly with a neuston net (35 stations, 335 µm mesh). Plankton assemblages at discrete depths (200m) were collected using a 1m diameter Meter net (3 stations, 335 µm mesh). In combination these myriad net deployments reveal the vertical and horizontal distribution patterns of the marine insect *Halobates*, eel (leptocephali) and spiny lobster (phyllosoma) larvae, pteropods, and general zooplankton diversity and taxonomic composition in relation to numerous environmental parameters. A minilogger for depth and temperature was deployed with each meter net (3 stations).

Surface phytoplankton assemblages were regularly sampled with a 30cm diameter, drift net (14 stations, 63 µm mesh) set at 1-3m below the sea surface. The net drifted for the duration of each morning's CTD cast and was sorted for diatoms, dinoflagellates, foraminiferans, and radiolarians.

Coral reef ecosystems were studied and compared among three islands along the cruise track. At each island three replicate sites were surveyed for a total of nine survey sites. Each survey documented the following parameters:

- Substrate cover and coral health using 0.5m2 quadrates (n=10) spaced evenly along a 100 foot transect tape
- Fish abundance and diversity using a) Stationary Point Count method (10' minute observation period), b) Belt Transect method (2m wide, 100-foot belt transect), and c) Roving Swim method (30 minute observation period).
- Invertebrate abundance and diversity were assessed with a a) Belt Transect method (2m wide,

100-foot belt transect), and b) Roving Swim method (30 minute observation period).

- Environmental data using a towed RBR-CTD (7 stations only), and water samples to measure chlorophyll-*a*, nutrients (phosphate), and pH (7 stations only).

Water clarity was determined with routine deployments of a secchi disc (17 stations) to estimate the 1% light level.

Final scientific work involved the deployment of decorated styrofoam cups to validate pressure increases with changing ocean depth.

Jeffrey Schell, Associate Professor – Chief Scientist, S267

| SCHEDULE OF DATA DELIVERY: | |
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| Data Description | Date of Expected Delivery to Dept. of State |
| Final Cruise Report | 19 June 2017 |
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CRUISE TRACK (insert here):