

MOSS LANDING MARINE LABORATORIES

ANNUAL REPORT: ACADEMIC YEAR 2015-2016



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Executive Summary 2015-2016

Moss Landing Marine Laboratories (MLML) administers the Master of Science in marine science program for California State Universities (CSU) in northern and central California, and is dedicated to the pursuit of excellence in both education and research. An outfitted marine operations department, active research diving program and state of the art equipment allow for cutting edge research in a wide variety of disciplines including: marine ecology; biology of marine plants, invertebrates, fishes, turtles, birds and mammals; oceanography and marine geology; chemistry and biogeochemistry. MLML is known for a hands-on, field-oriented approach, which places our students, faculty, researchers and staff at the frontiers of marine science worldwide where discoveries are being made. MLML provides the skills and training so students will become successful scientists, teachers and resource managers serving societal needs involving marine issues.

MLML had a dynamic year with the addition of two new faculty members and six new research affiliates. Marine operations are evolving in new directions given the loss of the R/V Point Sur, a new five-year strategic plan is under development, and strategies for a major fund-raising effort are underway in collaboration with our administrative campus, San José State University (SJSU). A new online general education course in Oceanography will greatly expand our educational connection with undergraduates at the consortium campuses.

Future plans include development of a 5-yr Strategic Plan, a new GE Oceanography course, a proposal to develop a Center For Aquaculture, planning for a new research vessel in collaboration with UCSD, and a large fund-raising effort with support from SJSU Advancement.



Mission & Goals

Mission

The mission of MLML is to provision the marine scientists of the future. This means that undergraduate and graduate students are provided with unparalleled access to faculty advisors and teachers, research facilities, and an incredible local marine environment.

Goals

Our primary goal is to provide students with the necessary skills to succeed in academia, governmental agencies, conservation, and management. The following describes how we have met our specific goals during the past year.

Goal One: Provide skills in communication, analytical computation, marine science literacy, critical thinking, and technical aspects of their discipline.

We continue to revamp our courses to better serve the changing needs of the students to keep pace with the evolving job market. This requires constant vigilance regarding the necessary skills of science, conservation, and policy. Primary among these skills are communication and analytical tools. We have developed new courses to better tailor our analytical courses with the various disciplines of marine science (i.e. oceanography and marine biology). The analytical methods used by oceanographers are somewhat different than those used by biologists, so we have tried to create courses that serve both disciplines. We also have restructured course material to continue stressing critical thinking, which is a foundational skill in sciences. With new faculty, new course material, and new use of technology, we continue to provide influential material for the various disciplines covered by the M.S. degree in marine science at MLML. We continue to assess this goal based on the quality of the Master's Thesis that is generated by all our M.S. students. We have assessed this qualitatively but we are generating a rubric to more quantitatively assess this goal.

Goal Two: Graduate students should obtain an M.S. degree within 3 years of entry into the program.

Because our M.S. degree in marine science is field based, it requires a fair amount of time to devise, assemble, conduct, and analyze research in the field setting. The vagaries of weather, equipment, changing sea conditions, and lack of financial support cause delays and greater effort. These characteristics make it difficult to achieve graduation in three years or less. MLML faculty and administration are committed to continuing to support student success by reducing the time it takes our students to complete their M.S. degree. During AY 2015-2016, we analyzed the time-to-degree data for all MLML alumni who had graduated within the previous four years, and found that the average time-to-degree for 2015 graduates had fallen to approximately 4 years since entry in the MLML program, down from an average time-to-degree of 6 years for 2013 graduates. While our hands-on, laboratory and field-oriented approach to our curriculum acknowledges unpredictability (of sea and environmental conditions, etc.), we continue working towards our goal of an average time-to-degree of 3 years by evaluating potential initiatives including, but not limited to, refining the process of thesis proposal development and approval, revising the process of thesis draft submission and approval, and increasing funding opportunities to offset our students' financial burdens.

Goal Three: Provide a broad, multidisciplinary understanding of marine science and the current issues of our time.

We have largely achieved this goal by offering basic courses in the major disciplines coupled with specialty courses in relevant issues of the day. These special courses include: Climate Change, Coastal Erosion and Habitat Mapping, Cycling of Trace Metals and Nutrients in the Coastal Zone, Modeling Marine Systems, and Ocean Acidification. We also have incorporated these concepts into the core courses (e.g. Physical Oceanography, Geological Oceanography, Chemical Oceanography, Biological Oceanography, and Marine Ecology). We have not assessed this goal recently via our course rubrics, but we will in the near future.

Goal Four: Solve problems of societal relevance.

We have largely reached this goal by partnering with MARINE (Monterey Area Research Institutions Network for Education), which is a collaboration between the Center for Ocean Solutions at Stanford University and seven Monterey Bay area academic campuses, including MLML. This assortment of educational institutions provides a forum for a variety of events that provide leadership development and education for students at MLML, helping create the marine science leaders for the future. The primary topics include: climate change, ecosystem health, and land-sea interactions. MLML recently helped develop and taught a regional course regarding the impacts of vessels on whales which was attended by students from MLML, Naval Postgraduate School, Middlebury Institute for International Studies, Stanford University, and CSU Monterey Bay.



MLML has largely met its four goals of (1) improving the scientific and communication skills of our graduate students, (2) decreasing the time until graduation, (3) broadening student understanding of current issues of our time, and (4) discussing and solving problems of societal relevance. We are in the final stages of establishing a (proposed) Center For Aquaculture at SJSU and the consortium, with the eventual goal that this Center would represent the entire CSU.

MLML operates with about \$3.6 million from the State (CSU, SJSU, and consortium campuses), an average of \$500,000 indirect costs returned from contracts and grants administered by San José State University Research Foundation (SJSURF), and \$190,000 of administration and facility supplemental funding issued to MLML by the SJSURF. The administrative campus of the MLML consortium, SJSU, does not extract any indirect costs generated by MLML because the MLML campus has a number of expenses (e.g. library, vessels,

vehicles, diving, IT, safety) that cannot be covered by services at SJSU. During AY 15-16, MLML researchers acquired 90 grants and awards totaling \$16.7 million, and produced 155 scientific publications.

MLML provides a world-class Master's program in marine science, and is the only multi-campus entity in the CSU that offers a curriculum and a Master's degree program. Although undergraduate and graduate students attend courses at MLML, in AY 15-16 87% (n=71) of the 81 students were graduate students. In AY 15-16, most of the graduate students matriculated through CSUMB (n=41) and SJSU (n=30) with the student fees paid to the campus of matriculation.

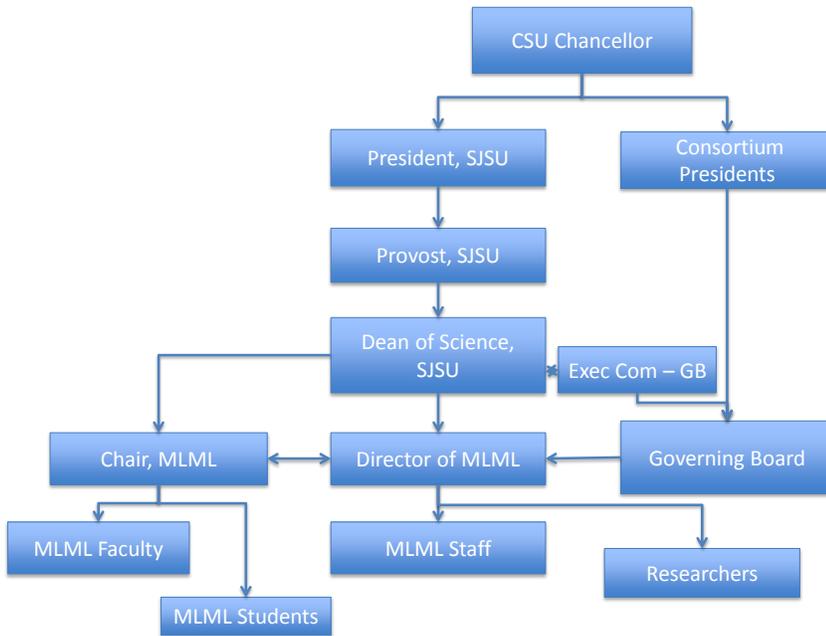
Some of the successes of the year included 12 students graduating with a M.S. degree, a dynamic MLML Open House with more than 1,800 of the public visiting MLML during a weekend in April, \$20,500 in scholarships and awards presented to students, and MLML celebrating its 50th anniversary. The highlight of the 50th Anniversary was the return of at least 350 alumni (more than 50% of graduates) to MLML for a weekend celebration.



Organization & Governance

Organization

The organization of MLML within the larger CSU system is documented below. MLML's internal organization is displayed below that. MLML Director Jim Harvey reports directly to Dean Michael Parrish, College of Science, SJSU.



Director Jim Harvey	Faculty Chair	Nine Faculty
	Ivano Aiello	Librarian – Katie Lage
	Assistant to the Director	Ten Faculty Researchers
	Academic Program and Operations	Information Technology - Jeffrey Arlt, Rhett Frantz, Michael Radojevic Graduate Program Coordinator – Terra Eggink Financial Management SJSU – Jane Webster Financial Management SJSURF – Michelle Keefe Environmental Health and Safety – Jocelyn Douglas Scientific Diving Safety Officer – Diana Steller Facilities Manager - Gary Adams Facility Technicians – James Cochran, William Cochran, Kris Machado
Marine Operations Manager	Kathleen Donahue	Administrative Assistant - Kate Sawyers Small Boats Coordinator – Captain John Douglas Deckhand/Technician – Jackson Winn
	Assistant to the Director	
	Development, Strategic Planning	
	Mike Prince	

In some respects MLML operates like a small University campus because it is located one hour south of SJSU, its administrative campus. This distance has required building an infrastructure that mimics many campus resources, such as a library, IT and facility services, health and safety officers, vehicles, and instrument technicians. As a marine laboratory, it also had to provide unique resources that a main campus does not provide: seawater system, diving program, and vessels. Thus the Director oversees an Assistant to the Director, who is responsible for managing daily operations of the laboratory, a Marine Operations Manager, an IT manager, and a person who assists with Development and Strategic Planning. The Director also works closely with the Chair of the department to assist with academic support.



(L-R) Dean Parrish, SJSU College of Science with Dr. Welschmeyer, MLML Chemical Oceanography Lab and MJ Donohoe, SJSU Advancement

Governing Board

The MLML Governing Board (MLML GB) is comprised of faculty members and academic leaders from the seven CSU consortium campuses (A list of the Governing Board members is included in Appendix 4.). The MLML GB provides oversight, and sometimes approval of, various aspects of MLML activities. The MLML GB meets twice per year, in the Fall and Spring semesters, to discuss MLML's academic program, budget, and operations.

Discussions held during the meetings in AY15-16 centered on the loss of the R/V Pt. Sur, student recruitment, the 50th Anniversary and changes to the bylaws. A committee was formed to make necessary changes to the bylaws and Rules of Operation for MLML. The changes include new language regarding the dissolution of MLML, as requested by the Chancellor's Office (CO). The committee will provide its recommended changes to the documents by the Fall 2016 meeting and a motion will be made at that meeting to accept the amendments.

Governing Board Meetings

The meeting highlights below document the issues and actions impacting MLML during AY15-16.

December 2015 Meeting Highlights:

- Four new staff and faculty members introduced including the new Physical Oceanographer and Graduate Program Coordinator.
- Recruitment underway for new faculty member to serve as the MLML Science Librarian.
- MLML's Annual Report covering 2012-2015 for the Chancellor's Office was reviewed and discussed.
- Report and updates on the Aquaculture Center facility.
- MLML's 50th Anniversary plans.
- Curriculum and academic program reviewed along with discussion about launching online courses and reintroducing weekend courses.

- The continued discussion among SJSU, CSUMB, and the Chancellor's Office regarding the future administrative campus of MLML. The assumption was that there has been a delay in decision-making until the new SJSU President Mary Papazian could be fully informed after her start in July 2016, that MLML and representatives of the consortium would be involved in the deliberations, and that a decision will be made this AY 2016/17.
- The lack of housing at MLML has greatly affecting the ability for consortium campus students to attend courses and for researchers to gain access to MLML resources.
- The loss of the R/V Point Sur has hampered class cruises, access to the ocean by consortium members, and decreased income generated by NSF contracts associated with operating the research vessel. MLML is interested in obtaining another research vessel and the Governing Board members were supportive of efforts to determine whether a new vessel would be appropriate.

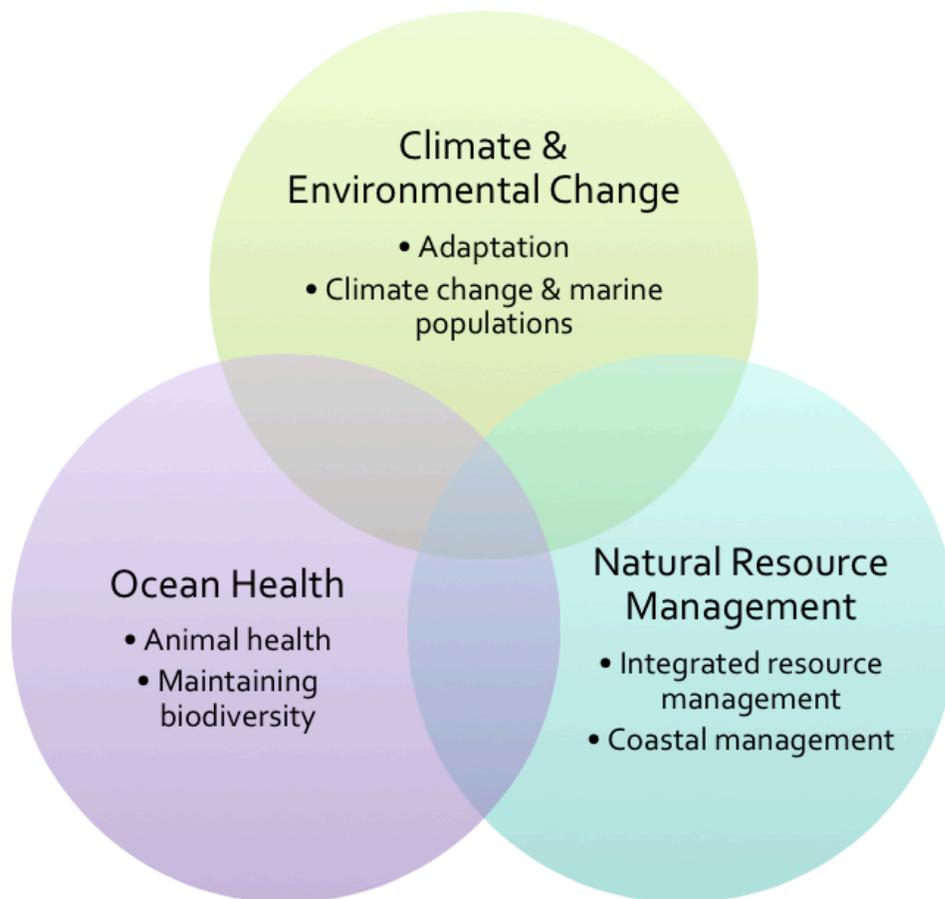
May 2016 Meeting Highlights:

1. New Science Librarian, Katie Lage from Univ. of CO has joined MLML's faculty.
2. Visiting Scientists for AY16-17 introduced: Dr. Michael Lee from CSU East Bay and new visiting scholar Dr. Patrick Gagnon from the Dept. of Ocean Sciences, Memorial University of Newfoundland.
3. Development of a hybrid course in Oceanography emphasizing the environments of Monterey Bay would include online material combined with weekend field trips. Once the course has been developed it will be presented to the Governing Board for discussion and approval before going to each campus for formal approval by each campus.
4. MLML also is developing a few weekend courses. One unit, 2-day experientially based courses in marine science at MLML. These will be available for undergraduates at the consortium campuses.
5. MLML has produced a six-minute film that promotes the lab for prospective students and the general public.
6. Discussion about increasing involvement from consortium campuses by giving talks, holding recruitment fairs, hosting weekend visits for potential graduate students.
7. Online course in Oceanography demonstrated and discussed.
8. Report on Aquaculture Center's meeting sponsored by CSU COAST that brought together representatives from CSU campuses, private industry with local, state and national stakeholders.
9. Changes to the By Laws. A committee was formed to make necessary changes to the By Laws and Rules of Operation for MLML. This will include new language regarding the dissolution of MLML, as requested by the CO. The committee will provide recommended changes to the documents by the Fall 2016 meeting, and hopefully will be approved at that time.



MLML and Non-CSU Partners

MLML collaborates with other research institutions in Central California and with institutions around Monterey Bay. As it was established, the MLML consortium was only an association of CSU campuses, and there may be an addition of other CSU campuses. There have been discussions of developing a joint Ph.D. program with different UC campuses (i.e., UC Santa Cruz and UC Davis). The MLML By Laws do allow non-CSU partners: "In special cases, the MLML Governing Board may also recommend to the Consortium Presidents formal affiliations with institutions outside the CSU for the purpose of promoting the mission of MLML. Examples may include PhD granting universities, research institutions, or other non-commercial collaborative groups, government agencies, or consortia with shared goals and purposes."



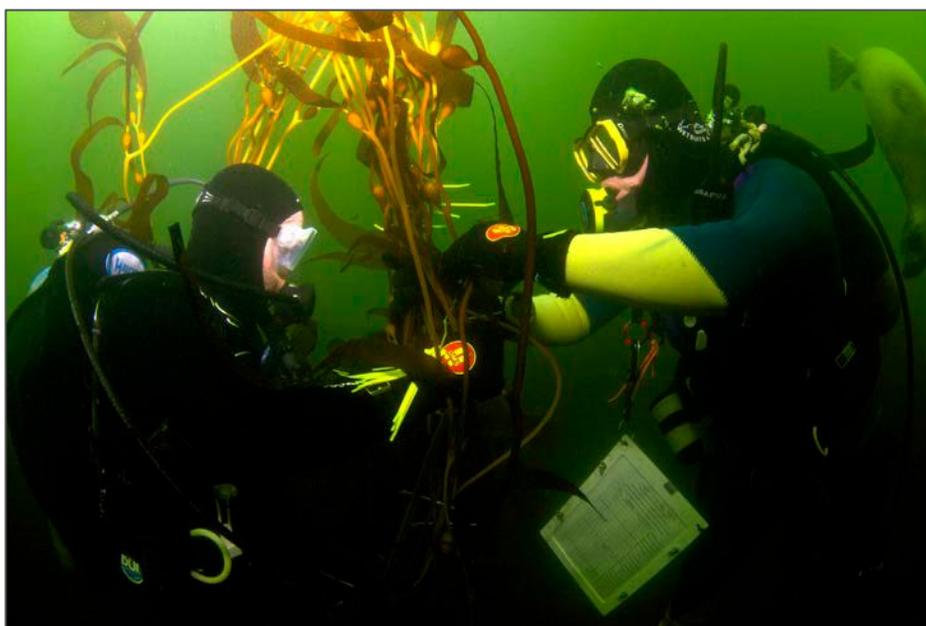
Operations

MLML is a consortium representing seven CSU campuses: SJSU, CSU Monterey Bay, CSU East Bay, CSU Stanislaus, San Francisco State University, Fresno State, and Sacramento State. The MLML Bylaws allow collaboration with non-CSU partners as well: “In special cases, the MLML Governing Board may also recommend to the Consortium Presidents formal affiliations with institutions outside the CSU for the purpose of promoting the mission of MLML. MLML collaborates with other research institutions in Central California and particularly with institutions around Monterey Bay. Examples may include Ph.D. granting universities, research institutions, or other non-commercial collaborative groups, government agencies, or consortia with shared goals and purposes.” There have been discussions of developing a joint Ph.D. program with different UC campuses (i.e., UC Santa Cruz and UC Davis).

For additional information, please see the Organization & Governance section on page 39.

Scientific Diving Program

The MLML diving program trains and supports our AAUS (American Academy of Underwater Sciences) divers to safely and productively conduct underwater research. The program has overseen an increasing number of research dives annually with student researchers conducting the majority of these dives. A team of these divers has contributed to the coastal California sampling by Reef Check California; a protocol that is taught in our research diving courses. The program strives to advance underwater research productively and safely.



Students Mike Fox and Jasmine Ruvalcaba from the Phycology Lab tagging kelp for growth and distribution studies

MLML/MBARI Research Library

The MLML/MBARI Research Library is a joint library shared with the Monterey Bay Aquarium Research Institute (MBARI). MLML's public-private partnership with MBARI maximizes the resources of both institutions to create a world-class library that supports research and teaching in fisheries, marine birds and mammals, invertebrate zoology, oceanography, ecology, molecular biology, biogeochemistry, toxicology, marine geology, marine chemistry, and deep-sea biology. The library portfolio includes MLML's Digital Commons, an institutional repository that provides access to Master's Theses, publications by MLML-affiliated authors, institutional records, and an image archive. During the year, the MLML/MBARI Research Library joined a collaborative project led by the CSU Libraries and the Chancellor's Office to create a Unified Library Management System (ULMS). This new collaborative library services platform will streamline back-end workflows as well as allow for easier discovery and access to our library resources, SJSU King Library resources, and CSU system-wide resources. Lage attended a ULMS training at King Library (a "vanguard library" in the system migration) and will continue to look to King Library for insights and collaboration opportunities.

Professor Joan Parker, long-time librarian at MLML, retired in December of 2015. Kathryn (Katie) Lage started as our new librarian on 1 July 2016.

In addition, SJSU's Advancement team worked with the Friends of MLML to set up a crowdfunding page to raise money to replace the worn and tired furniture (which had been donated by a local jail 35 years earlier). The response from alumni and friends was overwhelming with almost \$15,000 raised over a two-month period. The upgrade created a more user-friendly, studios and beautiful space to foster academic and research collaboration in the library, which now features scientific artwork highlighting MLML research.



Library circa 1984



Library circa 2016

Marine Operations

Moss Landing Marine Laboratories Marine Operations continues to serve a wide variety of research efforts. MLML research vessels have assisted in tagging leatherback turtles off the Farallon Islands (Benson), deployed artificial kelp forests in Carmel Bay (Cunningham), conducted water quality assessments during the demolition of the San Francisco Bay Bridge (Cal-Trans), and measured CTD profiles at Cal American's slant well in south Monterey Bay (AMS). We supported MLML grad students in data collections for their thesis work in the Elkhorn Slough and Monterey Bay and offered our resources to all our consortium campuses. In AY2015-16:

- R/V John H Martin completed 45 cruises
- R/V Sheila B completed 17 cruises
- Whaler fleet completed 302 cruises

The future brings the possibility of exciting developments for Marine Operations. We are in preliminary talks with UCSD Scripps Institution of Oceanography (SIO) in a joint effort to replace the R/V Point Sur (MLML) and R/V Gordon Sproul (SIO) with a shared 49-m vessel that would serve the State of California. We are also studying the feasibility of replacing the R/V John Martin with a somewhat larger, more capable ship of about 27 meters. This vessel would be event responsive, able to lift and deploy heavier packages, support class cruises and multi-day operations, yet still be of a size that could be managed by a small crew. Preliminary surveys indicate that such a vessel may see as much as 190 days of use per year.

If MLML were able to acquire these bigger vessels, we would have to renovate the Del Mar wharf and surrounding property to accommodate berthing. The acquisition of new ships and development of our facilities better will serve our students and the greater oceanographic community, and cement Moss Landing Marine Laboratories' reputation as a premier research institution on the West Coast.



Research Vessel John H. Martin

Museum and Digital Archive

The MLML Museum houses many specimens of birds, mammals, turtles, fishes, and invertebrates. In addition, it contains a herbarium collection of marine macrophyte (algae and plant) pressings. The collection contains at least 11,000 accessioned biological specimens, with ~75% housed in research collections and ~25% in teaching collections.

This is a unique collection focusing on the biota of the Monterey Bay, collected during the last 50 years. It represents a thorough sampling of the flora and fauna of Monterey Bay and the larger sub-tropical and temperate northeast Pacific region (Baja California, California, Oregon, and Washington).

Recent improvements include; 1) reorganization of specimens, using compact storage units; 2) improving the care of specimens, including renewing preservation fluids and standardizing specimen storage containers; 3) updating of digital data files on the holdings; and 4) taking digital images of specimens.

The latest project is a collaboration with MLML Library and IT groups to utilize Darwin Core (a metadata standard for biological records) to make the MLML Museum collection available online via the MLML website. This searchable database will include links to photos and metadata, allowing scientists easy and complete access to the collection.



Left: Student Heather Hawk from the Invertebrate Zoology Lab

Right: Lobby display cases featuring specimens from current research

Proposal for a new Center For Aquaculture

MLML has proposed a new Center For Aquaculture, which we expect will serve the consortium, the CSU, and the entire state of California. After sponsoring a meeting in January 2016 of representatives from all 23 CSU campuses, state and federal agencies, industry, and other interested organizations, MLML officially applied to SJSU to form a new ORTU (Organized Research and Training Unit), called the Center For Aquaculture. After the Packard Foundation helped to construct the new Aquaculture building in 2015, MLML has been writing proposals and seeking support to greatly expand the infrastructure and capabilities of the facility. This year's (2016/17) MLML Visiting Scientist, Michael Lee (CSU East Bay), will help develop partnerships and assist with the organization of a future curriculum and degree program in aquaculture. CA Sea Grant is hiring a new Extension Specialist that will reside at MLML and will be an aquaculture specialist enhancing the program.



New aquaculture building in background, with white rectangular tanks for raising abalone in foreground, round white tanks for algae, and blue tanks used for fishes.

Financials

MLML is supported by annual academic appropriations from SJSU, administered by the College of Science. The State support of MLML is completely funded via General Funds; all the tuition (student) fees are paid to the campus in which the student is enrolled. We supplement our operational costs with funds from the Facilities and Administration revenue (F&A) generated by our grants and contracts. The SJSU Research Foundation returns a portion of the F&A during the academic year, as such:

- 10% of our F&A goes to each Principal Investigator,
- 10% goes into a Reserve Account MLML set up for capital planning and for withstanding budget shortages and;
- 10% goes into an account for repaying a loan to SJSURF (Resolution 198).
- 70% remains to support research infrastructure
- SJSURF also provides MLML with \$190k in supplemental funding to support research administration and facilities because MLML does not benefit from the existing campus support in San Jose.

Academic Year	# of Grants Awarded	Total \$\$ Awarded	F&A Generated	70% F&A Return for Ops
AY15-16	82	\$16,724,109	\$2,032,712	\$622,026
AY14-15	85	\$7,052,005	\$2,486,928	\$471,202
AY13-14	116	\$21,424,577	\$2,201,622	\$322,070

Between AY2013 and AY2016, MLML's research operations and administration were typically supported with about \$500,000 to \$600,000 from the F&A generated by our grants. In the FY15-16 SJSURF returned an additional \$200,000, which was saved and rolled to FY16-17 to cover anticipated shortfall in F&A return expected in AY16-17.

FUNDING SOURCE	2013-2014	2014-2015	2015-2016	2016-2017 (estimated)
Funding from SJSU CoS	\$3.4 mill	\$3.6 mill	\$3.6 mill	\$3.5 mill
SJSURF 70% of F&A Return	\$321,950	\$471,202	\$376,809	\$264,462
SJSURF Fac/Admin Support	\$188,064	\$196,416	\$189,011	\$190,000
*Revenue Income & Donations	\$564,827	\$540,852	\$745,740	tbd
TOTAL OPERATING BUDGET:	\$4.1 mill	\$4.4 mill	\$4.9 mill	\$4.1 mill

*MLML generates additional funding via donations through the Tower Foundation and income generated by instrumentation use fees, Sandholdt property rental and Del Monte wharf rental

In addition to funding from the CSU, SJSU, and SJSURF, MLML relies on funding from private donors, corporate sponsors, and endowments that help fund scholarships for MLML students, facility improvements, and MLML outreach activities such as seminars, tours and displays for our Visitor Center. The Friends of Moss Landing Marine Labs (FoMLML) supports MLML development and outreach activities, with the funds being administered by the Tower Foundation at SJSU. In AY15-16, MLML received several large donations to support the 50th Anniversary celebration, the Library Upgrade, new scholarships were introduced from the Loury family and the Simpkins family made a generous donation to support the development of the proposed center for Aquaculture



San José State University - Operating Budget

The following table depicts the FY15-16 operating budget for MLML from SJSU, administered through the College of Science. The current \$3.4 million in State funding is derived from two sources; one via the CSU system-level support currently at \$1.6 million, and the second source from the administrative campus of SJSU that is \$1.8 million. MLML, like all the CSU campuses, had its OE&E support decreased in recent years, and continues to operate at 33% less than the OE&E appropriated in FY2007/08. The last substantive increase in OE&E was in 2002. From 1966 to 1993, MLML was completely supported by funds from the CSU thus funding the consortium model with SJSU as the administrative campus. Since 1994, all faculty members at MLML with appointments at non-SJSU campuses have been transferred to SJSU, so that now all MLML faculty members have assignments with SJSU. This and other financial changes have created the split State funding model (i.e. CSU and SJSU) for MLML.

MLML Operating Budgets 2013-2016: SJSU				
	<i>AY 13/14</i>	<i>AY 14/15</i>	<i>AY 15/16</i>	<i>AY 16/17</i>
Salary	1,664,862	1,745,802	1,661,377	1,811,042
Benefits	709,078	780,317	790,783	770,000
OE&E	389,627	452,096	407,648	407,648
Utilities	283,771	204,310	248,463	248,463
Salary Recovery / Reimbursement	130,531	227,485	13,022	20,000
Visiting Scientist Support	0	21,429	21,425	21,425
Other Reimbursement/Support	83,531	8,785	3,874	5,000
CSUMB Contribution	50,000	50,000	50,000	50,000
Prior Year Balance Forward	107,842	18,136	216,043	166,917
Roll-Forward Encumbrances	27,515	86,081	140,436	TBD
TOTALS:	3,446,757	3,594,440	3,553,071	3,500,495

For AY 15-16, the overall SJSU budget was slightly increased due to General Salary increases. The State budget covers the costs associated with salaries for faculty and staff, diving, instructional supplies, IT, library services, and facilities. MLML also remodeled a classroom which features moveable furniture, a 72" monitor on the wall, and short throw projectors; all well suited to both teaching and conferencing.

San José State University – Research Foundation

The following table depicts the operating budget supporting research at MLML. Income is generated from the return of some F&A allocations generated by research grant activity, rental property operated by MLML, and administrative support by SJSURF.

MLML SJSURF OPERATING BUDGETS 2013-2016				
REVENUE	AY 13-14	AY 14-15	AY15-16	AY16-17 est
Other Income	23,403	20,000	417.34	750
Rental Income (Del Mar, Sandholdt Center)	121,424	120,852	123,538	111,925
F&A Return (Less 30% to PI's, Reserve, Deficit Refinance)	321,950	471,202	376,809	264,462
Foundation Admin and Facility Support	188,084	196,416	189,011	190,000
Balance of Revenue To Fund Operations:	654,861	808,470	692,764	567,137
OPERATIONS DETAIL				
Total Salaries, Wages and Benefits	429,815	409,768	420,613	429,369
<i>SJSURF Facility and Admin Staff - not from Grant Direct Costs</i>				
Total Administrative Costs	22,320	37,074	22,812	25,000
Total Diving Costs	0	1,865	2,500	5,000
Total Information Technology	29,600	1,360	18,558	53,400
Total Maintenance and Repairs to SJSURF Properties:		32,384	50,774	53,000
<i>Del Mar, Norte, Aquaculture Center, Firehouse, Sandholdt</i>				
Total Services & Facility Costs	86,639	29,200	67,557	72,000
Total Supplies & Equipment	20,860	53,903	10,309	11,500
Small Boat Support	15,000	15,000	15,000	15,000
Total Operating Costs:	604,234	580,554	608,123	664,269
				(97,132)
RESERVE	AY13-14	AY14-15	AY15-16	AY16-17 est
Reserve Account Balance By Year:	379,852	406,423	333,988	381,225
REFINANCING ACCOUNT				
Refinance Begin Balance	3,158,966	3,112,973	3,030,238	2,983,001

The research activity at MLML (including salaries for staff, equipment, IT, and maintenance) is largely supported from a portion of indirect costs in grants and contracts that are returned to MLML from the SJSURF (ave \$585,071/yr for past 13 years) and an administrative allotment (\$190,000/yr). These two sources of revenue total an average of \$775,071 annually that are required by MLML for research operations. This is made in part possible because the SJSU College of Science forgoes any F&A payments, enabling more of the F&A resources to be used by MLML.

SJSURF issued MLML an unplanned increase during FY15-16 as a result of cost savings in operations at SJSURF. MLML was originally planned to receive ~\$150,000. In July 2016, the SJSURF announced MLML would receive an additional \$180,000. Because MLML forecasted an extremely low F&A return for FY16-17, these funds were pushed to the following FY16-17 when the operating budget was showing a deficit of ~\$150,000.

MLML continues to struggle with variability in annual returns of F&A that are somewhat dependent on the F&A generated on SJSU campus. The uncertainty each year of the amount of F&A that will be returned to MLML has necessitated the build-up of a substantial reserve to cover MLML during years when less F&A is returned. These returned F&A funds pay the salaries for IT staff, financial analysts, maintenance staff, services, and maintenance of properties that all support MLML's \$15-\$20 million annual research activity.

Property

In addition to the MLML CSU facilities and land, the SJSURF holds title to six nearby properties that house Research Affiliates and funded programs. These properties are important entities to the current and future operations of MLML.

- One property is the 2.3-acre Shorelab that was purchased in 1965 and contains the pump house that delivers seawater to all classrooms and laboratories in the main lab and to MBARI. The new Aquaculture facility also occupies this site.
- The property housing Small Boats and Diving Operations (0.6 acres) was purchased in 1983. All 13 research vessels, maintenance shop, offices, and supplies for marine operations are at this location. Dive operations also are located here including compressors, dive cylinders, lockers, shower, office, and maintenance space supporting the dive program.
- Across the street from Marine Operations is the Norte Facility that is a 1.7-acre site purchased in 2000. This site houses mostly Research Faculty and Affiliates with offices and laboratories that generate about \$10 - 12 million in funding annually.
- The 9.2-acre Sandholdt property adjacent to the main MLML building was purchased in 2005, for the purposes of building housing and teaching/research space.
- The 1.6-acre Del Mar property was purchased in 2006 to provide dock space for the 135' R/V Point Sur. The vessel was sold in 2015, so we are discussing the long-range use of this site for a new vessel and additional research space.

Without some of these properties that provide seawater and vessel/dive support we could not function as a marine lab. The other properties are providing valuable income and research opportunities for our students or future space for housing that is desperately needed for future courses and involvement with consortium campuses.

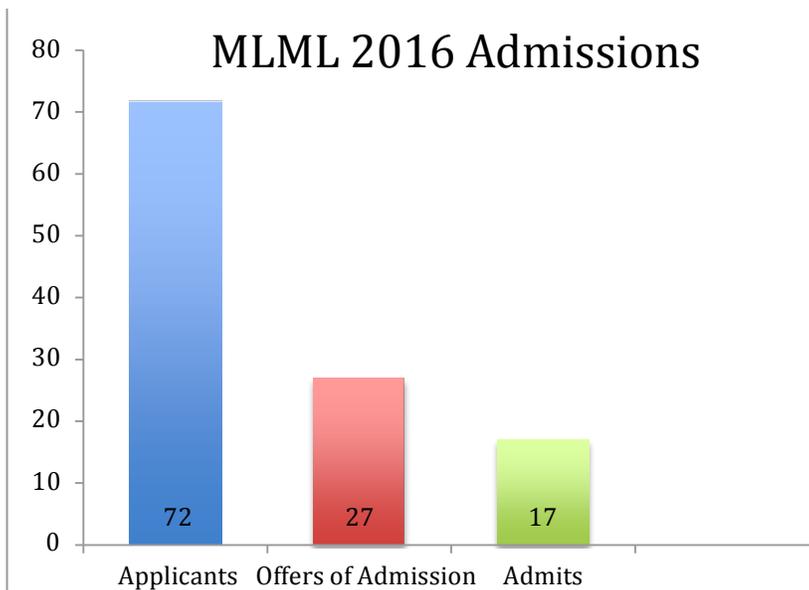


State-owned Main Lab and five other properties administered by MLML (with title held by SJSURF).

Academics

MLML provides a world-class Master’s program in marine science. Although MLML has a full complement of undergraduate and graduate courses, the majority (87%) of the students attending MLML are graduate students in pursuit of their M.S. degree in marine science. The combination of broad-based courses, excellent facilities support, and heightened expectations have garnered MLML a reputation as one of the best Master’s program in marine science in the U.S.

Admissions



The figure above indicates the number of graduate student applicants to MLML in AY15-16, the number of students offered entrance to the program, and the numbers that actually accepted the offer and were admitted.

The difference between the numbers offered and admitted is because MLML competes with R-1 institutions that provide healthy stipends for incoming students, thus some students choose to matriculate where there is better funding.



MLML New Student Orientation 2016

Enrollment (depicts actual Headcount)

AY15-16 Enrollment (Headcount)			
CSU Campus	Undergraduates	Graduate Students	Total Enrolled
East Bay	0	0	0
Fresno	0	0	0
Monterey	3	41	44
Sacramento	0	0	0
San Francisco	0	3	3
San José	7	30	37
Stanislaus	0	0	0
Totals:	10	71	81

Number of Masters in Marine Science degrees awarded: 12

SJSU Annual Program Assessment

This year’s Annual Program Assessment efforts focused on Program Learning Outcome (PLO) 1 (1a & 1b).

PLO 1a: Demonstrate an understanding of fundamental concepts in a particular category of oceanography and marine science

PLO 1b: Be able to synthesize and integrate across all of these fields, yet achieve a depth of understanding in the student’s individual specialty or field of study (MLML specialties include Physical Oceanography, Biological Oceanography, Chemical Oceanography, Geological Oceanography, Marine Phycology, Marine Ichthyology, Marine Turtle, Bird and Mammal Ecology, and Marine Invertebrate Zoology.)

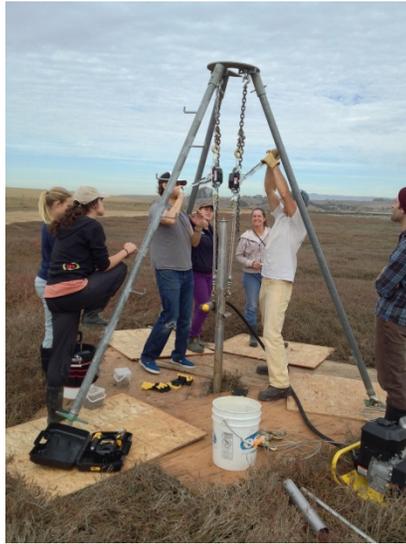
We tracked enrollment numbers in the courses that assess PLO 1a and 1b and were offered during academic year 2015–16, and the pass/fail rate of those courses, in order to evaluate if enrolled students gained proficiency as described in the PLOs. We also tracked student success in the written thesis and oral defense during the academic year 2015/16, because PLO 1a and 1b also address skills that would be mastered at the culmination of the degree program. Analysis indicated a 100% pass rate of the courses in question, indicating sufficient mastery of the curricula that maps to PLO 1a and 1b, and a 100% success rate in the written thesis and oral defense, indicating that all students demonstrated an understanding of fundamental concepts in a particular category of oceanography and marine science (PLO 1a), the ability to synthesize and integrate across all of these fields, and achieve a depth of understanding in the student’s individual specialty or field (PLO 1b).



MLML students from the Invertebrate Zoology Lab sampling in the Elkhorn Slough

Program Improvements

MLML leadership continues to look for ways to improve the academic program and curriculum, including the introduction of a new Aquaculture degree or certificate and a mandatory two-course first year blended course. In the near-term, the following two concepts are being evaluated.



Students constructing artificial kelp forest Geological Oceanography field studies

Blended Class Concept

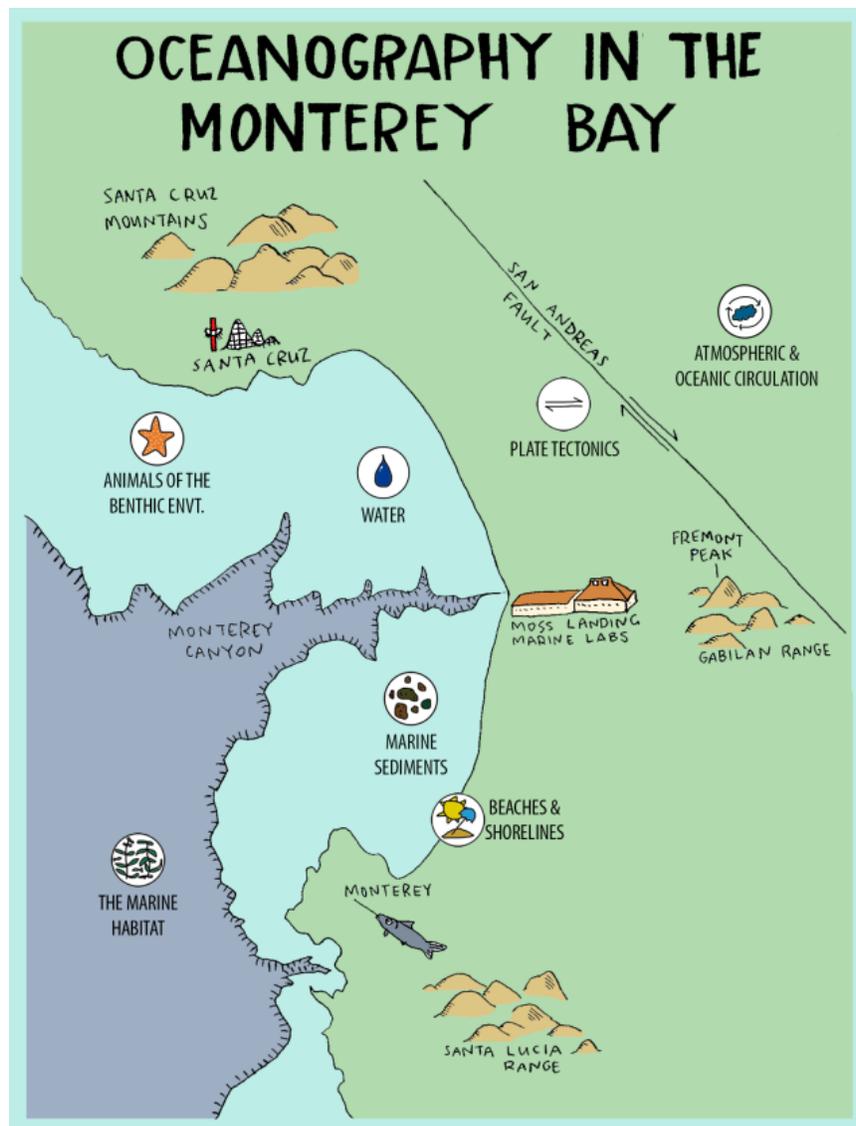
The “blended” class concept is being considered by the MLML faculty. This core course would be two semesters long and give all new students a basic understanding of marine science; incorporating physical, chemical, biological and geological oceanography, along with all the biological disciplines (Invertebrate, Vertebrate, Phycology/Ecology, Ichthyology) into a concept-driven course. The new students would concurrently take data analysis, statistics, programming, and science writing classes the first year. By the end of their first year, they also would write their thesis proposal.



Distance Learning Course

Faculty at MLML, under the supervision of Chair Aiello are developing a hybrid, online and 'in person' class called "Oceanography in the Monterey Bay". The main goal of this course is to provide exposure to the features, processes, and many issues affecting the global oceans and our local environment with specific examples from the Monterey Bay and central California. Although the delivery format will be mostly online, it will also include in-person meetings and a field trip to the Moss Landing Marine Labs. Our faculty members are developing the content for several of the modules.

This class will acquaint students with the knowledge and skills necessary to satisfy the General Education (GE) graduation portion requirements for non-science majors. A first detailed syllabus has been created that defines 11 main topics/modules that cover all physical, chemical, and biological components of the ocean system. The syllabus was shared with the MLML Governing Board during the Spring 2016 meeting.



Example of GE course map of major teaching modules

Faculty

Definitions

The term **Regular Faculty**, as used in the MML Rules of Operation 3.1, refers to tenure/tenure-track faculty members as defined by the CFA bargaining agreement. **Research Faculty** refers to those persons who have demonstrated a commitment to the education and research goals of MLML. Further, Research Faculty are those researchers who are in residence at MLML, hold a Ph.D. degree, serve as Principal Investigators (PIs) on grants and can be appointed as lecturers, and are permitted to serve on student thesis committees.

The term **Research Affiliates** refers to researchers that are generally in residence at MLML, generally hold a Ph.D. or a M.S. degree, most can serve as PIs on grants, but typically do not mentor students or teach courses. Research Affiliates can serve on thesis committees if they have a Ph.D. degree.

There are nine tenure-track faculty members, ten research faculty members, and twelve Research Affiliates that serve as the primary educational and research staff at MLML. All RTP processes are conducted through SJSU. MLML is designated as an Equivalent Unit to a Department, thus a waiver was required for MLML to obtain a Chair. The Chair (Dr. Ivano Aiello) attends the SJSU College of Science Council of Chairs meetings and is responsible for the academic program at MLML (e.g. courses taught, faculty assignments, TA positions, instructional support).

Evaluation

The MLML faculty members are evaluated by the RTP Committee at MLML, the Chair of MLML, the RTP Committee of the SJSU College of Science, Dean of College of Science, University RTP Committee, and finally the Provost of SJSU. Although there are a few standing committees (e.g. RTP, Curriculum, Diving Control Board, and Boats) most of the decision-making regarding policies, hires, planning, etc. is conducted in meetings of the entire faculty and a representative from the Research Faculty/Affiliates and a representative from the students.

Accomplishments

MLML faculty, faculty researchers, and research affiliates acquired **90 grants and awards totaling \$16.7 million** during AY15-16. These funds are administered by the San José State University Research Foundation (SJSURF). Please see Appendix 1 for details on the grants awarded. Please see Appendix 2 for the extensive list of this year's faculty publications.

DIRECTOR

JIM HARVEY, Director

- Dr. Harvey serves on numerous Federal, State, and local committees: COAST – Executive Committee, CA Sea Grant – Advisory Board, NOAA – Pacific Scientific Review Group, NOAA – Pacific Cetacean Take Reduction Team, Humboldt State University Marine Lab – Advisory Board, Elkhorn Slough National Estuarine Research Reserve – Reserve Advisory Panel, The Marine Mammal Center – Scientific Advisory, San José State University Research Foundation – Board of Directors.
- Conducted research on harbor seal distribution and foraging, leatherback turtle foraging ecology, humpback and blue whale diving and foraging.
- Current and Pending Grants: \$11,586,496

FACULTY (9)

IVANO AIELLO, Professor of Geological Oceanography

- Selected to sail as shipboard scientist on the Integrated Ocean Discovery Expedition 363 "West Pacific Warm Pool": Singapore to Guam (10-4 to 12-4, 2016);
- Christina Ravelo and Dr. Aiello convened a session at the AGU meeting in SF (Fall 2015) on: Interplay between tectonics, oceanography, hydro-thermal circulation and microbial processes in the Gulf of California.
- Pete Raimondi and Dr. Aiello convened a session at the Ocean Sciences meeting in New Orleans: Exploring biological-geological interactions in coastal and nearshore habitats.
- Dr. Aiello organized a workshop in Puerto Vallarta Mexico (11/6 to 11/9) Exploring deep subsurface life, sedimentation and tectonics in a young ocean: Workshop to synthesize site survey cruise data and develop new strategies for a scientific ocean drilling proposal in the Guaymas Basin. For this Dr. Aiello obtained a grant from IODP - USIO (\$22,100, 9/15 to 9/16).
- Current and Pending Grants: \$85,302

KENNETH COALE, Professor of Chemical Oceanography

- Dr. Coale Presented at the American Geophysical Union and at the American Chemical Society
- Courses taught: Chemical Oceanography, Biogeochemical Cycling of Trace metals and nutrients in the Coastal Zone, Marine Instrumentation and Fabrication
- Current and Pending Grants: \$189,683

TOM CONNOLLY, Professor of Physical Oceanography

- Dr. Connolly is the lead Principle Investigator for NSF-funded project on wave-current interaction, and MLML subcontract for NOAA-funded Central and Northern California Ocean Observing System (with MBARI and other institutions).
- Dr. Connolly presented research at two international conferences, American Geophysical Union Fall Meeting in San Francisco and American Geophysical Union/Association for the Society of Limnology and Oceanography Ocean Sciences Meeting in New Orleans.
- He is also a mentor for Monterey Bay Research Experiences for Undergraduates program (Miranda Baker, Haverford College).
- Current and Pending Grants: \$125,628

JON GELLER, Professor of Invertebrate Zoology

- 370 marine species discovered on beached debris from the 2011 Tohoku tsunami
- DNA barcoding research presented at the International Marine Bioinvasions Conference, Sydney, Australia
- Invasion research and training of Ecuadorian scientists in the Galapagos Islands
- MLML graduate students participate in biodiversity genetic research in the Northern Hawaiian Islands and Indonesia
- Current and Pending Grants: \$1,947,715 and \$378,632

MICHAEL GRAHAM, Professor of Marine Ecology

- Workshop on developing a CSU (proposed) Center For Aquaculture

- Processing center for study of effects of Fukushima disaster on radiation levels in seaweed
- Re-elected to 5-year contract as editor and managing office for Journal of Phycology
- Current and Pending Grants: \$507,230



MLML's (proposed) Center For Aquaculture and Dr. Graham featured in Silicon Valley Business Journal Sept 2016

SCOTT HAMILTON, Professor of Ichthyology

- Continuing studies investigating the effects of climate change (ocean acidification and hypoxia) on various aspects of the ecology and physiology of rockfish. Work includes studies of the impacts of multiple stressors on behavior, physiology, and gene expression in juvenile rockfish and effects on reproduction, embryo development, and larval quality in rockfish and other groundfishes. Funding from NSF, CA Sea Grant, NOAA, and SJSU has supported this work. The collaborative research involves students and faculty from MLML, CSU Monterey Bay, UC Santa Cruz, and NOAA Fisheries.
- Dr. Hamilton initiated two projects, both funded by programs at NOAA, to study life history and demographic variation in important groundfish species (lingcod and canary rockfish) and to provide the necessary data to help improve the stock assessments and ultimately the fisheries management of both species. The collaborative research involves students from MLML and CSU Monterey Bay and colleagues from NOAA Fisheries.
- Current and Pending Grants: \$1,357,654

KATIE LAGE, Librarian

- Kathryn (Katie) Lage joined the MLML faculty as the new Librarian on July 1, 2016. She comes to MLML from the University of Colorado Boulder, where she was head of head of an interdisciplinary, specialized library supporting research and teaching in the earth and environmental sciences. Lage is happy to be back in the CSU system after receiving her Master of Library Science from San José State University in 2002.
- Research interests: the challenges and opportunities that digital geospatial library materials present for organization and retrieval. Current research focuses on the curation of research data in geohumanities scholarship and in the Sciences.
- Presented on this research at the Association of American Geographers (AAG) in Chicago.

GITTE MCDONALD, Professor of Vertebrate Ecology

- Dr. McDonald and her collaborators from Aarhus University, St. Andrews University, and University of La Laguna have been awarded an Office of Naval Research grant to study heart rate in deep diving cetaceans.
- Alison Stimpert, Gitte McDonald, and colleagues from Marine Mammal Commission and the University of St. Andrews co-organized a workshop on Career/Life Balance in Marine Mammal Science held in conjunction with the Marine Mammal Society Biennial conference in December.
- Current and Pending Grants: \$55,599 and \$118,081



NICK WELSCHMEYER, Professor of Biological Oceanography

- Nick Welschmeyer, Award of merit, distinguished faculty mentor for Brian Maurer in CSU Student Research Competition, 2013.

Dr. Welschmeyer's Students:

- Karen Parker, M.S., Molecular Consultant, (Co-Founder, Chrysopylae, Inc.), Los Altos, CA. (MLML Thesis: 1st place, Outstanding Master's Thesis Award, Science and Engineering, San Jose State University, 2014).
- Brian Maurer, M.S., Water Systems Specialist, Monterey Bay Aquarium, Monterey, CA. MLML Thesis: 1st place CSU-wide competition for best graduate research in biological sciences, 2013.
- Current and Pending Grants: \$785,100 and \$440,000

Dr. Welschmeyer and students onboard Cal Maritime Academy's Training ship Golden Bear



EMERITUS FACULTY (2)

GREG CAILLIET – Professor Emeritus, Ichthyology, Moss Landing Marine Laboratories (MLML);

- Co-Director, Pacific Shark Research Center (PSRC); & Associate Director, Friends of Moss Landing Marine Laboratories (FoMLML)
- Dr. Cailliet is revising his part of the book *Fishes: A Laboratory and Field Guide through Waveland Press*, that he first co-authored in 1985, with Milton Love, Lara Ferry, and Scott Hamilton.
- He gave two keynote addresses in 2015 at the Symposium on Elasmobranchs for the Fishery Society of the British Isles in Plymouth, England; and the Symposium on fish feeding habits (“Gutshops”) at the American Fisheries Society meetings in Portland Oregon. Both keynote addresses resulted in manuscripts for publication.

MIKE FOSTER – Professor Emeritus, Phycology

- Dr. Foster published his co-authored book, *The Biology and Ecology of Giant Kelp Forests* with University of California Press. The book received a PROSE Award from the Association of American Publishers, and excellent reviews in a number of journals, including Ecology.
- Dr. Foster also has a consulting contract with NOAA/CFW to assist with damage assessment related to the Refugio Oil Spill. In addition, he has consulting contract with the Central Coast Regional Water Quality Control Board to help assess the thermal impacts of the Diablo Canyon Nuclear Power Plant.

RESEARCH FACULTY (10)

LARRY BREAKER, Oceanography

- Dr. Larry Breaker was invited to give a seminar at Scripps on his experience with 30 years of data from the Shore Stations Program in October 2016. Dr. Larry Breaker was invited to give a seminar at Scripps on his experience with 30 years of data from the Shore Stations Program in October 2016.
- Dr. Breaker also published a paper in La Tecnica sponsored by the University of Manabi Province on sea surface temperature variability off the coast of Ecuador in December 2015 (first author), and (3), published a paper entitled “Trends in sea surface temperature off the coast of Ecuador from 1900 to 2015” in the Journal of Marine Systems in September 2016 (first author).

COLLEEN DURKIN, Biological Oceanography

- Field work: Field work collecting sinking marine particles and phytoplankton: two, 5-day cruise at the New England Shelf Break (collaboration with scientists at University of Rhode Island and Skidmore College) and two day-cruises in Monterey Bay (collaboration with scientists at MBARI). Analysis of samples is ongoing at MLML.
- Communication, Publication, Education: Publication of 3 first-author studies, submission of two second-author manuscripts. Three research proposals, and two pre-proposals, were written and submitted by P.I. Durkin (NSF, NASA, CA-SeaGrant). P.I. Durkin also gave two invited seminars (at MBARI and MLML) and delivered two guest lectures to MLML graduate students (Data Analysis and Biological Oceanography). Mentored CSUMB-REU undergraduate student, who designed and performed an independent research project in the Durkin lab.
- Service: Invited participation and contribution to NSF sponsored “Biology of the Biological Pump” workshop to identify priorities for future research supported by NSF-OCE division. Nominated and appointed as committee member of the Association for the Sciences of Limnology and Oceanography (ASLO) Online Media Library.

DAVID EBERT, Pacific Shark Research Center

- A total of 13 books published or currently *in press*.
- A total of 49 publications, with PSRC students authoring 28 publications.
- PSRC students attended 9 conferences and presented 35 papers.

STACY KIM, Benthic Ecology

Graduate students (2):

- Clint Collins completed his MS Thesis, Natural and Anthropogenic Disturbance in McMurdo Sound, Antarctica: Iceberg Scours, Human-Derived Pollutants, and their Effects on Benthic Communities. Clint is now employed as the Diving Safety and Logistics Officer at University of Hawaii.
- Laughlin Barker started in a Ph.D. program in Underwater Robotics and Engineering at Johns Hopkins University.
- Current and Pending Grants: \$662,530



VALERIE LOEB - Biological Oceanographer

- October-November 2015 conducted the third and final field effort in an NSF funded pilot study that adds net sampling and underwater video recording to supply transits of the U.S. Antarctic Program vessel, ARSV "L.M. Gould" to establish the identity, concentrations and biomass of zooplankton and nekton acoustics targets recorded by coincidental Acoustic Doppler Current Profiling (ADCP) and relate these to physical structuring imposed by the strong frontal jets of the Antarctic Circumpolar Current (ACC)
- May 2016 prepared and submitted a grant proposal to NSF Polar Programs entitled "Drake Passage-Antarctic Peninsula Ecosystem Research (DAPPER)" requesting 3 years of support to continue the research initiated during the Drake Passage Pilot Study
- Current and Pending Grants: \$171,991

ILIANA RUIZ-COOLEY, Evolutionary Ecology, Marine Mammals and Turtles

- NSF, Biological Oceanography. The effect of warming on elemental cycling and tropho-dynamics in the Eastern Tropical Pacific. PI. R. I. Ruiz-Cooley, Submitted, 08/2016
- IMS Packard OST Endowment Proposal. *Domoic acid in marine food webs: a novel approach to trace nitrogen sources and transfer*. PI: Clarissa Anderson, Co-PI (Ruiz-Cooley); \$ 20,000; 2016
- NSF, Chemical Oceanography. Domoic acid in marine food webs: a novel approach to trace nitrogen sources and transfer. PI: Ruiz-Cooley, Co-PIs: C. Anderson, and R. Kudela
- Current and Pending Grants: \$390,374

JASON SMITH, Environmental Biotechnology

- Awarded grant from Gordon and Betty Moore Foundation to develop technologies for genetic transformation tools for the toxic diatoms *Pseudo-nitzschia australis* and *P. multiseriata* (10/15)
- April Woods completed her masters' thesis describing the association of photooxidative stress tolerance in the production of domoic acid by diatoms in the genus *Pseudo-nitzschia* (5/16)
- The national Alliance for Coastal Technologies program, with MLML-EBL serving as the Pacific Coast partner and testing laboratory was funded for an additional five years by NOAA-NCCOS-IOOS. ACT is one of the longest lived (15 yrs) extramurally funded programs by NOAA

- Current and Pending Grants: \$1,382,400 and \$97,271

RICK STARR, Fisheries and Conservation Biology

- Finished 10th year of Marine Protected Area monitoring with volunteer anglers. We published the first information showing that MPAs in central California work to increase densities and sizes of fishes, relative to adjacent reference sites
- Worked with National Marine Fisheries and Ca Dept. Fish and Game scientists to evaluate the effects of a 10-year long fishery closure.
- Developed a stereo-video camera system to survey commercially important fishes in deep rocky habitats
- Current and Pending Grants: \$420,773



DIANA STELLER, Phycology

- Mentored graduate student Angela Zepp who recently was awarded the 6,000\$ NOGI / Zale Parry diving scholarship for her research on demography and pH variation in the acid weed *Desmarestia ligulata* and her research diving leadership.
- Taught field based research diving and techniques courses. These included teaching Marine Science Diving (August and Fall semester 2015) and co-teaching Marine Environmental Studies of the Gulf of California (Spring 2016).
- Conducting international collaborative research on understanding the foraging ecology of the endangered Hawksbill sea turtles (*Eretmochelys imbricata*) in Mexico.

ALISON STIMPERT, Vertebrate Ecology

- In collaboration with NOAA, measuring the effects of anthropogenic sound on rockfish in southern California.
- In collaboration with MBARI, recording the soundscape of Monterey Bay from a bottom-mounted, cabled hydrophone.
- Developing methods for quantifying response of calling baleen whales to Navy sonar.
- Current and Pending Grants: \$94,969



RESEARCH AFFILIATES (12)

SCOTT BENSON – Southwest Fisheries Science Center - Marine Turtle Research Program (SWFSC)

- Received funding for a 2-year study to assess leatherback turtles off the U.S. West Coast in a changing climate.
- Active Level IV responder for the NOAA Whale Entanglement team to rescue whales tangled in fishing nets and line on the Central coast of CA.



JOSEPH BIZARRO – Ichthyologist

- Postdoctoral fellow with the National Marine Fisheries in Santa Cruz, CA
- Continuing his research in Aquatic and Fisheries Science and is a consultant on essential fish habitats
- Worked as a GIS Analyst, research ecologist and staff scientist for the Pacific Shark Research Center and Center for Habitat Studies at MLML.

ROSS CLARK – Central Coast Wetlands Group (CCWG)

- Led the 2016 EPA National Wetland Assessment effort for California
- Initiated a comprehensive Moro Cojo Slough planning, monitoring and modeling effort.
- Led a Monterey and Santa Cruz County Coastal Climate Change Hazard assessment effort
- Current and Pending Grants: \$1,828,141 and \$858,673

CURT COLLINS – Climate Change, Remote Sensing and Oceanography

- Emeritus Professor at CSUMB, Department of Oceanography and at the naval Postgraduate School
- Continues his research using remote sensing devices to understand the effects of climate change
- Began collaboration with the Physical Oceanography Lab and Dr. Connolly to submit proposal to NSF

RUSTY FAIREY – Marine Pollution Studies Lab (MPSL)

- Implementation of a long term monitoring program for mercury in the San Francisco Bay Delta.
- Managing and evaluating environmental data collected in response to the BP oil spill on the Gulf Coast
- Led the CA field survey for EPA's 2015 National Coastal Condition Assessment
- Led the field survey for a new monitoring program along the bay margins for the SF Bay Regional Monitoring Program
- Current and Pending Grants: \$2,947,715

WES HEIM – Marine Pollution Studies Lab (MPSL)

- Implementation of a long term monitoring program for mercury in the San Francisco Bay Delta.
- Development of a working mercury model of the San Francisco Bay Delta and Yolo Bypass.
- Completion of a 4-year project focused on management practices to minimize production and export of organic mercury from agricultural and non-agricultural lands.
- Current and Pending Grants: \$5,594,481 and \$16,923

KIM NULL – Chemical Oceanography

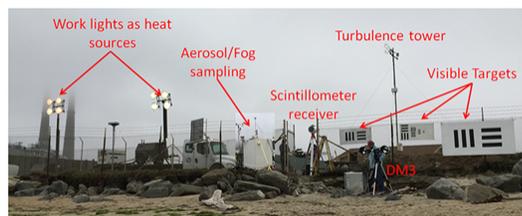
- Received funding from Anthropocene Institute to purchase water quality monitoring equipment to monitor the Moro Cojo slough.
- Mentor for the Research Experience for Undergraduates (REU), summer 2016.
- Participation in the nutrient co-operative advisory committee for central California.
- Current and Pending Grants: \$756,264 pending

TIM STANTON – Naval Postgraduate School, Research Professor, Oceanography Department

- Completion of a 4 year project focused on management practices to minimize production and export of organic mercury from agricultural and non-agricultural lands.
- Dr. Stanton has maintained a NSF and ONR sponsored Ocean Turbulence research group at NPS for the last 30+ years, with annual funding between \$500K and \$1M / year for the last two decades. At MLML, he has a \$100K ONR proposal being routed through the system for the Stratified Arctic Oceans DRI for FY17.
- Developing plans to participate in student projects with Dr. Tom Connelly and other MLML colleagues during 2017. Research will focus on instrument development, data analysis and ocean waves and turbulence.

QING WANG – Naval Postgraduate School

- Lead and participated in three field campaigns for air-sea interaction measurements, including the Coupled air-Sea Processes and EM ducting Research (CASPER), Coastal EO PropagaTion eXperiment (CEOPTeX), and Coastal Land-air-Sea Interaction (GLASI) projects;
- Lead a team of students, postdocs, and engineers on extensive data analyses of model and observational data;
- Organized special issues in conferences and workshops



MARK YARBROUGH – Marine Optical Buoy Project (MOBY)

- Continued MOBY operations at the Lanai, Hawaii morning site, providing calibration/validation data in support of Ocean Color science.
- Delivery of two new Carbon Fiber buoy structures for the MOBYNet project.
- Continued production of four fiber optic spectroradiometers for MOBYNet and production of two MOBYNet power and data acquisition control systems
- Current and Pending Grants: \$12,399,007

JENIFER ZELIGS – Science and Learning With the Help of Sea Lions (SLEWTHS)

- Built a new deck and pool for El Nino sea lion pups that we adopted who were deemed unreleasable after repeated restrandings and health issues. This is part of a larger problem of unusual massive stranding events in California that SLEWTHS is contributing expertise in the handling of the event.

- Began an investigation into the calibration of accelerometer usage for determining foraging events in sea lions with Gitte McDonald, MLML faculty and another investigation with Westchester University into swimming mechanics.



Student Accomplishments

Introduction

In AY15-16, MLML had 81 students enrolled primarily from SJSU and CSUMB with several that came from SFSU. Seventy-one were graduate students and 10 were undergraduates. Twelve students graduated with an M.S. degree. Of those twelve, two have enrolled in Ph.D. programs, two are now employed by state and federal agencies, one is working for a non-governmental organization (NGO), and three are employed as staff at MLML.



Phycology Lab students (L-R) Cody Dawson, Angela Zepp and Steven Perez-Cunningham working in the intertidal zone



Alumna Kirstin Carlson designed a 50th Anniversary Logo that illustrates MLML's spirit and global research activities

AY 2015-2016 GRADUATES

Hamilton "Will" Fennie

"Early Life History Traits Influence the Effects of Ocean Acidification on the Behavior and Physiology of Juvenile Rockfishes in Central California"

Faculty Advisor: Hamilton

Sara Worden

"Effects of Small-Scale Substrate Complexity and Heterogeneity on Rocky Intertidal Species Interactions"

Faculty Advisor: Graham

Kristin Meagher Robinson

"Motile Cryptofaunal Invertebrate Assemblages in Catalina Island's Rhodolite Beds in Relation to Physical Structure and Live Rhodoliths"

Faculty Advisor: Geller

Gabi Navas

"Geographic Variation in the Life History and Morphology of The Pacific Geoduck, *Panacea Generosa*"

Faculty Advisor: Hamilton

Clint Collins

"Natural and Anthropogenic Disturbance in McMurado Sound, Antarctica: Iceberg Scours, Human-Derived Pollutants, and their effects on Benthic Communities"

Faculty Advisor: Aiello and Kim

Vera Lawson

"Tracking Icebergs and Sea Ice in the Mid-Pleistocene Bering Sea Suggests Sea Ice Affects Ice Sheet Growth"

Faculty Advisor: Aiello

Ryan Fields

"Spatial and Temporal Variation in Rosy Rockfish (*Sebastes rosaceus*) Life History Traits"

Faculty Advisor: Hamilton

Emily Donham

"Effects of Global Change on Algal Biomineralization and Benthic Community Interactions on California's Temperate Rocky Reefs"

Faculty Advisor: Hamilton

Stephen Loiacono

"Effects of Substrate Warming on Sessile Marine Invertebrate Communities in Monterey Bay, California"

Faculty Advisor: Geller

Melinda Tanner

"A Sedimentological Analysis of the Siliciclastic Fraction in Pliocene Core Sediments from Bowers Ridge, Bering Sea (IODP EXP 323)"

Faculty Advisor: Aiello

April Woods

"Cellular Stress Physiology in the diatom *Pseudo-nitzschia* and its role in Domoic Acid production"

Faculty Advisor: Welschmeyer and Smith

Pamela Neeb Wade

"Effects of Non-Native Species on Two Life Stages of the Olympia oyster, *Ostrea lurida*, in the Elkhorn Slough Estuary"

Faculty Advisor: Geller



Open House



MLML students continued their successful outreach activities by planning and hosting the MLML Annual Open House. Every year MLML students open MLML's doors and invite the public to come and explore the labs. The event is free and aimed at all ages. This long treasured event allows the community, families, and educators to visit MLML, interact with our students and researchers, tour the facilities, explore our labs and participate in interactive activities geared towards marine science and our local ecology. MLML's Student Body constructs invertebrate touch tank displays, holds a raffle to earn scholarship funds, presents a sea lion show, and performs a marine-themed puppet show, which has become legendary. Other activities include a bake sale to help fund student research, marine-themed arts and crafts, and tours of our research vessels. The 2015 Open House had more than 1,800 visitors and netted more than \$4,000 for the Student Body Scholarships.

The Student Body also sold homemade lunches during the 50th Anniversary weekend and raised \$2,000 for the MLML Student Body Treasury.

Moss Landing Marine Laboratories
Come celebrate our 50th Anniversary!

Open House
Saturday & Sunday
April 30 - May 1
9:00 am - 5:00 pm

FREE admission!
FREE parking!

FUN!

FREE!

Live touch tanks
Sea lion show
Arts & Crafts
Raffles & Prizes
Marine life puppet show
Educational presentations
Meet staff, faculty & students
Food available for purchase

8272 Moss Landing Rd, Moss Landing, CA
For more information or disability accommodations
Call 831.771.4400 or visit:
www.openhouse.mlml.calstate.edu



Scholarships and Awards

AY 15-16
25 Awards
\$20,500

John H. Martin Scholarship

Heather Fulton-Bennett

Xiphias Martin Scholarship

Maureen (Mo) Wise

James Nybakken Scholarship

Pamela Neeb Wade

Sonia Linnik Hamilton Marine Science Scholarship

Jen Chiu

Signe Lundstrum Memorial Scholarship

Steven Perez-Cunningham

Loury Family Marine Science Outreach Scholarship

Laurel Lam

Simpkins Family Marine Science Scholarships

Stephanie Schneider

Devona Yates

Maureen (Mo) Wise

Scott Miller

MLML Scholar Awards

Stephen Pang

Mason Cole

MLML Wave Awards

June Shrestha

Bonnie Brown

Holly Chiswell

Stephan Bitterwolf

Jessica Jang

Emily Schmeltzer

Kristin Walovich

Dr. Earl and Ethel M. Myers Oceanographic and Marine Biology Trust Grants

Stephan Bitterwolf

Mason Cole

Lindsay Cooper

Cody Dawson

Heather Fulton-Bennett

Jinchen (Martin) Guo

Jessica Jang

Alex Olson

Angela Zepp



Friends of MLML



FRIENDS OF MOSS LANDING
MARINE LABORATORIES

The Friends of Moss Landing Marine Laboratories (FoMLML) was established in 1994 as a 501c(3) non-profit organization to support research, education and conservation at MLML. Although the 501c(3) has been dissolved, the organization continues to provide support and organization for the MLML alumni and current students through donations and philanthropic giving. These funds are held and administered at the SJSU Tower Foundation. The FoMLML plays a critical role in gathering community support for the facility, funding scholarships for graduate student support, undertaking special projects to enhance the MLML Visitor Center, and operating numerous public outreach programs for the local community. In AY15-16, FoMLML received \$630,715 in private donations, endowments and corporate contributions from alumni, the Anthropocene Institute, the Simpkins family, and the Packard Foundation.



Library Upgrade

To raise funds for upgrading the MLML/MBARI Research Library, SJSU's Advancement team launched a crowdfunding campaign. The library's furniture had been donated by a local jail 35 years ago, and was shabby and broken. A short video was produced and then posted on SJSU's crowdfunding page. FoMLML

experienced a tremendous response from alumni and donors, and almost \$15,000 was raised to purchase new furniture and chairs. (see photo on page 8.)



50th Anniversary Book

FoMLML also assisted the 50th Anniversary Planning Committee with fundraising efforts to raise money to publish a book commemorating 50 years of excellence in marine science research and education. Almost \$24,000 was raised with donations coming from the alumni, the Monterey Bay National Marine Sanctuary, the Acacia Foundation, the Moss Landing Harbor District, MBARI, and Save The Earth.

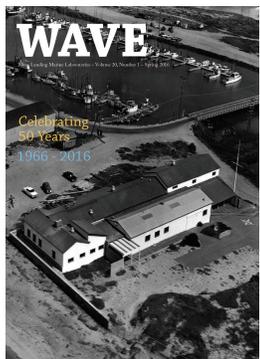


Mock-up of the 50th Anniversary Book used to raise money towards publication

Friends of MLML Outreach Activities

The Wave Magazine

FoMLML produces the *Wave* magazine, which highlights MLML research activity and student success, and provides updates to sponsors and donors. The AY15-16 edition focused on MLML's 50th Anniversary.



Public Lecture Series

A free public lecture was presented by one of our Oceanographic Technicians, Jason Adelaars about some of the lab's current research, "Stand Back! We Are Doing Science!"

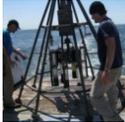
 FRIENDS OF MOSS LANDING
MARINE LABORATORIES *presents*

Community Lecture Series 2016

STAND BACK! WE ARE DOING SCIENCE!

The Friends of Moss Landing Marine Labs invites you to please join us:

Wednesday July 20, 2016
7:00pm
For an evening with
Jason Adelaars
8272 Moss Landing Rd. Moss Landing, CA



Let's take a quick look at a few projects currently happening out of Moss Landing Marine Labs!! From removing nutrients out of agricultural run-off water, to identifying areas vulnerable to the impacts of sea level rise around Monterey Bay, to real-time oceanographic monitoring, and how we're using cutting-edge technology to achieve results.

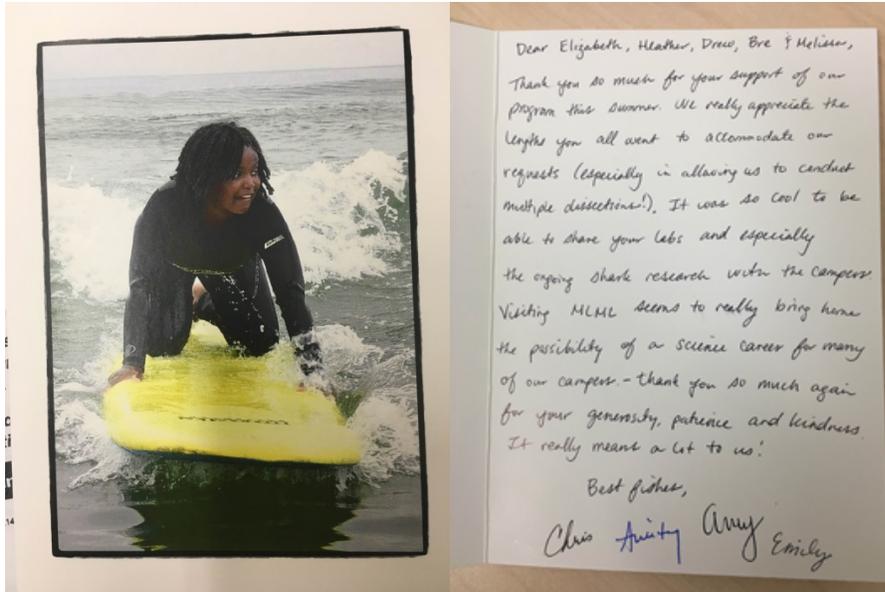
Recommended donation for non-Friends of MLML: **\$8**
To check if you are a Friend of MLML:
Please call: 831-771-4100 or Email: friends@mml.calstate.edu

Lab Tours

During AY 15-16, FoMLML student tour guides conducted more than 25 tours for local K-12 classes, science summer camps, home schoolers, and other youth organizations. Our tour guides provided education about the ecology of the local coast, wetlands, redwoods, and native plants found along the shore. Visitors get to walk through labs, participate in hands-on activities, hike along the slough, learn about the Monterey Bay Submarine Canyon, and learn what it takes to be a marine scientist!



Dr. Diana Steller shows young visitor how to write underwater



Camp SeaLab student's first visit to the ocean Moss Landing, CA July 2016

Thank You card from CampSea Lab for Tours given summer 2016

Seminar Room

In addition to these outreach and fund raising activities, FoMLML coordinates the use of MLML's Seminar Room. MLML provides its Seminar Room free of charge to marine research organizations throughout the Monterey Bay area and California and allows other non-profit groups to use the space at a discounted rate. In AY15-16, FoMLML coordinated 48 events and meetings in the MLML Seminar Room for groups like CSUMB, PBS, the BBC, the Monterey Bay Aquarium, NOAA, CA Fish and Wildlife, US Dept. of Agriculture, CSU Stanislaus, Canada College, local NBC station KSBW, and for nonprofits like the American Red Cross, North Monterey County Fire District and local school districts. MLML even leant the Seminar Room, lobby and Martin's Point of View to York High School in Monterey, CA for its senior prom.



50th Anniversary

MLML held its first classes in 1966 at a converted cannery building that had been occupied by a private marine laboratory (Beaudette Foundation). Since 1966 MLML has grown into a major marine laboratory with an international reputation. More than 650 students have graduated with a Master's degree. More than \$400 million has been generated in contracts and grants during its history. To celebrate the 50th Anniversary of MLML a series of events was held, with the help of San José State University.



Moss Landing Marine Labs

- **4 August:** MLML hosted a media day for ten representatives from the local print and TV media, which produced four stories about MLML, including a cover story on the new MLML Aquaculture Facility in the *Silicon Valley Business Journal* on August 16. (see Appendix 3)
- **5 August:** An evening reception for more than 100 dignitaries overlooking Monterey Bay provided an opportunity for elected officials (Congressman Sam Farr and Assemblymen Mark Stone and Bill Monning), CSU Administrators (CSU Assistant Vice Chancellor for Research, Ganesh Raman, SJSU President Mary Papazian and CSU Monterey Bay President Eduardo Ochoa), leaders of local marine institutions (CEO of MBARI Chris Scholin), and California Secretary of Natural Resources John Laird to celebrate MLML's history. The festivities included the presentation of a Congressional Order of Honor of the 114th U.S. Congress by Congressman Farr, and a California State Assembly Resolution by Assemblyman Mark Stone.
- **6 and 7 August:** More than 450 former and current MLML students, staff, and faculty gathered for two days of pictures, reminiscing, and celebrations. More than half of the 650 MLML alumni attended, a truly amazing testimony to their connection with their alma mater.



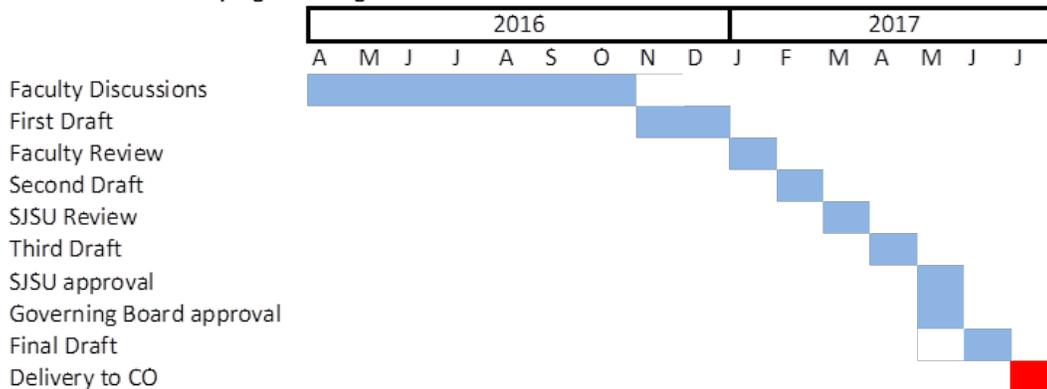
Alumni gather at the Martin's Point of View to take group photos during MLML's 50th Anniversary

Looking Forward

Strategic Plan

According to a letter dated 18 December 2015 from Assistant Vice Chancellor for Research, Zed Mason and Executive Vice Chancellor for Academic and Student Affairs, Loren Blanchard (CO), MLML was conditionally authorized to continue operations under EO 1103 until 6 May 2016 based on an original Annual Report and an addendum. The conditional status was based on the fact that there was no approved Strategic Plan for MLML. Given that an appropriate and comprehensive Strategic Plan could not be developed by 6 May 2016, MLML and SJSU requested a greater amount of time to develop such a plan. A letter dated 25 April 2016 to Dr. Sue Martin (interim SJSU President) from Loren Blanchard approved the request thus a Strategic Plan was to be developed and delivered to the CO by 31 July 2017. Below is our schedule for developing a Strategic Plan and securing the proper approval before it will be sent to the CO. We have had a few faculty meetings and one MLML faculty retreat to start the development of a strategic plan.

Schedule for developing a Strategic Plan for MLML



Academic Program

The primary objectives of the MLML Academic Program are to decrease the time until graduation with a M.S., broaden the number and diversity of students in courses and receiving our content, and strengthen the student’s understanding of ocean issues and their scientific capabilities. We have recently decreased the time until graduation using a combination of greater oversight and mentoring. Future plans are to make curricular changes that would reduce the course burdens and to develop curriculum that accelerates the thesis development process (e.g. proposal writing, improved writing skills, and better analytical skills).

The development of a GE-based hybrid course that would allow much greater participation by students within the consortium would greatly increase the number and diversity of the students we serve. Most of the students taking courses at MLML are graduate students in the M.S. marine science program. By offering hybrid (online/field) courses we expect undergraduates, in particular, will be attracted to the MLML curriculum. Because the consortium campuses have much greater numbers of under-represented groups in the sciences, we can attract a greater diversity of students into the program.

We have been trying recently to provide courses that are more integrated regarding the different disciplines of marine science. The applied nature of some course material, the multidisciplinary integration, and the broadening of content should strengthen the student's understanding of ocean issues and their ability to practice science.



Research

Much of the success of MLML regarding research activity is because there are a number of affiliated researchers. In the effort to grow research capacity at MLML we continue to add soft-money researchers to the program. These personnel bring added expertise benefitting the students and faculty, and they bring in substantial amounts of research dollars (approximately \$9.4 million annually).

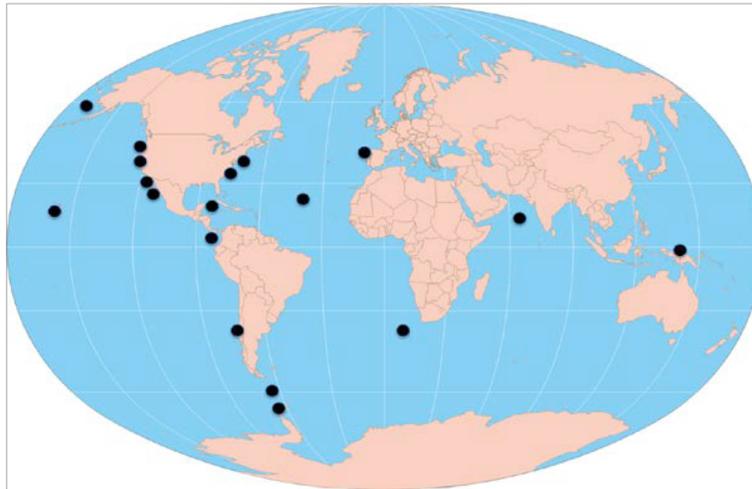
In the past year or so we have added six new Research Affiliates:

- Dr. Qing Wang (Meteorologist at Naval Postgraduate School). She studies environmental effects of electromagnetic wave propagation, air-sea interactions, and boundary layer processes.
- Dr. Iliana Ruiz-Cooley studies trophic dynamics, and environmental habitat mapping using stable isotopes.
- Dr. Tim Stanton (Physical Oceanographer at the Naval Postgraduate School in Monterey, CA. He studies turbulent boundary layers, ocean/ice interactions in polar regions, and wave and sediment dynamics.
- Dr. Joe Bizzarro (Ichthyologist with National Marine Fisheries Service). He studies abundance, distribution, age, growth, and foraging ecology of elasmobranchs.
- Dr. Coleen Durkin is a biological oceanographer who studies the vertical export of particles, phytoplankton physiology, and environmental genetics.
- Dr. Kim Null studies nutrient cycling and dynamics in coastal and groundwater systems throughout the globe.

Faculty

The MLML/SJSU faculty has been very active in their research pursuits. All of the faculty members are fully funded and conducting research projects throughout the world. (The figure below depicts research location for MLML scientists in 2015/16). Three of the nine faculty members are new this past year, but we do have a

couple of faculty that are getting closer to retirement, so the faculty at some point will need to discuss the future of the faculty composition.



Proposal for a new Center For Aquaculture

We expect to greatly expand our vision of the proposed Center For Aquaculture in the coming years. We have a proposal for a new ORTU that is in its final stages of approval at SJSU, we have a course in aquaculture that will be taught in Spring 2017, and we will be hiring a new California Sea Grant Extension Specialist that will be a Research Faculty member at MLML and a specialist in aquaculture. This person will help develop new courses in aquaculture science, will help bring in new sources of funding, and will help mentor students as they obtain a M.S, degree in marine science with a concentration in aquaculture. We are currently progressing on obtaining new sources of funding for the Center, and to further outfit the new building funded by Packard Foundation with instrumentation.



*(L) Cultivating dulce seaweed at MLML's proposed Center for Aquaculture
(R) Professor Graham pulls netting filled with sea lettuce covered by baby abalone*

Marine Operations

With the loss of the R/V Point Sur, MLML is considering future plans regarding vessels and personnel. We are in the early stages of assessing whether there are enough potential users (e.g. researchers and teachers) and whether there is a business plan that makes sense financially. The plan would include the joint operations of a vessel with the UC system, in particular, Scripps Institution of Oceanography (SIO). We anticipate that the vessel would serve the needs of the oceanographic community in the CSU and UC, and would be a member of the UNOLS fleet so NSF-sponsored research would also make use of the vessel. We are working with SIO to

judge the degree of interest in a coastal research vessel, and the characteristics of the vessel that would make it unique, useful, and efficient.

MLML/SJSU has hired a new Marine Operations Manager (Brian Ackerman) who has experience overseeing the purchase and retrofitting of research vessels, and also has experience managing a complex and dynamic marine operations. MLML continues to operate 12 research vessels ranging in size from 14' to 57'. These vessels are used by a variety of institutions (e.g. Monterey Bay Aquarium Research Institute, Naval Postgraduate School, Monterey Bay Aquarium, UC Santa Cruz, and CSU campuses).



Facilities

This coming year we have funding and donations that will expand the number of seawater tanks at the aquaculture facility. New plumbing and electrical installations will provide more resources for the expanding users of the aquaculture facility. In anticipation of a new research vessel arriving in the future, MLML is starting to make improvements to the Del Mar property that is the large wharf owned by MLML/SJSURF in the Moss Landing harbor. This space is in need of repairs, and the first step is demolition of the existing structure and placement of new pilings. MLML is developing a site plan for the Sandholdt property next to the main building of MLML that would provide additional housing, conference space, and research labs. With NSF funding we completed a survey of potential users and investigated what could be constructed on the site. Now we need to move into developing a business plan and specific site plan with architectural drawings before we start fund raising for the project.

Housing

Housing continues to be the most important impediment to further growth in education and research at MLML. Most other marine labs in the country have some form of housing to provide accommodations for weekend courses, summer courses, visiting scholars, and meetings. Without housing MLML will remain largely a graduate program with a limited amount of space for undergraduate students. The plans for development, as outlined above in the Facilities section, will allow us to expand and meet our objectives of greatly expanding our capabilities for undergraduate education, especially under-represented students, in marine science.



Visitor Center

One of the requirements of our permit to build the main building at MLML after the 1989 Loma Prieta earthquake was to provide a Visitor Center. We have had limited funds to meet this requirement, and have slowly started to image the aspects of the Center. With some recent donations we have installed a museum-style kiosk in the entry way that has a slide show of images. Eventually, and with enough funding, we hope to install some interactive displays that allow visitors to virtually explore our labs, the Monterey Bay, surrounding wetlands and redwoods and learn more about local wildlife. A display such as this would invite potential graduate students to virtually explore our Master in Science program, learn more about the faculty and research, and watch videos showing students in the field, interviews with alumni and current student sharing their MLML experiences.



Martin's View at MLML Main Lab



Great Blue Heron in the Slough below Martin's POV

Development-Fundraising

University Advancement at SJSU has recently announced that they will provide personnel and support for a fundraising campaign for MLML designed to raise funds for four themes (in no particular order):

- **Academic Village:** (housing, research labs, conference center) at the Sandholdt property next to the main lab. This much needed expansion will allow us to offer more courses, provide housing for summer and weekend courses, and will allow us to develop our concept of a conference center around the notion of Sustainable Ocean Science (SOS).
- **New Research Vessel:** With the sale of the NSF-owned R/V Point Sur, MLML has lost most of the capability for class cruises, larger research expeditions, supporting science for regional scientists, and an icon and symbol of MLML to the rest of the oceanographic world. We hope to purchase and operate (possibly in partnership with UCSD and Scripps Institution of Oceanography) a regional class vessel

possible of 95 - 120' in length. Our vision is that this vessel would serve the CSU throughout the State allowing classes and researchers access to a world-class research platform. We also propose this vessel would be used to address issues of concern for California, including climate change, sea level rise, ocean acidification, coastal erosion, and monitoring marine protected areas.

- **Proposal for a new Center For Aquaculture:** We maintain that one burgeoning field in California will be aquaculture, which in many ways is directly related to marine science and the CSU. The CSU is considered a leader in workforce development, and we believe MLML and the CSU could be a leader in development of a more robust, sustainable, and profitable aquaculture enterprise. MLML organized a meeting of all the CSUs with federal/state agencies, industry, and others this past year. We plan to lead the way in the development of training for the aquaculture industry, provide leadership in developing sustainable methods and sound science-based paths, and to provide sound advice to policy makers regarding permitting and regulations. We view this as a critical contribution to the economy of California, while providing research and job opportunities for our students. This will be a CSU-wide endeavor.
- **Student Success:** The success of the students at MLML is largely determined by the amount of financial support we can provide. Graduate students need resources for vessels, diving, instrumentation and supplies for their research. An immense concern for MLML students is how to fund personal costs (e.g. housing food, tuition). The Central Coast of CA is currently one of the most expensive places to live in the U.S (median rent in Santa Cruz County is over \$2000/month for a 1-bedroom apartment). MLML does not have the financial resources to support 75-85 graduate students (which is the current level), let alone to expand the graduate program or develop a robust undergraduate program. We propose to start a fundraising campaign for an endowment that would allow financial support for students in perpetuity.



Appendix 1: MLML Grants & Awards

MLML faculty, faculty researchers and research affiliates acquired 90 grants and awards totaling \$16.7 million during AY15-16. These funds are administered by the San José State University Research Foundation (SJSURF).

FACULTY: (57 grants) \$4.7 million

- Elkhorn Slough Restoration
- Characterizing Sub-Sea Floor Life and Environments in the Guaymas Basin
- Development of Best Management Practices To Reduce Methyl Mercury Exports and Concentrations From Seasonal Wetlands
- In Situ Sampling of Thermodynamics and Fog
- Collaborative Research: Investigations on Cycling of Mercury from the Ocean to Fog and Deposition to Land in Coastal CA
- Along-shelf Transport and Cross-shelf Exchange Driven by Surface Waves on the Inner Continental Shelf
- Japanese Tsunami Marine Debris (JTMD) and Alien Species Invasions PICES Year 2: Continued Interception, Acquisition
- Development of a Strategic Plan for Aquaculture Research and Education at the California State University
- Using Habitat-Specific, Spatial Demographic Information to Improve Stock Assessments of Ground Fishes
- 2015 East Bay Bridge Demolition Fish Surveys - ESA
- Effects of Climate Change Induced Ocean Acidification and Hypoxia on Reproduction of Rockfishes
- Water Pollution Control Lab, Rancho Cordova CA: *Alaska Dept. of Fish and Game, City of Santa Cruz, CA, Karuk Tribe, New Mexico Dept. of Game and Fish, CA Dept. of Fish and Wildlife, Sonoma County Environmental Health Dept., Morro Bay Foundation, Yurok Tribe* (water quality monitoring, sampling and analysis)
- Refugio Beach: National Resource Damage Assessment
- Elkgrove Dry Well Project
- BeachCombers Project
- Central and Northern Coast Ocean Observatory System (CeNCOOS)
- Office of Naval Research AGOR Support
- Enhanced Stranding Response (*partnership with UC Santa Cruz*)
- Estuarine Wetland and Near Shore Ecology Studies
- Shipboard Ballast Water Treatment Tests: Aquatic Invasive Species and Ballast Water Management

RESEARCH FACULTY: (8 grants) \$692,621

- Alliance for Coastal Technologies (ACT): National Scale Efforts Towards Verification and Validation of Observation Technologies

- Monitoring and Assessments of CA's Marine Protected Areas
- Fisheries: Species Distribution Models, Data Collection Methods, Stock Assessment and Management
- Southern CA Behavioral Response Study on the Effects of Naval Sonar on Marine Mammals

RESEARCH AFFILIATES: (25 grants) \$11.3 million:

- Marine Pollution Studies Lab (MPSL) received grants to provide ongoing analytical services to the CA State Water Resources Control Board
- Surface Water Ambient Monitoring Program (SWAMP) is funded for continued bioassessments and data management
- Marine Optical Buoy (MOBY) Operations, Technology Development and Instrument Compatibility for Calibration with Ocean Color Satellites
- Central Coast Wetlands Group received a grant to develop guidance for management of estuaries in CA.
- Mercury and Methylmercury Sampling and Analysis

Appendix 2: MLML Publications AY15-16

Please note MLML Researcher names in bold.

TOTAL NUMBER OF PUBLICATIONS: 155

Adams, J., W.A. Walker, E.J. Burton, and **J.T. Harvey**. 2015. Stomach contents of a Cuvier's beaked whale (*Ziphius cavirostris*) stranded in Monterey Bay, California. *Northwest Nat.* 96:93-98.

Aguilera, S.E., J. Cole, E.M. Finkbeiner, E. Le Cornu, N.C. Ban, M.H. Carr, J.E. Cinner, L.B. Crowder, S. Gelcich, C.C. Hicks, J.N. Kittinger, R. Martone, D. Malone, C. Pomeroy, **R.M. Starr**, S. Seram, R. Zuercher, K. Broad. 2015. Managing small-scale commercial fisheries for adaptive capacity: Insights from dynamic social-ecological drivers of change in Monterey Bay. *PLoS ONE* 10(3): e0118992. doi:10.1371/journal.pone.0118992

Aiello, I.W., 2016, The Miocene hydrocarbon migration system: seep carbonates in the Santa Cruz area, California. In: Outcrops that change the way we practice petroleum geology, 100th Anniversary of the AAPG (in print).

I.W. Aiello, 2015, Elkhorn Slough TMRP: surface and subsurface properties and settlement potential at Minhoto and Hester Marsh. Elkhorn Slough National Estuarine Research Reserve. 15 pages.

Alappattu, D. P., Q. Wang, and J. A Kalogiros, 2016, Anomalous Propagation Conditions over Eastern Pacific Ocean Derived from MAGIC Data, *Radio Science*, **50**, doi:10.1002/2016RS005994.

Denny P. Alappattu and **Qing Wang**, 2015: Correction of Depth Bias in Upper-Ocean Temperature and Salinity Profiling Measurements from Airborne Expendable Probes. *J. Atmos. Oceanic Technol.*, 32, 247–255., doi: <http://dx.doi.org/10.1175/JTECH-D-14-00114.1>.

Arranz, P, DeRuiter, SL, **Stimpert, AK**, Neves, S, Friedlaender, AS, Goldbogen, JA, Visser, F, Calambokidis, J, Southall, BL, and Tyack, PL. In press. Discrimination of fast click series produced by tagged Risso's dolphins (*Grampus griseus*) for echolocation or communication. *Journal of Experimental Biology*.

Ashton, G. V., Davidson, I. C., **Geller, J.**, Ruiz, G. M. (2016). Disentangling the biogeography of ship biofouling: barnacles in the Northeast Pacific. *Global Ecology and Biogeography*. 25(6), 739-750

Ashton, G. V., Davidson, I. C., **Geller, J.**, Ruiz, G. M. (2016). Disentangling the biogeography of ship biofouling: barnacles in the Northeast Pacific. *Global Ecology and Biogeography*. 25(6), 739-750

Aspillaga, E., F. Bartumeus, C. Linares, **R.M. Starr**, À. López-Sanz, D. Díaz, M. Zabala, B. Hereu. 2016. Ordinary and extraordinary movement behaviour of small resident fish within a Mediterranean Marine Protected Area. *PLoS ONE* 11(7): e0159813. doi:10.1371/journal.pone.0159813

Barnes, C.L., R.M. Starr, and P.N. Reilly. 2015. Growth, mortality, and reproductive seasonality of California halibut (*Paralichthys Californicus*): a biogeographic approach. California Cooperative Oceanic Fisheries Investigations. Vol. 56, 2015.

Benson, S.R., R.F. Tapilatu, N. Pilcher, P. Santidrián Tomillo, L. Sarti Martinez. 2015. Leatherback turtle populations in the Pacific. In: Spotila, J. and Santidrián Tomillo, P. (Eds.), *The Leatherback Turtle: Biology and Conservation*. The Johns Hopkins University Press.

Bigman, J.S., Knuckey, J.D.S., & Ebert, D.A. 2016. Color aberrations in Chondrichthyan fishes: first records in the genus *Bathyraja* (Chondrichthyes: Rajiformes: Arhynchobatidae). *Marine Biodiversity*, 46(3): 579-587.

Bjorkstedt, E., J. Field, M. Love, **L. Rogers-Bennett, R. Starr.** 2016. Marine fisheries. pp. 779-816 in: H. Mooney and E. Zavaleta (eds.) *Ecosystems of California*. University of California Press.

Bradie, J., M. Veldhuis, A. Curto, P. Stehouwer, N. **Welschmeyer, L.** Younan, S. Bailey, K. Broeg, S. Heitmuller, M. Rolke, C. Gianoli, J. He, A. Nakata, L. Schillak, A. Zaake, J. Vanden Byllaardt, 2016. A shipboard comparison of analytic devices for ballast water compliance monitoring. *Journal of Sea Research (Netherlands, submitted, special ballast water issue)*.

Breaker: Paper in La Tecnica sponsored by the University of Manabi Province on sea surface temperature variability off the coast of Ecuador in December 2015 (first author), and (3), published a paper entitled "Trends in sea surface temperature off the coast of Ecuador from 1900 to 2015" in the *Journal of Marine Systems* in September 2016 (first author).

Cailliet, G.M. 2015. Perspectives on elasmobranch life -history studies: a focus on age validation and relevance to fishery management. *Journal of Fish Biology* 87: 1271-1292.

Cailliet, G.M. & Ebert, D.A. 2015. The diversity and natural history of Chondrichthyan fishes. *Immunobiology of the Shark*. CRC Press, Chapter 1: 1-28.

Carretta, James V., K. Danil, S.J. Chivers, D.W. Weller, D.S. Janiger, M. Berman-Kowalewski, **K. M. Hernandez, J.T. Harvey,** R.C. Dunkin, D.R. Casper, S. Stoudt, M. Flannery, K. Wilkinson, J. Huggins, and D.M. Lambourn. 2015. Recovery rates of bottlenose dolphin (*Tursiops truncatus*) carcasses estimated from stranding and survival data. *Mar. Mamm. Sci.* 32(1): 349-362.

Caselle JE, Rassweiler AR, **Hamilton SL,** Warner RR. Recovery trajectories of kelp forest animals are rapid yet spatially variable across a network of temperate marine protected areas. *Scientific Reports* 15:14102 DOI:10.103/srep14102

Clerkin, P.J. & Ebert, D.A. In Press. First southeastern Atlantic record of the false catshark, *Pseudotriakis microdon* (Carcharhiniformes: Pseudotriakidae). *Marine Biodiversity*.

K. Coale, W. Heim, H. Chiswell, A. Olson, M. Johnson, P. Weiss-Penzias, D. Fernandez, Dimethyl Mercury in Seawater, A Potential Source of Monomethyl Mercury in Fog. Paper presented at the American Geophysical Union Fall Meeting, December 14th, 2015, San Francisco, California.

Coale, K. H., Bitondo, A., Christensen, S., Drake, C. Fennie, W., Loiacono, S., Navas, G., Ghatt, G., Walovich, K, Woods, A., Worden, S. 2015. John Holland Martin, from Picograms to Petagrams and Copepods to Climate. Association for the Sciences of Limnology and Oceanography Bulletin, November 2015 p 1-19.

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Appendix 3: Media Highlights

Media Highlights 2015-2016

Moss Landing Marine Labs has always had a productive and positive relationship with local media, nature journalists and wildlife programs, both national and international. MLML is a regular stop for The Discovery Channel and has been the focus of Shark Week episodes for almost a decade. Local news channels for ABC, NBC and CBS make regular visits to the lab to talk about current research, student activities or to interview our researchers about emergent ocean science events and issues. MLML tries to maintain an active social media profile and has a very popular Facebook page:

<https://www.facebook.com/mosslandingmarinelabs/>

In AY15-16, MLML's Pacific Science Research Center headed by Dr. Dave Ebert was again featured on The Discovery Channel's Shark Week, we contributed specimens and subject matter expertise to the joint BBC/PBS three-day, live broadcast "*Big Blue Live*" that aired over Labor Day in 2015 and the Media Open House held in August 2016 for our 50th Anniversary yielded coverage on stations throughout the Central Coast and San Francisco Bay Area, including the cover of the Silicon Valley Business Journal in August 2016, featuring the (proposed) Center For Aquaculture.

Additional media included:

- 50th Anniversary Coverage
 - <http://abc7news.com/science/moss-landing-marine-labs-focused-on-research--/1457832/>
 - <http://www.kionrightnow.com/news/local-news/moss-landing-marine-laboratories-turns-50/41060820>
 - <http://www.kionrightnow.com/news/local-news/local-marine-lab-celebrates-50-year-anniversary/41060778>
 - http://www.bizjournals.com/sanjose/news/2016/08/18/from-lagoon-to-spoon-aquaculture-gets-a-boost.html?surround=etf&ana=e_article&u=ZmXAzIMKB%2B%2FT9smpTd6kEA0cbc9aad&t=1471975101&=75524962

- White House blog on inter-agency cooperation to develop capacities for nutrient monitoring and mitigation. Dr. G. Jason Smith, MLML research faculty is the Pacific-Coast technical Coordinator for the Alliance for Coastal Technologies (ACT)
 - <https://www.whitehouse.gov/blog/2016/08/03/improving-nutrient-management-and-reducing-pollution-through-open-innovation-prizes>

- Dr. Kenneth Coale was interviewed and featured in several publications, articles and news stories about his research looking at levels of mercury found in the fog along the Northern and Central CA coast.
 - <http://www.santacruzsentinel.com/article/NE/20151225/NEWS/151229822>
 - <http://www.ecowatch.com/mercury-laden-fog-swirls-over-california-coastal-cities-1882143694.html>
 - <http://www.popsci.com/mercury-observed-in-coastal-fog-off-california>
 - <http://www.mercurynews.com/2016/01/04/marins-heavy-coastal-fog-could-be-carrying-mercury-into-ecosystem/>

- MLML featured in the Los Angeles Times *Daily News Magazine* as part of a cover story on Cal State University.
 - <http://ladailynews.travidia.com/SS/Tiles.aspx>

- Oakland Bay Bridge Demolition, October 2015: The MLML team from Dr. Rick Starr's CA Collaborative Fisheries Research Program (CCRP) lab was featured in several San Francisco Bay Area news broadcasts and publications. The team spent Halloween weekend in 2015 monitoring the waters surrounding the demolition site to track fish mortalities.
 - <http://www.sfgate.com/bayarea/article/Bay-Bridge-demolition-set-for-early-Saturday-6632160.php>

- The (proposed) Center For Aquaculture and Professor Michael Graham of the Phycology Lab were featured in local newspapers throughout the year (*Santa Cruz Sentinel*, *Monterey County Weekly*) and was selected by the Chancellor's Office to be "In The Spotlight" of the CSU News website.
 - <http://www.santacruzsentinel.com/science/20160127/aquaculture-the-next-great-monterey-county-frontier>
 - <http://news.calstate.edu/csu-collaboration-to-strengthen-california-aquaculture/>
 - http://www.montereycountyweekly.com/news/cover/monterey-bay-seaweeds-brings-seaweed-superpowers-to-plates/article_0424d1f2-38ac-11e6-8959-4f8fd23ed8ee.html

- AY2015-2016 saw a tremendous increase in marine mammal activity throughout the Monterey Bay. Dr. Jim Harvey was interviewed by local NBC, CBS and ABC affiliates as well as news publications as an expert on whales, orcas and the effects of El Nino on the Monterey Bay ecosystem.
 - <http://www.santacruzsentinel.com/20160419/high-number-of-killer-whales-spotted-in-monterey-bay>
 - <http://www.kionrightnow.com/news/local-news/dead-whale-of-west-cliff-may-be-the-result-of-more-orcas-in-the-monterey-bay/39366164>

- Whale Disentanglements: MLML's Scott Benson and Captain JD Douglas are Level IV responders for NOAA's Whale Entanglement Team (WET). They performed numerous disentanglements of humpback, blue and gray whales throughout the year and were recognized by NOAA in press releases issued internationally and picked up by major news outlets in several countries.
 - <http://www.santacruzsentinel.com/environment-and-nature/20160422/monterey-bay-humpback-whale-freed-while-orcas-feed-froli>
 - <http://www.cawhalerescue.org/news/2016/5/11/california-whale-rescue-responders-disentangle-humpback-whale-off-carmel-coast>

- Great White Sharks: the coastline between Capitola and Manresa State Beaches in the Monterey Bay has experienced a tremendous increase in Great White Sharks over the last 2 years. MLML's Dr. Dave Ebert and his students served as a subject matter expert several times throughout the year for local and national news broadcasts and publications.
 - <http://www.kionrightnow.com/news/local-news/what-to-do-if-you-encounter-shark-while-kayaking/35450810>
 - <http://www.kionrightnow.com/news/local-news/group-of-great-white-sharks-spotted-at-seacliff-beach-in-aptos/39602028>
 - http://www.nbcbayarea.com/news/local/Great-White-Sharks-Spotted-in-Santa-Cruz-384005641.html?_osource=SocialFlowFB_BAYBrand

- KION TV, local CBS affiliate featured MLML during a Special Report in May 2016 on the town of Moss Landing: *“An Inside Look At Moss Landing Marine Labs”* interviewing Professor Emeritus Dr. Greg Cailliet about the history and mission of MLML
 - <http://www.kionrightnow.com/news/local-news/inside-look-moss-landing-marine-labs/39637580#.Vz6dFantc8>
- The Salinas Californian selected the Friends of MLML as their non-profit of the month: *“The Spirit of Moss Landing”*
 - <http://www.thecalifornian.com/story/life/2016/07/07/friends-and-spirit-moss-landing/86782292/>
- Ross Clark of the Central Coast Wetlands Group (CCWG) continued publishing his regular column in the Santa Cruz Sentinel *“Earth Matters”*
 - <http://www.santacruzsentinel.com/environment-and-nature/20160630/ross-clark-earth-matters-changing-the-rules-as-climate-changes-too>

MLML Film

MLML commissioned an alumnus and a local filmmaker to make a short film that could be used to recruit new students, donors and research partners. The film also needed to describe and illustrate the complexity of the lab’s organizations to local, regional and State officials, stakeholders and representatives within the CSU seeking to understand who we are and what we do; a daunting mission to undertake in only 6-8 minutes.

Footage was donated by MBARI, wildlife photographers, and underwater filmmakers. Footage was captured of our students in the field and classroom, interviews were videotaped, a narration track was recorded, and maps were woven in to bring context to the Monterey Bay area.

The resulting film has been viewed by the MLML Governing Board, the MLML community, alumni, and guests at the 50th Anniversary VIP reception. Audience reactions have been positive, although faculty and advisors within the CSU system requested more footage of students, particularly showing where they ended up after graduation, and more details on locales in the world where MLML employees are conducting research.



Stephanie Schneider and team, Grad student in the Vertebrate Ecology Lab Castle Rock, Humboldt County monitoring Common Murres



Chemical oceanographers deploy benthic chambers to measure mercury flux in the SF Bay Delta Complex

Appendix 4: Governing Board Members