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DIRECTOR'S STATEMENT

The OSU/NOAA Cooperative Institute for Marine Resources Studies (CIMRS) represents a strong, long-term, NOAA-university partnership dedicated to research in marine science, graduate and public education, and cooperation with regional industries and communities that are dependent on marine resources.

An integral part of the OSU's Hatfield Marine Science Center (HMSC), CIMRS is a model cooperative institute for many reasons. By its co-location with three regional NOAA laboratories representing two NOAA Line Offices, the Institute is able to bring together research partners from a variety of disciplines to address complex multidisciplinary issues relating to the living and non-living components of the marine environment. It is also the administrative home for 28 research staff and 3 research faculty working on collaborative projects with NOAA investigators who serve as OSU courtesy faculty. No other OSU research institute provides both grant administration and personnel review in the manner of an academic department. In FY06 CIMRS celebrated the promotion of one faculty member to Associate Professor and adjunct status in the College of Oceanic and Atmospheric Research and two Faculty Research Assistants to Senior rank. CIMRS faculty also conduct research with funding from agencies such as NSF and ONR, which extends the impact of the Institute and its value to NOAA.

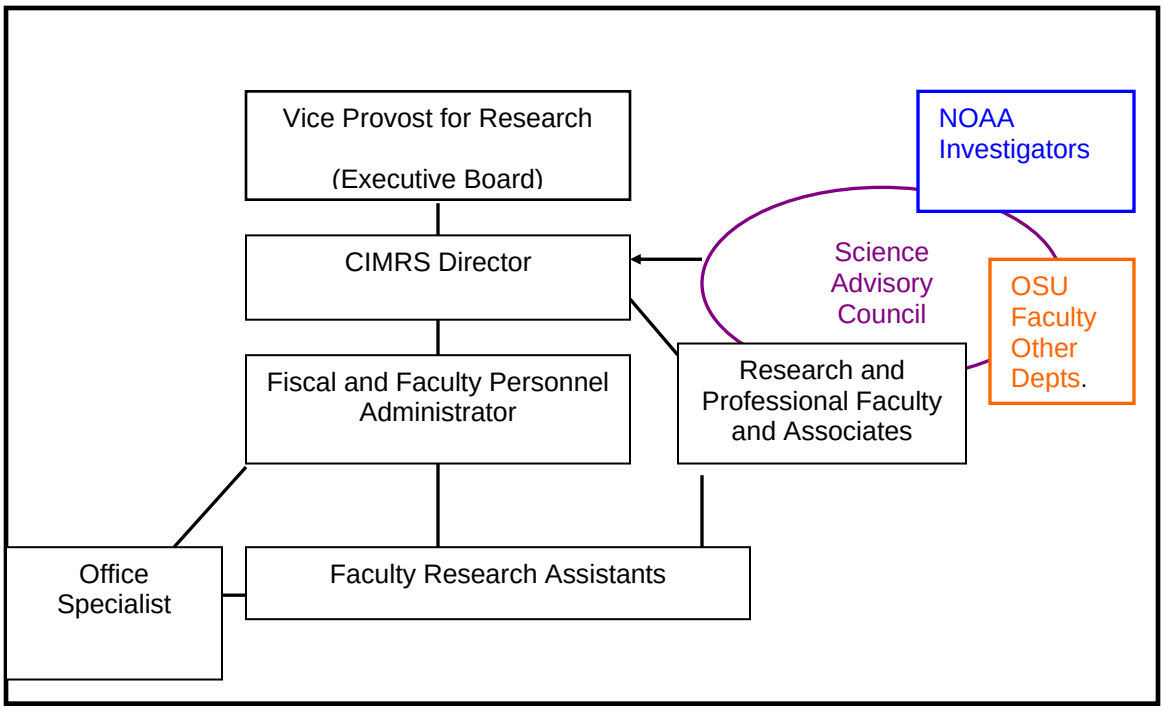
The research focus of CIMRS addresses living and non-living marine resources and is thus linked to programs that require environmental sampling or observing within the ocean and programs that characterize seafloor habitats. This focus encompasses the broad field of marine fisheries (including fisheries oceanography, habitat research, and ecosystem-based management), geological/chemical oceanography, marine mammal acoustics, and the effects of climate change on marine ecosystems. It thus addresses ecosystem and climate mission goals in NOAA's 5-year research plan and poises CIMRS research to contribute to NOAA's 20-year research vision.

The Institute thrives because of the commitment of leaders from within the laboratories of its NOAA associates and the OSU Research Office. As a result, during the past few years external research grant funding has grown, graduate student opportunities have diversified, and CIMRS has entrained many more OSU investigators from a broad range of disciplines to join together and address research problems of environmental, economic and social importance. Media recognition of CIMRS research this year included, but was not limited to, the Discovery Chanel, Oregon Public Broadcasting, NPR, and Discovery Magazine. Over 26 publications appeared in peer-reviewed scientific journals reporting results from CIMRS collaborative research.

In summary, the scientific accomplishments of CIMRS demonstrate its value to both NOAA and the University. Its purpose is to serve as a bridge between traditional disciplines, a crossroad for fostering new ideas, and a dependable source of new research and analysis. It is anticipated that ongoing efforts will continue to raise the profile of the Institute and the partnerships it cultivates. For more information, please contact our website at http://oregonstate.edu/groups/cimrs.

ORGANIZATION

CIMRS is administered through the OSU Research Office with oversight from an Executive Board made up of members from the participating NOAA laboratories and collaborating OSU colleges and programs under the terms of a Memorandum of Understanding between OSU and NOAA/NMFS. A Science Advisory Council (SAC) gives input on research directions, progress, and policy to the Director.



2006/7
EXECUTIVE BOARD

John Cassady (Chair)
Vice-Provost for Research, Oregon State University

Usha Varanasi
Director, Northwest Fisheries Science Center, NOAA

Eddie Bernard
Director, Pacific Marine Environmental Laboratory, NOAA

Sherman Bloomer
Dean, College of Sciences, OSU

Erik Fritzell
Assoc. Dean, College of Agricult. Sci., OSU

Mark Abbott
Dean, College of Oceanic & Atmos. Sciences, OSU

Robert Malouf
Director, Oregon Sea Grant, OSU

George Boehlert
Director, Hatfield Marine Science Center, OSU

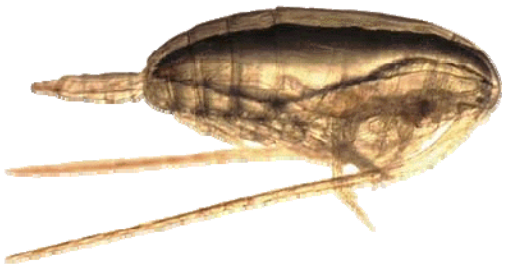
Michael Banks
Director, CIMRS (Ex Officio), OSU

SCIENCE ADVISORY COUNCIL

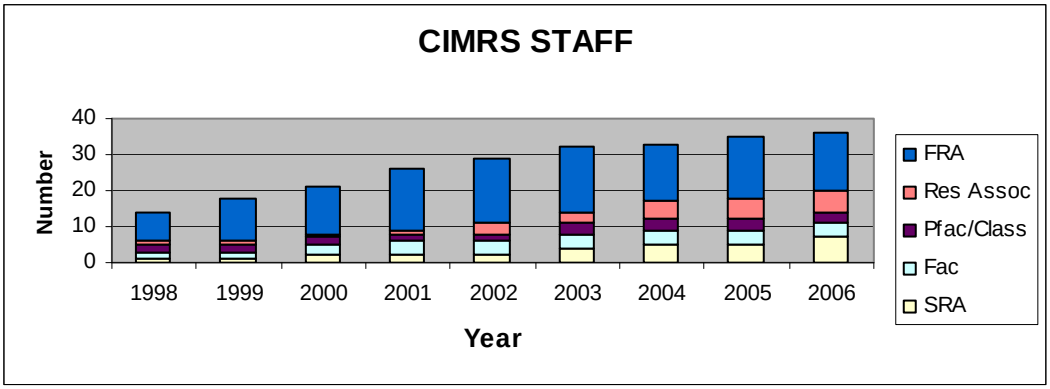
Hal Batchelder	College of Oceanic and Atmospheric Sciences, OSU, Corvallis OR
Kelly Benoit-Bird	College of Oceanic and Atmospheric Sciences, OSU, Corvallis OR
Bill Chadwick	CIMRS, OSU Hatfield Marine Science Center, Newport OR
Elizabeth Clarke	FRAM Division Director, NOAA Fisheries, Northwest Fisheries Science Center, Seattle WA and Newport OR
Tracy Collier	EC Division/Ecotoxicology, NOAA Fisheries, Northwest Fisheries Science Center, Seattle WA
Robert Embley	Ocean Environment Research Division, Pacific Marine Environmental Laboratory, NOAA, OSU Hatfield Marine Science Center Newport OR
John Ferguson	FE Division, NOAA, Fisheries, Northwest Fisheries Science Center, Seattle WA
Selina Heppell	Dept. of Fisheries and Wildlife, OSU, Corvallis OR

David Mellinger	CIMRS, OSU Hatfield Marine Science Center, Newport OR
Alan Mix	College of Oceanic and Atmospheric Sciences, OSU, Corvallis OR
Cliff Ryer	RACE Division, NOAA Fisheries, Alaska Fisheries Science Center, OSU Hatfield Marine Science Center, Newport OR

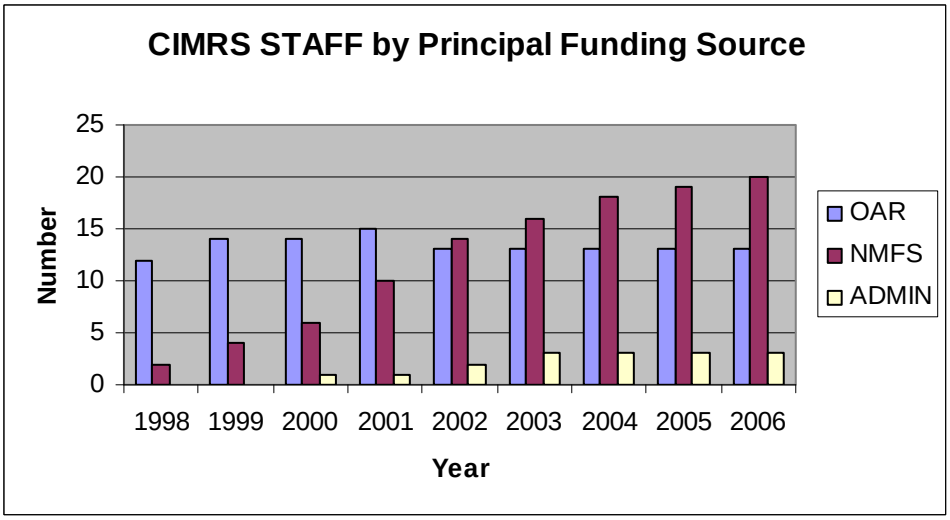
Ex-Officio – Michael Banks



The number of CIMRS staff has grown steadily over the past 7 years as a result of new research initiatives in fisheries ecology, stock assessment, and marine mammal acoustics. The range of responsibilities and expertise of the staff have also grown and been recognized through promotion.



Faculty =Research Professors and the Director, ResAssoc = Research Associates, PrFac = Professional Faculty, Class= Classified Staff, SFRA=Senior Faculty Research Assistants, FRA= Faculty Research Assistants.



ADMINISTRATIVE SUPPORT

In FY2006/7, $163,849 was expended by the university for CIMRS administration. These funds provided salary and benefits for the Director, Michael Banks (0.4 FTE), the Fiscal and Faculty Personnel Administrator, Jessica Waddell (1.0 FTE), and a part-time office specialist (0.5 FTE). Administration funds were also used for personnel training and staffing, routine office supply costs, communication, computer network fees, equipment storage, hosting meetings, and contributing to public events at HMSC. Administrative support provided by the HMSC business office is not included in this figure.

Additional directed support from the NWFSC for project coordination provided another portion of the Director's salary and benefits (0.2 FTE).

"Marine Team" fisheries students experience survival training at HMSC.

PROJECTS SUPPORTED WITH CONTRIBUTED FUNDS FROM NOAA PARTNER LABORATORIES IN FY 2006/7

This section summarizes directed research projects undertaken by CIMRS with research funding received from NOAA through the Northwest Fisheries Science Center and the Pacific Marine Environmental Laboratory. All projects were approved by the Assistant Administrator and the Grants Management Division of NOAA after independent merit review.

Projects under Grant NA06NMF4550286

Total Award $1,299,618; 9/1/06-8/31/07

"The Effects of Ocean Variability on Marine Survival of Fishes"

This project supports the active monitoring of ocean conditions, zooplankton distributions, and fish populations off the coasts of Washington, Oregon and California. New field efforts and retrospective analysis of historical data are being undertaken with all efforts emphasizing relationships between ocean conditions and growth and survival of marine fishes. Specific focus areas are *Plume Habitat and Pelagic Fish Ecology, Zooplankton Ecology, Nekton Distribution, Trophic Ecology, Pelagic/Demersal Fish Habitat and Bioacoustics Studies,* and *Long-term Indices of Annual Growth of Long-lived Groundfishes.*

OSU Investigators, Research Staff: Selina and Scott Heppell, Associate Prof. F&W; Bryan Black, Asst. Prof., Sr. Res.; Hongsheng Bi, Jim Ruzicka, Research Assoc.; Leah Feinberg, Sr. Faculty Research Asst., Toby Auth, Karen Hunter, Jennifer Menkel, Jason Phillips, Suzan Pool, Tracy Shaw, Heather Soulen, Faculty Research Assistants; Rebecca Baldwin, Graduate Research Assistant

Collaborating NOAA Investigators: Ric Brodeur, Bill Peterson, Tom Wainwright, Kym Jacobson, FE/NWFSC;

"Fisheries Habitat Investigations"

The objective of this work is to integrate many types of oceanographic, biological, geological (e.g., seafloor bathymetry, sidescan sonar images, sediment and rock types, active fault zones, observations and measurements from submersibles) and groundfish fisheries data (including fishery dependent records) into a Geographical Information System (GIS) so that information can be overlain on spatial maps. These maps are then utilized to characterize, classify and predict the distribution of seafloor habitats, to study relationships between habitat type and productive versus unproductive fishing grounds, and to document the consequences of management measures on fishing activities and habitat.

OSU Investigators, Research Staff: Chris Goldfinger, Associate Prof., College of Oceanic and Atmospheric Sciences, Jack Barth, Professor, College of Oceanic and Atmospheric Sciences, Steve Pierce, Research Associate, Chris Romsos, Faculty Research Assistant (all COAS)

Collaborating NOAA Investigators: Waldo Wakefield and Elizabeth Clarke, FRAM/NWFSC

"Cooperative Research"

Marine Team

A fisheries internship program that was originally awarded from an RFP under "Marine Team" a student–led research program run through the Department of Fisheries and Wildlife at Oregon State University has continued successfully for several years. Through the efforts of Scott Heppell and Michael Harte (OSU Marine Resource Management) interested students are now able to participate in an industry/agency internship, which will allow them the opportunity to (1) spend time working on commercial fishing vessels and learn the fisheries while interacting with captains and crew, (2) spend time at shore-side support facilities such as gear shops and fish processors, and (3) work with state management agency ODFW) personnel on research, monitoring, and policy projects.

Priorities this year were to:

1. Conduct estuarine and nearshore/intertidal sampling for juvenile groundfish
2. Create opportunities for students to participate in state and federal fisheries research projects
3. Conduct fisheries issues forums to facilitate interactions between students and resource scientists, managers, and industry representatives.
4. Create opportunities for Marine Team students to work with commercial industry partners and agencies through the new internship program.
5. Represent Marine Team, OSU, and CIMRS at the annual Marine Team Research Poster presentation.
6. Participate annually in the Oregon Chapter meeting of the American Fisheries Society

<u>Collaborating NOAA Investigators:</u> Elizabeth Clarke, Waldo Wakefield, John Harms, FRAM/NWFSC

"Stock Assessment Improvement"

Incorporation and Evaluation of Environmental Parameters into the W.C. Groundfish Assessment

The focus of this project is the incorporation and evaluation of environmental parameters into population assessments of West Coast sablefish. Statistical studies are also being performed to establish the suitability of sea level as an independent variable and its control on recruitment trends. Incorporation of recruitment predictions in stock assessment models is being tested.

OSU Research Staff: Jim Colbert, Research Associate, CIMRS
Collaborating NOAA Investigator: Michael Schirripa, FRAM/NWFSC

Population Dynamics and Stock Assessment of W.C. Groundfish

Stock assessments and statistical analyses provide the basis for identifying over fished and threatened stocks, guiding and monitoring rebuilding of these stocks, and forecasting biologically sustainable harvest levels for healthy stocks of commercial fish. They are conducted periodically to track changes in abundance and are supported by long-term fishery-dependent and fishery-independent monitoring, and life history studies.

This year Dr. Gertserva conducted an assessment of the longnose skate, *Raja rhina.* This assessment was approved and accepted by the Stock Assessment Review (STAR) Panel as well as Scientific and Statistical Committee (SSC) of the Pacific Fishery Management Council, and will be used to establish management actions for the longnose skate fisheries.

Dr. Gertseva also teaches the course "Introductory Population Dynamics". This course is designed for undergraduate students and is a part of the core curriculum for a Bachelor's degree in Fisheries & Wildlife. It is delivered exclusively online through OSU Extended Campus and is offered every Fall, Winter and Summer terms. The course introduces the fundamental concepts of population dynamics, exposes students to quantitative analysis of biological data, and illustrates applications of mathematical models for management and conservation of populations in fisheries and wildlife.

OSU Research Faculty: Vladlena Gertseva, Asst. Prof., Sr. Res., CIMRS
Collaborating NOAA Investigator: Elizabeth Clarke, FRAM/NWFSC

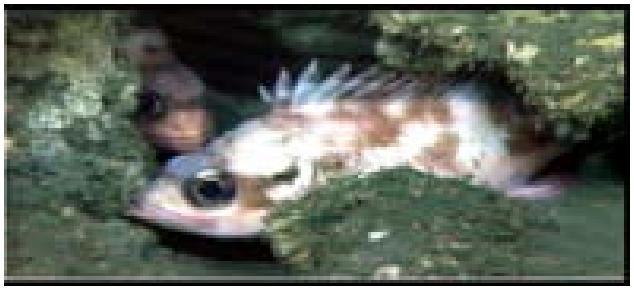
Estimating Key Life History Parameters of Selected Rockfish

The purpose of this research is to investigate the reproductive biology and maternal effects of Pacific Ocean perch in the Gulf of Alaska. Older female rockfish may produce more fit and viable larvae due to greater contribution of lipids to the larvae. By collecting Pacific Ocean perch larvae at sea and then rearing them in the ADF&G/AFSC Kodiak Laboratory Seawater Facilities in Kodiak, larval lipid levels can be quantified and analyzed. This project is vital to maternal effects research and can be utilized by the

North Pacific Fisheries Management Council and the National Oceanic and Atmospheric Administration's Fisheries Agency in order to create management actions to protect a proportion of older age rockfish from commercial fishing.

GRA Emily Washchuk conducted research on Pacific Ocean perch reproductive biology and maternal effects in Kodiak, Alaska from late April to early June 2007. Emily presented preliminary results of her research findings at the Oregon Chapter of the American Fisheries Society in Eugene and the Annual Meeting in San Francisco during the year.

OSU Research Faculty: Scott Heppell, Asst. Prof., Dept. of Fisheries and Wildlife
Collaborating NOAA Investigator: Grant Thompson, REFM/AFSC



Projects under Grant NA17RJ1362

Total Award $1,299,319; 7/1/06-6/30/07

"Ocean Environment Research"

This multidisciplinary project seeks to quantify the effects of submarine volcanic and hydrothermal activity on the ocean. Continuous acoustic monitoring of spreading centers in the world's oceans allows investigators to detect and study the chemical, physical, geological and biological effects of tectonic activity on the global ocean and to follow free-ranging populations of large cetaceans. Specific focus areas are *Ocean Observing Systems, Hydrothermal Venting, Marine Mammal Acoustics, Microbiology of Seafloor Vents and Eruptions, Fisheries Oceanography.*

The Acoustic Monitoring Project provides wide-area, continuous seismic monitoring of global ridge systems using low-frequency acoustics. The primary focus of the effort is in using the U.S. Navy SOSUS hydrophone arrays to provide real-time monitoring of the

Juan de Fuca /Gorda Ridge systems to queue event response efforts. Additionally, CIMRS investigators maintain and deploy both autonomous and near real-time (via satellite) hydrophone technologies for acoustic characterization of remote regions of the global oceans.

In order to acoustically monitor areas of the world ocean not covered by existing fixed hydrophone arrays, CIMRS scientists have developed autonomous moored hydrophone instruments to record acoustic energy from both underwater seismic activity as well as that from whale calls. These instruments are capable of recording frequencies from 1 - 1000 Hz, and can record data for over a year before servicing is required. The hydrophones are designed to be deployed as an array of independent instruments whose geometry can be determined by the needs of the experimenter in order to localize acoustic sources of interest.

The goal of the Geophysical Monitoring program is to better understand how submarine volcanoes work. Efforts continue to be divided between projects focused on volcano monitoring in the NE Pacific and seafloor mapping and exploration in the Western Pacific.

CIMRS researchers involved in the Hydrothermal Emissions project collect, measure, and analyze trace elemental gases in hydrothermal fluids, particularly helium-3, using ultra-high vacuum mass spectrometry. The objective of this research is to assess the locations, mechanisms, chemical flux rates and ages of active hydrothermal systems along sea floor spreading centers with the eventual end result of quantifying and predicting large-scale spatial and temporal effects of venting on ocean chemical and thermal budgets.

The Coastal Tide Modeling project assesses the effects of increasing the spatial resolution of a coastal tide model on the modeled tides and tidal currents for a variety of sites along the open coast, island locations and within embayments. The OSU tidal inversion software (OTIS) has been modified and tested for simulating tides at the very high spatial resolution required for tsunami hazard modeling.

OSU Investigators, Research Staff: William Chadwick, Associate Prof., Sr. Res., Robert Dziak, Associate Prof., Sr. Res., David Mellinger, Assistant Prof., Sr., Res., Haru Matsumoto, Research Associate; Andra Bobbitt, Susan Merle, Sharon Nieukirk, Sr. Faculty Research Assistants; Leigh Evans, Matthew Fowler, Ron Greene, Joe Haxel, Sara Heimlich, Faculty Research Assistants; Andy Lau, Professional Faculty (all CIMRS); Gary Egbert, Prof., S. Erofeev, Research Associate, COAS

Collaborating NOAA Investigators: Robert Embley, Frank Gonzalez, Stephen Hammond, John Lupton (all PMEL/OERD)

FY 2006/7 CONTRACTS

Title	Source	Total Funding	Duration	PI
Fish Behavior GRA	NOAA/AFSC	$62,075	9/05-9/08	Banks
Fish Behavior Analysis	NOAA/AFSC	$12,976	11/06-06/07	Banks
Survival of Juvenile Salmonids…	BPA	$539,460	8/1/06-8/31/07	Banks
Historic Habitat Food Web Linkages	BPA	$76,975	10/06-9/07	Banks

FY 2006/7 GRANTS FROM OTHER AGENCIES

Title	Source	Total Funding	Duration	PI
Real-Time Volcanic Detection	NSF	$127,367	10/06-9/07	Dziak
Productivity, Biogeochemical Transforations and Cross-Margin Transport…	NSF	$86,362	4/06-5/07	Peterson
Intrusion and Eruption Dynamics (Joint with Univ. of Idaho)	NSF	$11,813	1/07-2/07	Chadwick
Odontocetae Datasets	ONR	$175,000	7/06-6/07	Mellinger
Passive Acoustic Monitoring	IAGC	$110,200	1/07-12/07	Mellinger
Earthquakes and Endangered Whales	NOAA OE	$231,000	5/07-4/09	Dziak, Mellinger
Submarine Volcanic Activity and Assoc. Extreme Ecosystems	KOPRI	$29,912	7/06-6/07	Dziak

Institute Director's Research Activities

The Institute Director's research was supported in 2006/7 through grants awarded to the Coastal Oregon Marine Station, Dept. of Fisheries and Wildlife where he holds a faculty appointment at the rank of Assistant Professor.

Project Title: SNP Development in Chinook Salmon for Genetic Stock Identification of Mixed Fisheries
Source of Support: NOAA/NWFSC
Total Award: $39,999 Period Covered: 7/1/06-6/30/07
Person Months Committed to the Project by PI: 0

Project Title: Conservation Hatchery Implementation Program: OSU Component for Non-pariel Dam Adult Trap and Genetic Pedigree
Source of Support: Oregon Watershed Enhancement Board
Total Award: $143,948 Period Covered: 8/1/06-6/30/07
Person Months Committed to the Project by PI: .8 (Co-PI)

Project Title: "Real-Time" Genetic Information to Address the Klamath 'Weak' Stock Crisis for Oregon's Ocean Salmon Fishery
Source of Support: Agriculture Research Foundation
Total Award: $127, 833 Period Covered: 9/07-12/08
Person Months Committed to the Project by PI: 1.2 (Co-PI)

CIMRS Fellowship Opportunities and Graduate Students Supported Through Joint Projects

Fisheries Oceanography Graduate Fellowships

The goals of NOAA's strategic plan are to build sustainable fisheries, to recover protected species, and to sustain healthy coasts. These goals require the support of sound scientific research to build the knowledge base for maintaining economically viable fisheries and, at the same time, minimize anthropogenic impacts on marine ecosystems. To accomplish these goals a Fisheries Oceanography Graduate Fellowship program was started within CIMRS in 2003 with funds provided by the Alaska Fisheries Science Center of NOAA/NMFS. This program seeks to recruit highly talented M.S. or Ph.D. students to oceanography, fisheries or wildlife science, resource economics, zoology, environmental science or a related field at Oregon State University, with an intended focus on ecological and natural resource issues in the Northeast Pacific, Aleutian Islands, and Bering Sea. In 2006, one fellowship (first awarded in 2003) was continued.

2006 Fellows and Projects

Julie Keister Investigations of Variability of Mesoscale Energy off the Coast of Central Oregon and Northern California
Major Professor: Tim Cowles, COAS

Graduate Students supported through Joint Research Projects

A growing number of graduate student projects are being supported with contributed grant funds from the NOAA Fisheries. The CIMRS Director works to match qualified students with projects and courtesy faculty based at the Hatfield Marine Science Center.

Ph.D. Candidates – *Fisheries and Wildlife*

Rebecca Baldwin	2006-2009	Using Parasite Community Data and Population Genetics for Assessing Pacific Sardine (*Sardinops sagax*) Population Structure along the west coast of North America Co-Major Professor: Michael Banks/Kym Jacobson NOAA Fisheries Rep: Kym Jacobson, NWFSC
Fisheries and Wildlife		
Kate Boersma	2005-2007	Divergent anti-predator strategies and risk allocation in juveniles of three north Pacific flatfishes Co-Major Professors: Selina Heppell, Cliff Ryer

		NOAA Fisheries Rep: Cliff Ryer, AFSC
Marissa Litz	2005-2008	Abundance, distribution, and spawning behavior of the northern anchovy, *Engaulis mordax*, off the cost of Oregon and Washington Major Professor: Selina Heppell Minor Rep: Scott Heppell NOAA Fisheries Rep: Robert Emmett, NWFSC
Emily Waschuk	2005-2008	Estimating Key Life History Parameters for Selected Species of Rockfish Major Professor: Scott Heppell Minor Rep: Selina Heppell NOAA Fisheries Rep: Grant Thompson, AFSC

Degrees Completed

Ph.D. Candidates – *Fisheries and Wildlife*

Todd Miller	1999-2006	Trophic Dynamics within Varying Conditions of the Northern California Current Major Professor: Hiram Li NOAA Fisheries Rep: Ric Brodeur, NWFSC

Environmental Molecular & Toxicology

Claudia Bravo	2002-2006	Toxicology of Polycyclic Aromatic Hydrocarbons: Dibenzo [a,l] pyrene (DB[a,l]P) in Rainbow Trout, *Oncorhynchus mykiss* Major Professor: Larry Curtis, E&MT NOAA Fisheries Rep: Mary Arkoosh, NWFSC

M.S. *Marine Resource Managemen*t

Maria Juan Jorda	2003-2006	Development of a Physical Database and GIS Coordination at Heceta Bank, Oregon Major Professor: Jack Barth, COAS NOAA Fisheries Rep: Waldo Wakefield, NWFSC

M.S. *Fisheries and Wildlife*

Brooke Martin 2002-2006 Purification and Characterization of Vitellogenin, and use for Enzyme Linked Immuno-absorbent Assay (ELISA) for gender and maturity status in Black rockfish (*Sebastes melanops*)

Major Professor: Selina Heppell
Minor Rep: Scott Heppell
NOAA Fisheries Rep: Grant Thompson, AFSC

2006-2007 Publications

FY 07

Auth, T.D. and R.D. Brodeur. 2006. Disrtibution and community structure of ichthyoplankton off the coast of Oregon, USA, in 2000 and 2002. *Mar. Ecol. Progr. Ser.* 319: 199-213.

Bi, H. and M. Benfield. 2006. Egg production rates and stage-specific development times of *Clausocalanus furcatus* (Copepoda, Calanoida) in the northern Gulf of Mexico. 2006. *J. Plankton Res.* 28(12): 1199-1216.

Brodeur, R.D., S. Ralston, R.L. Emmett, M. Trudel, T.D. Auth, and A. J. Phillips. 2006. Anomalous pelagic nekton abundance, distribution and apparent recruitment in the northern California Current in 2004 and 2005. *Geophys. Res. Lettr.* 33 L22S08, doi: 10.1029/2006GL026614.

Bucklin, K.A., M.A. Banks, and D. Hedgecock. 2007. Assessing genetic diversity or protected coho salmon (*Onchorhynchus kisutch*) populations in California. *Canadian J. Fish. & Aquat. Sci.* 64(1):30-42.

Chadwick, W.W., Jr. 2007. A submarine volcano is caught in the act. *Science*, In Press.

Chadwick, W.W., Jr., D.J. Geist, S. Jonsson, M. Poland, D.J. Johnson, and C.M. Meertens. 2007. A volcano bursting at the seams: Inflation, faulting, and eruption at Sierra Negra Volcano, Galapagos. *Geology* 34(12): 1025-1028.

DeRonde, C.E.J., E. Baker, G.J. Massoth, J.E. Lupton, I.C. Wright, R.J. Sparks, S.L. Walker, R.R. Greene, C. Bannister, M.E. Reyners, J. Ishibashi, K. Faure, J.A. Resing, and G.T. Lebon. 2006. Submarine hydrothermal activity along the mid-Kermadec arc, New Zealand: Large-scale effects on venting. *Geochim. Et. Cosmochim.* 70(18): A136-A136 Suppl.

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Gertseva, V.V. and V.I. Gertsev. 2006. A conceptual model of fish functional relationships in marine ecosystems and its application for fisheries stock assessment. *Fish. Res.* 81 (1): 9-14.

Gomez-Gutierrez, J., L.R. Feinberg, T. Shaw, and W.T. Peterson. 2006. Variability in brood size and female length of *Euphausia pacifica* among three populations in the North Pacific. *Mar. Ecol. Prog. Ser.* 323: 185-194.

Helama, S., B.R. Schone, B.A. Black, E. Dunca. 2006. Constructing long-term proxy series for aquatic environments with absolute dating control using a schlerochronological approach: introduction and advanced applications. *Mar. and Freshwat. Res.* 57(6): 591-599.

Hooff, R.C. and W.T. Peterson. 2006. Copepod biodiversity as an indicator of changes in ocean and climate conditions of the northern California current ecosystem. *Limnol. & Oceanogr.* 51(6): 2607-2620.

Lupton, J., D. Butterfield, M. Lilley, L. Evans, K. Nakamura, W. Chadwick, Jr., J. Resing, R. Embley, E. Olson, G. Proskurowski, E. Baker, C. de Ronde, K. Roe, R. Greene, G. Lebon, and C. Young. 2006. Submarine venting of liquid carbon dioxide on a Mariana Arc volcano. *Geochem. Geophys. Geosyst.* 7, Q08007, doi: 10.1029/2005GC001152.

Mellinger, D.K. and C.W. Clark. 2007. MobySound: A reference archive for studying automatic recognition of marine mammal sounds. *Applied Acoustics* 67(11-12): 1226-1242.

Peterson, B., R. Emmett, R. Goergicke, E. Venrick, A. Mantyla, S.J. Bograd, F.B. Schwing, S. Ralston, K.A. Forney, R. Hewitt, N. Lo, W. Watson, J. Carlow, M. Lowry, B.E. Lavaniegos, F. Chavez, W.J. Sydeman, D. Hyrenbach, R.W. Bradley, P. Warzybok, K. Hunter, S. Benson, M. Weise, J. Harvey. 2006. The state of the California current, 2005-2006: Warm in the North, cool in the South. *CalCOFI Reports* 47: 30-74.

Qayum, H.A., A. Klimley, R. Newton, and J. Richert. 2007. Broad-band versus nattow-band irradiance for estimating latitude by archival tags. *Marine Biol.* 151(2): 467-481.

Suryan, R.M., F. Sato, G. Balogh, K.D. Hyrenbach, P. Sievert, and K. Ozaki. 2006. Foraging destinations and marine habitat use of short-tailed albatrosses: A multi-scale approach using first-passage time analysis. *Deep-Sea Research II* 53:370-386.

Van Doornik, D.M., D.J. Teel, D.R. Kuligowski, C.A. Morgan, and E. Casillas. 2007. Genetic analyses provide insight into early ocean stock distribution and survival of juvenile coho salmon off the coasts of Washington and Oregon. *N.A. J. Fish. Mgmt.* 27(1): 220-237.

Wainwright, T.C., L.R. Feinberg, R. Hooff**,** W.T. Peterson. 2007. A comparison of two lower trophic models for the California Current System. *Ecol. Model.* 202(1-2): 120-131.

FY 06

Black, B.A., G.W. Boehlert, and M.M. Yoklavich. 2005. Using tree-ring crossdating techniques to validate age in long-lived fishes. *Can. J. of Fish. And Aquat. Sci.* 62(10): 2277-2284.

Brodeur, R.D., J.F. Fisher, R.L. Emmett, C.A. Morgan and E. Casillas. 2005. Species composition and community structure of pelagic nekton off Oregon and Washington under variable oceanographic conditions. *Mar. Ecol. Prog. Ser.* 298: 41-57.

Chadwick, Jr., W.W., S.L. Nooner, M.A. Zumberge, r.W. Embley and C.G. Fox. 2006. vertical deformation monitoring at Axial Seamount since its 1998 eruption using deep-sea pressure sensors. *J. Volcanol. Geoth. Res.* 150(1-3): 313-327.

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CIMRS OUTREACH ACTIVITIES

Educational and scientific outreach is important in all aspects of CIMRS research. Websites are a venue that reaches an enormous audience. CIMRS investigators feature their collaborative research efforts in the fields of fisheries oceanography, geophysical and acoustic monitoring of spreading centers, ocean exploration, and bioacoustic monitoring of large cetaceans at several sites hosted by NOAA. One award winning website (http://www.pmel.noaa.gov/vents) features educational curricula, video clips of in situ seafloor experiments, and animated 3-dimensional fly-through movies of seafloor ridges.

The Visitor Center at OSU's Hatfield Marine Science Center also lends a convenient outlet for educational displays and programs. NOAA's Teacher-at-Sea Program and the Ocean Exploration Program have helped sponsor educators on land and at sea who together present and interpret research activities for the general public. CIMRS investigators have also collaborated with Sea Grant Educational staff to design and prepare interactive exhibits. At the "ROPOS Exhibit", visitors can pilot a remotely operated vehicle to the seafloor and back with a joystick while viewing computer-generated and real video clips of the seafloor.

SeaFest, the OSU Hatfield Marine Science Center Open House, is an important outreach event that reaches approximately 3000-4000 families introducing them to the science activities at HMSC. CIMRS investigators spend many hours preparing exhibits for and then participating in the day-long event each year.

CIMRS researchers also provide valuable volunteer hours at K-12 Science Fairs and related activities throughout the year.